Mapping the Research in Commodity Derivatives Market (CDM) through Bibliometric Analysis (2010-2021): An Insight from Literature Survey

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Abstract: Commodity derivatives are investmentvehicles allowing investors to reap profits by investing in commodities without owning them. A commodity exchange is place where various commodities and their derivatives contracts are bought and sold, Indian commodity exchange mainly trade in commodity futures. This paper mainly focused on bibliometric analysis on commodity derivatives market research, for this purpose,Iextracted 1612 research papers in different steps which is published through 2010-2021 after the global financial crisis periodand listed in the Scopus database. Paper employed a blend of bibliometricand network analysis techniques (through "R" andVOSviewer) to classify and evaluate the literature for identifying significant trends and themes in the domain. The unprecedented growth in the commodity derivatives market research is observed from 2010 to 2021. The analysis highlights most impactful authors, prominent journals and most productive countries based on various parameters like total publications, total citations, or h-index.The study also provides an analysis of co-occurrence of keywords,bibliographic coupling and co-authorship analysis in the context of commodity derivatives market research. This research paper will assist academicians, practitioners, future researchers, and other stakeholders by providing new perspectives for future research projects.

Keywords: Bibliometric analysis, Commodity derivativesmarket,Commodity futures, Commodity prices,Descriptive Analysis,Network analysis.

1.Introduction

The term derivative indicates that it has no independent value, its value is entirely derived from the value of the underlying asset. The asset can be securities, commodities, bullion, currency, livestock, or anything else(**Gupa, 2013**). In other words, derivative means forwards, futures, options, and swaps, as well as hedging of commodities and financial assets such as interest rate, future index quotations, and so on (**Ferreira & Junior, 2019**).Derivatives are structured from contracts in which one party buys and the other sells a specific asset at a pre-determined price and amount for future settlement (**Hull, 2018**). When derivates came its primary goal was reducing the risks associated with price volatility, and later on its main type came like financial derivatives, commodity derivatives, currency derivatives, interest rate derivatives, and so on.

A commodity is generally defined as a group of items or assets that can be traded or exchanged, except money and actionable claims. A commodity market is a venue for the active trading of commodities. Commodity derivative markets are now considered commodity markets, thanks to the introduction of commodity derivative trading. This is due to the fact that commodity derivative markets entail commodity trade, delivery, and settlement. In recent years, commodities have piqued investors' curiosity

as a viable investment option. In terms of participant motivation and strategy, commodity markets have become more like financial markets, but the physical aspects of commodity markets remain significant. Types of commodities traded in major commodities exchanges all over the world mentioned below:

Agricultural and food- Wheat, Soyabean, Tea, Coffee, Sugar, Almond, Chana, Dal, Rice, Butter, Milk, Cheese, Mustard Oil, Sunflower oil, Cotton, Rubber, etc

Livestock &Meat- Lean Hogs, Live Cattle, Feder Cattle, Wool, Egg, etc.

Fuels- Gasoline, Kerosene, Crude oil, Diesel, Ethanol, Natural gas, Coal, etc.

Metals- Gold, Silver, Platinum, Steel, Copper, Lead, Zinc, Nickel, Cadmium, etc

Other non-conventional products- Weather, Emission, Electricity, Water, etc**(Kapale, 2016)(Rajib, 2014).**

Mainly 4 types of Contracts associated in commodity derivatives market area that is briefly explained as below:

1)**Forward Contracts**: Forward refers to a customized contract to buy or sell the certain specific assets(commodities), at the pre agreed prices as well as pre agreed quantity in the future point of time.

2)**Futures Contracts**: Future contract is a standardised contract to buy or sell certain specific assets at pre agreed price at a pre agreed quantity at the future point of time

3)**Option Contracts**: Options is a standardised contract to buy or sell the right but not the obligation to buy or sell the certain specific assets as the pre agreed price on or before the specific point of time in the future

4)**Swaps Contracts**: Swaps are the customized agreement to exchange a series of the future cash flows to be based on the a pre determined form**(Bhagwat & Singh Maravi, 2016)(Himadri, 2007)**

Moving beyond the basics of the commodity derivatives market, this analysis argues that there is a need for a study on CDM research. Numerous scholars have attempted to do so but several limitations are present for example**(Ferreira & Junior, 2019)** tells about bibliometric analysis on focusing on only agricultural derivatives, WOS database not focused on the whole derivative segment,and the keyword used for analysis was "agricultural derivatives", "options market", "futures market" and "swaps market."**(Kaur & Goel, 2021)**is also focused on commodity futures research only and takes data from Scopus1984 to 2020 and not done a comprehensive study and limited keyword too much, that's the reasonarticles outcome was very low and a brief overview ignored.**(Pal Kaur & Bimal Anjum, 2013)**have limited on the descriptive and traditional narrative style of literature review and focused on agricultural commodity futures in Indian aspects.**(Balcilar et al., 2021)** narrow his area on the connectivity of commodity market and select WOS database.**(Shree Jyothi & Srinivasa Rao, 2017)** focus on the traditional and narrative method of review in focus only on Indian commodity market. **(Kabbiri et al., 2016)**focused on only food market area which is a part of whole commodity market. **(Kim & Kim, 2021)**thirty years journals of derivatives and quantitative studies focused on specific journal. **(Baker et al., 2021)**forty years of the Journal of Futures Markets: A bibliometric overview is also focused on journals production not the specific topic on commodity derivatives.

Finally, I searched the Scopusdatabase on 5 Feb 2022 at 1.00 am with keywords"commodity derivative*" or "commodity market*" and "biblio*" or "review*" limiting the area article title, abstracts, and keywords, only 262 documents came after search, so I shortlisted after checking the title of each document, only 8 relevant document selected(which is related with commodity derivatives market area partially) that is mentioned as **1.)**Indian commodity markets: A thematic review of existing literature. **2.)**A Global Perspective of Food Market Integration: A Review. **3.)**The impact of biofuel demand on agricultural commodity prices: A systematic review**. 4.)**Relationship Between Spot & Future Prices of Silver and Copper in the Indian Commodity Market: A Literature Review. **5.)**Commodity price dynamics and derivative valuation: A review. **6.)**The three roles of agricultural markets: A review of ideas about agricultural commodity markets in India**. 7.)**Commodity futures markets in LDCs: A review and prospects. **8.)**Primary commodity markets and models: an international bibliography.

So, we said that with proper evidence that no paper was written on bibliometric analysis on "commodity derivatives market"specific theme in focusing world commodity derivatives market. More importantly, no review on CDM, to date, has adopted a bibliometric analysis for review, which is a useful method to reveal key bibliometric attributes and research themes **(Donthu, Kumar, Pandey, et al., 2021) (Donthu, Kumar, Mukherjee, et al., 2021) (Donthu, Kumar, Pattnaik, et al., 2021) (Kumar, Lim, et al., 2021)(Kumar, Sureka, et al., 2021)(Baker et al., 2020) (Kumar et al., 2020)(Martínez-Climent et al., 2018) (Le et al., 2019) (Sharma et al., 2021) (Garg & Tiwari, 2021)** this information is very useful for scholars, professors, practitioners, derivatives market players and policymakers for identification of leading journal,author,trending topicsand theme,collaboration,countries, institutions,articles, etc.through this they can saw the whole area of commodity derivatives market research after 2009 and develop a good scientific thought process

To that end, this review is positioned as a ground-breaking attempt to map the domain of CDM from a bibliometric standpoint, with current insights and future research directions on CDM taking centre stage. As a result, this review investigates the following research questions (RQs):

RQ1. What is the publication trend of CDM (number of papers published per year)?
RQ2. Where can I find CDMs most influential publications (magazines, articles)?
RQ3. Who are the most active contributors to CDM (writers, nations, and organisations)?
RQ4. What can we learn about CDM from previous studies (themes, topics)?
RQ5. Where can further research (avenues) be pursued to further our knowledge about CDM?

2. Literature Review

In recent years a lot of studies have been conducted in the commodity derivatives market area after the global financial crisis or global economic recession **(V.Srinivas, 2018)(Kose et al., 2020)(Grusky et al., 2011)(Phillips & Nugent, 2014)**for examples like commodity trading and risk management**(Jyothi & Rao, 2019)**,copula-GARCH Models and Fuzzy Clustering Methods**(Just & Luczak, 2020)**, risk appetite and commodity returns**(Etula, 2013)**, prices determination in the crude oil area**(Sarwat et al., 2019),** agricultural commodity futures markets with cointegration and causality tests**(Ali & Gupta, 2011),** Tea Futures**(Bhattacharjee & Mahapatra, 2020),** coffee, cotton, wheat, and oil commodity**(Ederer et al., 2016)**, soybean futures markets**(Ranganathan & Ananthakumar, 2014)** oil and gas **(Hong et al., 2020)**price discovery and volatility spillover area**(R L & Mishra, 2020),** Samuelson hypothesis**(Gupta & Rajib, 2012).** Almost many studies have been conducted in commodity areas and the topmost trending commodities in the world are crude oil, steel, soybeans, iron ore, corn, gold, copper, aluminium, silver, natural gas.

To further explicit the CDM literature, a bibliometric review on CDM research is carried out. The specific methods and procedures of the review are explained in the next sections.

3. Methodology:

3.1: Bibliometric search

The search for publications for the review began after global economic depression period (2007-2009), so data collected from 2010 to 2021 (12 years) and was led by a five-stage search method that we devised: database extraction year filtrations, academic filtration, language filtration, and subject filtration (see Figure 1).

Stage1: Database search is the first stage. Scopus was chosen because of (1) its comprehensiveness of bibliometric information for publications that it indexes, and (2) its coverage of publications that met a demanding set of indexing conditions (e.g., scientifically, and intellectually relevant). Scopus is a scientific database that is frequently recommended for bibliometric evaluations**(Dontu et al., 2021),** and

it is excellent for endeavours wanting to curate a big corpus for review**(Paul et al., 2021).**Scopus has been recognised as a high-quality source for bibliometric data**(Baas et al., 2020),** and the correlation of its measures with those available from alternative scientific databases such as Web of Science is "extremely high," (**Archambault et al., 2009**)despite the latter's coverage being less than the former, **(Paul et al., 2021)** making Scopus a more comprehensive yet high-quality data source for reviewers. We also choose: "Commodity derivative*" OR "Commodity market*" as our search keyword since it is a crucial idea in our research and a central theme in our research, and we limited our search 2010 to 2021, which is in keeping with (**Donthuet al., 2021**)suggestions. There were 5200 articles found in the database.

Stage 2: is year filtration, we choose to include 2010 to 2021(12 years) data because wewant to check research after global financial crisis, which ended early in 2009 and start in 2007, so I filtered only this year and 3442 articles included.

Stage 3: The third stage is scholarly filtration. Only source type list we include journal articles, since they are typically (1) evaluated on the basis of originality and (2) submitted to rigorous peer review, both of which are necessary criteria to (1) unpack knowledge variety and (2) convey high-quality insights, respectively. Other articles, such as books and book chapters, were excluded since they typically failed to meet these criteria. The criteria are in line with (**Paul et al., 2021**) suggestions. We also filtered based on document type and include only article and review article and left book chapter, conference paper, book and note etc.The scholarly screening eliminated 673 articles, leaving only 2769 articles.

Stage 4: Language filtration is the fourth stage. Only items authored in English that were kept in Stage 3 were included. Because (1) we are native English speakers and (2) translation labour is unfeasible for evaluations with huge datasets, this filtration was necessary (e.g., bibliometric reviews). The criteria used here are in line with (**Donthu et al., 2021**) recommendations. Only 2667 items were included due to the language filtration, which eliminated 102 articles.
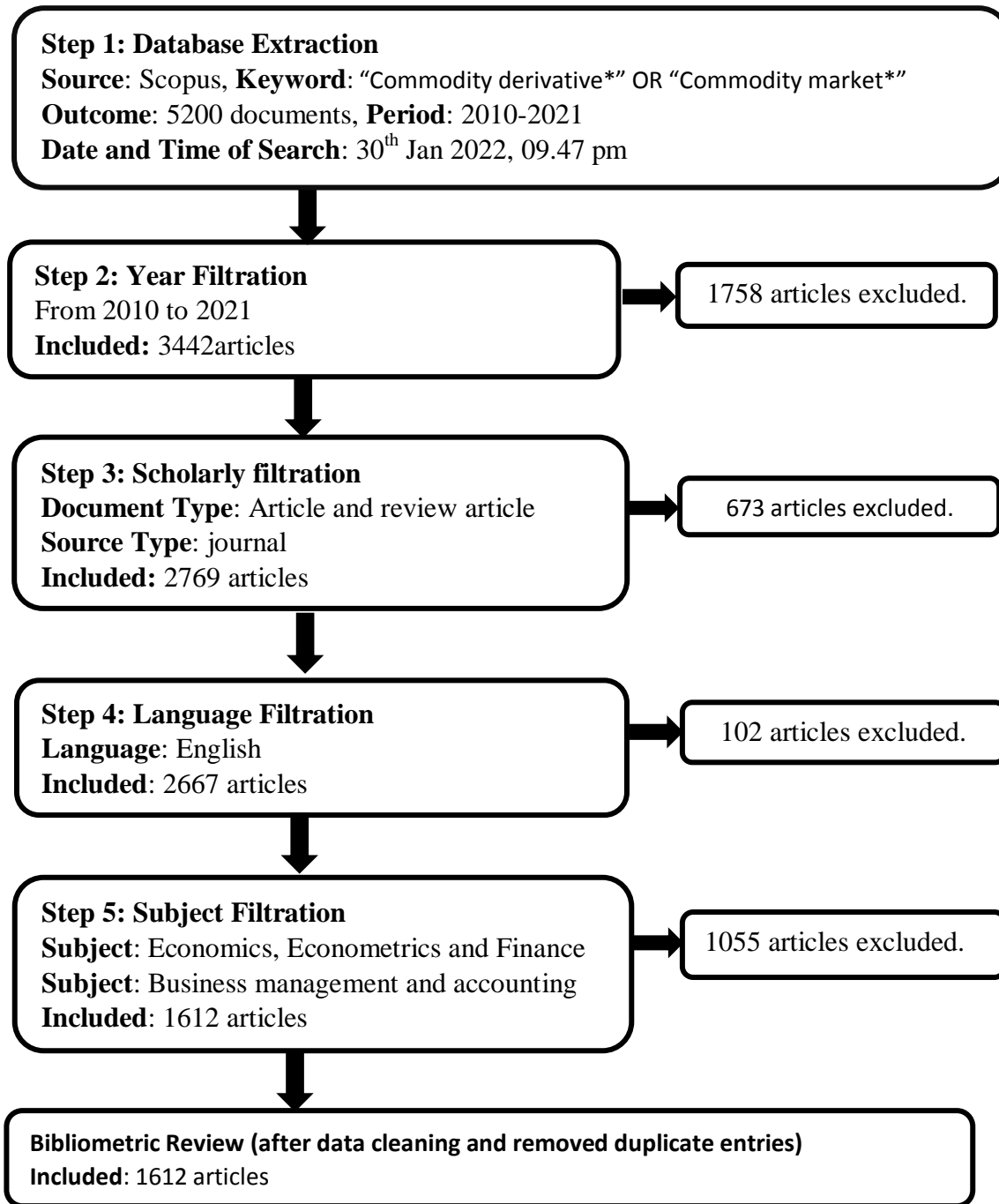
Stage 5: Subject filtration is the fifth stage. We choose to include publications from Stage 4 solely in (1) economics, econometricsand finance, (2) businessmanagementand accounting, this filtration was necessary since the Scopus-defined subject areas were the most wide and important to "business," the overarching discipline in which CDM is located. The criteria here are in line with the recommendations by (**Donthu et al., 2021**) (**paul et al., 2021**). The subject filtration eliminated 1055 items, leaving only 1612 to be considered.

A total of 3588 articles were filtered out due to year, scholarly, language, and subject criteria. The remaining 1612 articles that made it through the filtration procedure will be subjected tobibliometric analysis, in final filtration we go for data cleaning and removed duplicates based on sort and filter and conditional formatting option in excel, in this ground we check author columnand title column and find no duplicate entry at all. So finally, we applied 1612 articles in bibliometric research. Which will be discussed in the following section.

3.2: Bibliometric analysis

This review conducted a bibliometric analysis of the CDM literature (see Fig. 2). Using 1612 articles that were retained from the bibliometric search in Scopus, we conducted a series of bibliometric-based analyses. In particular, we conducted publication, global citation, and social network analyses to describe the publication trends (RQ1) and the leading contributors (authors, countries, and institutions) (RQ2) and publications (outlets, articles) (RQ3) of CDM research. In addition, we used VOSviewer to enrich our exploration of the leading contributors (RQ2) and publications (RQ3) through co-authorship, local citation, and bibliographic coupling.

FigureNo1: Bibliometric Data Extraction: a step-by-step procedure.

Step 1: Database Extraction
Source: Scopus, **Keyword**: "Commodity derivative*" OR "Commodity market*"
Outcome: 5200 documents, **Period**: 2010-2021
Date and Time of Search: 30ᵗʰ Jan 2022, 09.47 pm

Step 2: Year Filtration
From 2010 to 2021
Included: 3442articles

1758 articles excluded.

Step 3: Scholarly filtration
Document Type: Article and review article
Source Type: journal
Included: 2769 articles

673 articles excluded.

Step 4: Language Filtration
Language: English
Included: 2667 articles

102 articles excluded.

Step 5: Subject Filtration
Subject: Economics, Econometrics and Finance
Subject: Business management and accounting
Included: 1612 articles

1055 articles excluded.

Bibliometric Review (after data cleaning and removed duplicate entries)
Included: 1612 articles

Source: Author Compilation

The same software was used to map the intellectual structure of CDM (RQ4) through keyword co-occurrence analysis, which can also help future research to identify avenues for future exploration (RQ5).The combination of bibliometric analysis techniques and enrichment techniques are in line with the recommendation by (**Donthu, Kumar, Mukherjee, et al., 2021**)for a well-done bibliometric review.

Figure No:2 Analysis strategy for bibliometric review
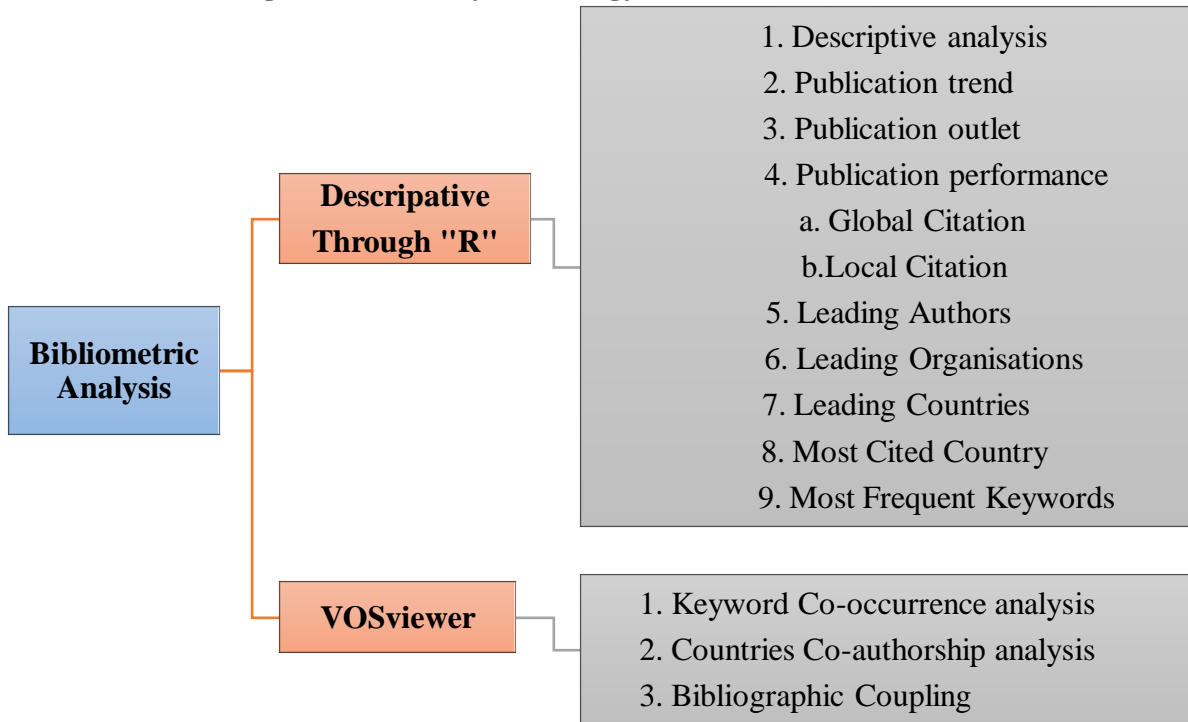
Source: Author Compilation

4.Results

4.1: Descriptive analysis Through "R"

Some in short information about data collected by biblioshiny through"R" software and it can be explained in following:the primary data for the 1612 documents mined from the Scopus database for the bibliometric analysis is shown in Table 1. Which includes Articles (1570), review articles (42), between 2010 to2021, 3137 writers published these studies in 432 venues (journals, etc.) over 12 years. There are 16.26 citations per document on average**.**The number of keywords utilised by the author is almost 4350/1612=2.70 times that of the total number of documents. On average, nearly two authors (1.95) contributed to each document. The cooperation index of 2.17 per document depicts the collaborative and collective research activity of multiple authors on commodities derivatives market.

Table No 1: Main Information About Data

Main Information	Description	Results
Timespan	Year of publication	2010:2021
Sources (Journals, Books, etc)	Occurrence of documents in specific journals, books etc.	432
Documents	Total number of studies	1612
Total Citation		26212
Average citations per documents	Total number of citations (26212) ÷ Total number of documents(1612)	16.26
Average citations per year per doc	---------------	2.29
References	Total references	63002
Document Types		
article	Total article	1570
review	Total review article	42

| Document Contents		
Keywords Plus (ID)	Total number of recurrent phrases identified automatically through algorithm in title of an articles' references	2949
Author's Keywords (DE)	Total number of keywords used by authors	4350
Authors		
Authors	Total number of authors	3137
Author Appearances	Occurrence of authors in specific studies	4057
Authors of single-authored documents	Number of single authors per document	268
Authors of multi-authored documents	Number of authors of multi-authored documents	2869
Authors Collaboration		
Single-authored documents	Number of documents with single author collaborated	290
Documents per Author	Total number of documents (1612) ÷ Total number of authors(3137)	0.514
Authors per Document	Total number of authors (3137) ÷ Total number of documents(1612)	1.95
Co-Authors per Documents	Author Appearances (4057) ÷ Total number of documents(1612)	2.52
Collaboration Index	Total number of authors of multi-authored documents(2869) ÷ Total number of multi-authored documents (1612-290) =1322	2.17

Source: Data collected from Scopus using R bibliometric package

4.2 publication trend (RQ1)

The distribution of articles by year of publication (see Fig. 3) shows that commodity derivatives market has piqued scholarly attention during the last 12 years. The majority of CDM research was published in 2021 (n = 235),in which CDM research increased maximum is 2013 (45 percent) and 2020 (41 percent) by over the previous year (n = 84 and 141). Surprisingly, previous to the 2012, CDM research was usually in the double digits, but it touchestriple digits from 2013 onwards and it grows to 2014 then start falling till 2016 after it from 2017 it increases,in only 2019 it slows down then 2020 and 2021 shows maximum growth on this trend basis we can said that 2022 will be most promising year for commodity derivatives market researcher.

4.3: Publication Outlet (RQ2)Journal Quality analysis(top journal for CDM research)

The distribution of articles by publication outlet shows that Resources Policy is the most prolific home for CDM research (n=127 articles) (see Table no2). This is followed by Energy Economics, (n=118 articles), Applied Economics, Applied Economics Letters,American Journal of Agricultural Economics, Journal of Commodity Markets each hosting 69,39,38,30 articles on CDM. Most publication outlets on this list are journals that are ranked "A" by the Australian Business Deans Council or "3," or "2,"by the Association of Business Schools, which suggests that CDM research is welcomed at premier journals. By SJR rank- scimago journal and country rank many journals came in "Q1" category, then after "Q2" and very few in "Q3" and none in "Q4" that is very good indicator of future research prospectus. The h-index, m-index and g-index is shown in table by using bibliometric analysis in "R".

Figure 3: Publication Trend CDM Research
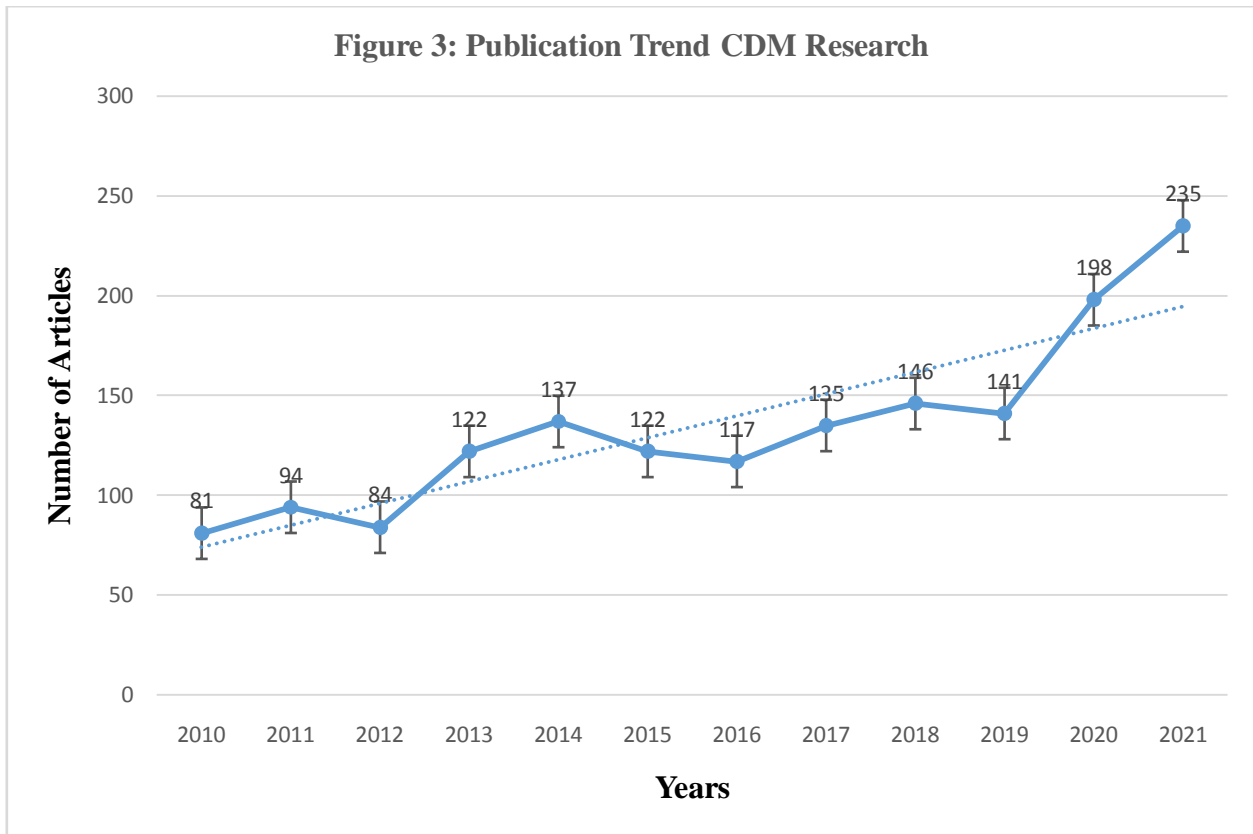
Source: Author calculation using "R" bibliometric package

We include other vital factors that influence the journal quality is total citations, average citation per paper(divided by total citation of number of papers), publisher, country and time period of publishing journal, more importantly in total citation case some journal is not the highest number of articles but in citation area they shows their relevance like we take the example of energy economic it have 118 paper but received highest number of citation, in the average citation per paper criteria journal of banking and finance shows maximum average.

Table No 2: Top 20Contributing Journals for Commodity Derivatives Market Research

Sources	NP	TC	AC /Pa per	A B D C Ra nk	A B S ra n k	S J R ra n k	h	m	g	Publi sher	Countr y	Time perio d of Journ al	H ind ex by SJ R	SJ cR Ra nk
Resources Policy	127	21 41	16. 86	B	2	Q 1	24	1.8 5	42	Elsev ier	UK	1974-2020	69	1.2 8
Energy Economics	118	48 24	40. 88	A*	3	Q 1	35	2.6 9	66	Elsev ier	Netherl ands	1979-2019	15 2	2.5
Applied Economics	69	31 1	4.5 1	A	2	Q 2	9	0.6 9	11	T &F	UK	1969-2020	85	0.5 7
Applied Economics Letters	39	22 3	5.7 1	B	1	Q 3	7	0.5 4	12	T & F	UK	1994-2020	51	0.3 8

American Journal of Agricultural Economics	38	605	15.92	A*	3	Q1	13	1	23	Wiley	US	1919-2020	111	1.95
Journal of Commodity Markets	30	269	8.97	A	3	Q2	9	1.29	15	Elsevier	Netherlands	2016-2020	12	0.73
Journal of Futures Markets	27	253	9.37	A	3	Q1	10	0.83	15	Wiley	US	1981-2020	55	0.88
Economic Modelling	26	780	30	A	2	Q2	13	1	25	Elsevier	Netherlands	1984-2020	77	1.05
Journal of Retailing and Consumer Services	26	590	22.69	A	2	Q1	12	0.92	24	Elsevier	UK	1994-2021	89	1.57
Food Policy	24	636	26.5	B	3	Q1	15	1.25	24	Elsevier	UK	1975-2020	102	2.09
Finance Research Letters	22	167	7.60	A	2	Q1	9	1.12	12	Elsevier	Netherlands	2004-2020	39	1.34
Quantitative Finance	22	359	16.31	A	3	Q1	10	0.77	18	T & F	UK	2001-2020	72	0.77
Journal of Agricultural Economics	21	311	14.81	A	3	Q1	10	0.83	17	Wiley	US	*	61	1.16
International Review of Financial Analysis	19	372	19.58	A	3	Q1	11	1.1	17	Elsevier	US	1992-2020	59	1.27
Agris on-line Papers in Economics and Informatics	18	116	6.44	------	---	Q3	6	0.55	10	**	Czech Republic	2011-2020	16	0.25
Journal of Banking and Finance	18	755	41.94	A*	3	Q1	10	0.77	16	Elsevier	Netherlands	1977-2020	161	1.58
Empirical Economics	17	94	5.53	A	2	Q1	6	0.55	9	Springer	Germany	1976-2020	56	0.61
World Development	16	521	32.56	A	3	Q1	9	0.69	16	Elsevier	UK	1973-2021	175	2.39
International Review of Economics and Finance	15	173	11.53	A	2	Q2	5	0.56	13	Elsevier	US	1992-2021	54	0.68
North American Journal of	15	147	9.8	B	2	Q2	7	0.88	12	Elsevier	US	1992-2020	37	0.61

Economics and Finance											

Note: *Journal of agricultural economics time periodfrom 1928 to 31, 1933 to 38, 1940, 1946 to 2020. **Agris on-line Papers in Economics and Informatics--- Faculty of Economics and Management culs Prague.

Source: 1. **ABDC rank** = as per Australian Business Deans Council (6 December 2019) Journal Ranking List. It consists of (A*, A, B, C rank) **2.ABS rank** = as per (chartered) Association of Business Schools (2021) Journal Quality Guide., AGB (Academic journal guide 2021), it gives rank 1,2,3,4, 4*.

3. SJR rank: Scimago Journal and Country Rank, (2020) its Ranking based on, Q1, Q2, Q3, and Q4.

Where:NP: Number of Papers, TC: Total Citations, AC: Average Citation Per Paper, h-index(h), g-index(g), m-index(m) and T&F: Taylor and Francis

Source: Author calculation using "R" bibliometric package

4.4:Publication Performance (RQ2)

4.4.1: Global Citations

Global citations refer to the number of citations received without any filtration (e.g., discipline) **(Baker, Pandey, Kumar, and Haldar, 2020).** In this review, the article with the highest number of global citations is "Better to give than to receive: Predictive directional measurement of volatility spillovers" (n = 1228 citations), followed by "Index investment and the financialization of commodities" (n = 601 citations) (**see Table 3**). Remaining articles received less than 500 global citations.

Table no 3: Most cited articles on CDM based on global citation document rank wise.

S. N.	Title	Authors	Year	Citations	TC per Year	Normalized TC
1	Better to give than to receive: Predictive directional measurement of volatility spillovers	Diebold F.X., Yilmaz K.	2012	1228	111.6364	25.3134
2	Index investment and the financialization of commodities	Tang K., Xiong W.	2012	601	54.6364	12.3887
3	Commodity price shocks and civil conflict: Evidence from Colombia	Dube O., Vargas J.F.	2013	328	32.8	12.1703
4	Export prices across firms and destinations	Manova K., Zhang Z.	2012	291	26.4545	5.9985
5	On the links between stock and commodity markets' volatility	Creti A., Joëts M., Mignon V.	2013	266	26.6	9.8698
6	Correlations and volatility spillovers across commodity and stock markets: Linking energies, food, and gold	Mensi W., Beljid M., Boubaker A., Managi S.	2013	263	26.3	9.7585
7	Exiopol - development and illustrative analyses of a detailed global mreesut/iot	Tukker A., de Koning A., Wood R., Hawkins T., Lutter S., Acosta J., Rueda	2013	257	25.7	9.5359

		Cantuche J.M., Bouwmeester M., Oosterhaven J., Drosdowski T., Kuenen J.				
8	Financialization of commodity markets	Cheng I.-H., Xiong W.	2014	251	27.8 889	9.9759
9	Do global factors impact BRICS stock markets? A quantile regression approach	Mensi W., Hammoudeh S., Reboredo J.C., Nguyen D.K.	2014	245	27.2 222	9.7375
10	Speculation and volatility spillover in the crude oil and agricultural commodity markets: A Bayesian analysis	Du X., Yu C.L., Hayes D.J.	2011	243	20.2 5	8.193
11	Dating the timeline of financial bubbles during the subprime crisis	Phillips P.C.B., Yu J.	2011	241	20.0 833	8.1255
12	Co-movement of energy commodities revisited: Evidence from wavelet coherence analysis	Vacha L., Barunik J.	2012	233	21.1 818	4.8029
13	Volatility spillover between oil and agricultural commodity markets	Nazlioglu S., Erdem C., Soytas U.	2013	225	22.5	8.3485
14	The economics of grain price volatility	Wright B.D.	2011	216	18	7.2826
15	The crude oil market and the gold market: Evidence for cointegration, causality and price discovery	Zhang Y.-J., Wei Y.-M.	2010	212	16.3 077	7.4889
16	Principal Challenges Confronting Smallholder Agriculture in Sub-Saharan Africa	Jayne T.S., Mather D., Mghenyi E.	2010	202	15.5 385	7.1356
17	The macroeconomic determinants of volatility in precious metals markets	Batten J.A., Ciner C., Lucey B.M.	2010	200	15.3 846	7.065
18	Dynamic spillover effects among crude oil, precious metal, and agricultural commodity futures markets	Kang S.H., McIver R., Yoon S.-M.	2017	192	32	12.278 5
19	Rising food prices, food price volatility, and social unrest	Bellemare M.F.	2015	184	23	12.347 6
20	The impact of terrorism on financial markets: An empirical study	Chesney M., Reshetar G., Karaman M.	2011	180	15	6.0689

Source: Author calculation using "R" bibliometric package

4.4.2: Local Citation

Local citations refer to citations received from the articles in the review corpus **(Baker et al., 2020).**In other words, local citations are computed based on citations received from 1612 articles on "commodity derivatives market" that were retrieved from Scopus and retained after scholarly, language, and subject

filtration. In this review, the article with the highest number of local citations is "Index investment and the financialization of commodities" (n = 118 citations) (see **Table 4**), followed by "Financialization of commodity markets" (n = 91 citations), after it "Better to give than to receive: Predictive directional measurement of volatility spillovers", "Volatility spillover between oil and agricultural commodity markets", "Speculation and volatility spillover in the crude oil and agricultural commodity markets: A Bayesian analysis", "Correlations and volatility spillovers across commodity and stock markets: Linking energies, food, and gold", received 80,58,58,53 citations which is more than 50.

Table no 4: Most Cited Articles on CDM based on Local Citations.

S.N.	Title	Authors	Year	Local Citations	Global Citations	LC/GC Ratio (%)	Normalized LC	Normalized GC
1	Index investment and the financialization of commodities	Tang K., Xiong W.	2012	118	601	19.63	27.08	12.39
2	Financialization of commodity markets	Cheng I.-H., Xiong W.	2014	91	251	36.25	30.19	9.98
3	Better to give than to receive: Predictive directional measurement of volatility spillovers	Diebold F.X., Yilmaz K.	2012	80	1228	6.51	18.36	25.31
4	Volatility spillover between oil and agricultural commodity markets	Nazlioglu S., Erdem C., Soytas U.	2013	58	225	25.78	19.99	8.35
5	Speculation and volatility spillover in the crude oil and agricultural commodity markets: A Bayesian analysis	Du X., Yu C.L., Hayes D.J.	2011	58	243	23.87	26.09	8.19
6	Correlations and volatility spillovers across commodity and stock markets: Linking energies, food, and gold	Mensi W., Beljid M., Boubaker A., Managi S.	2013	53	263	20.15	18.27	9.76
7	Financialization in commodity markets: A passing trend or the new	Adams Z., Glück T.	2015	47	150	31.33	28.11	10.07

	normal?							
8	Testing the Masters Hypothesis in commodity futures markets	Irwin S.H., Sanders D.R.	2012	43	152	28.29	9.87	3.13
9	Dynamic spillover effects among crude oil, precious metal, and agricultural commodity futures markets	Kang S.H., McIver R., Yoon S.-M.	2017	41	192	21.35	25.86	12.28
10	What does futures market interest tell us about the macroeconomy and asset prices?	Hong H., Yogo M.	2012	39	168	23.21	8.95	3.46
11	On the links between stock and commodity markets' volatility	Creti A., Joëts M., Mignon V.	2013	33	266	12.41	11.37	9.87
12	Oil price shocks and agricultural commodity prices	Wang Y., Wu C., Yang L.	2014	32	116	27.59	10.62	4.61
13	Limits to arbitrage and hedging: Evidence from commodity markets	Acharya V.V., Lochstoer L.A., Ramadorai T.	2013	32	136	23.53	11.03	5.05
14	Modeling volatility and correlations between emerging market stock prices and the prices of copper, oil and wheat	Sadorsky P.	2014	30	179	16.76	9.95	7.11
15	World oil prices and agricultural commodity prices: Evidence from an emerging market	Nazlioglu S., Soytas U.	2011	29	156	18.59	13.04	5.26
16	Risk spillover between energy and agricultural commodity markets: A dependence-switching CoVaR-copula model	Ji Q., Bouri E., Roubaud D., Shahzad S.J.H.	2018	27	109	24.77	22.53	9.51

17	Dynamic spillovers among major energy and cereal commodity prices	Mensi W., Hammou deh S., Nguyen D.K., Yoon S.-M.	2014	26	106	24.53	8.62	4.21
18	Commodity and equity markets: Some stylized facts from a copula approach	Delatte A.-L., Lopez C.	2013	25	84	29.76	8.62	3.12
19	The economics of grain price volatility	Wright B.D.	2011	23	216	10.65	10.34	7.28
20	The macroeconomic determinants of volatility in precious metals markets	Batten J.A., Ciner C., Lucey B.M.	2010	23	200	11.50	17.09	7.06

Source: Author calculation using "R" bibliometric package

4.5: Leading Authors (RQ3)

Chevallier, J., covered 18 articles, fromUniversity Paris 8 (LED), Saint-Denis, France, **(see table no 5)**Prokopczuk, M., also covered 18 articles, from Leibniz University Hannover, Koenigsworther Platz 1, D-30167 Hannover, Germany and Bahmani-Oskooee, M., published 15 articles belong to The Center for Research on International Economics and Department of Economics, The University of Wisconsin-Milwaukee, Milwaukee, WI, United States, so in top 20 author list we find that many belong to US, UK, France , Germany, India, China etc.

Table No 5: Top Contributing Authors on CDM Research

S.N.	Author	Affiliation	NP	TC	H	g	m
1	Chevallier, J.	a. University Paris 8 (LED), Saint-Denis, France: b. IPAG Business School, (IPAG Lab), 184 boulevard Saint-Germain, Paris 75006, France	18	247	8	15	o.667
2	Prokopczuk, M.	a.Leibniz University Hannover, Koenigsworther Platz 1, D-30167 Hannover, Germany b.ICMA Centre, Henley Business School, University of Reading, Reading, RG6 6BA, U.K.	18	259	9	14	o.692
3	Bahmani-Oskooee, M.	The Center for Research on International Economics and Department of Economics, The University of Wisconsin-Milwaukee, Milwaukee, WI, United States	15	101	7	9	0.538

4	Kang, S.H.	Department of Business Administration, Pusan National University, Busan 609-735, Republic of Korea	15	535	10	15	1.250
5	Bouri, E.	School of Business, Lebanese American University, Lebanon	14	388	8	113	1.333
6	Hammoudeh, S.	Lebow College of Business, Drexel University, Philadelphia, United States	12	800	11	12	1.000
7	Ji, Q.	Institutes of Science and Development, Chinese Academy of Sciences, Beijing, 100190, China	12	521	9	11	1.286
8	Benth, F.E.	Department of Mathematics, University of Oslo, P.O. Box 1053, Blindern, Oslo, N-0316, Norway	10	73	5	8	0.417
9	Mensi, W.	a.Department of Economics and Finance, College of Economics and Political Science, Sultan Qaboos University, Muscat, Oman; b.Institute of Business Research, University of Economics Ho Chi Minh City, VietNam;	10	809	8	10	0.800
10	Nguyen, D.K.	a. IPAG Business School, Paris, France; b.VNU International School, Hanoi, VietNam	10	758	10	10	1.111
11	Tiwari, A.K.	Rajagiri Business School, Rajagiri Valley Campus, Kochi, India;	10	172	7	10	0.778
12	Yoon, S.M.	Department of Economics, Pusan National University, Busan, South Korea	10	433	7	9	o.778
13	Garcia, P.	Department of Public Health, William Paterson University, Wayne, NJ, USA	9	155	6	9	0.667
14	Ielpo, F.	Lombard Odier Asset Management, and University Paris 1 (CES), France	9	70	4	7	0.400
15	Shahzad, S.J.H.	a.Montpellier Business School, France b.South Ural State University, Russia	9	407	8	9	1.333
16	Todorova, N.	Department of Accounting, Finance and Economics, Griffith Business School, Griffith University, Australia	9	102	5	9	0.556
17	Gupta, R.	University of Pretoria, Pretoria, South Africa	8	180	7	9	0.875
18	Irwin, S.H.	Norton Chair of Agricultural Marketing, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign.United States.	8	317	7	8	0.636
19	Algieri, B.	a.Department of Economics, Statistics and Finance, University of Calabria, Rende, Italy b.Department of Economic and Technological Change, Zentrum für Entwicklungsforschung (ZEF), Universität Bonn, Bonn, Germany	7	183	5	5	0.556
20	Guesmi, K.	Center of Research for Energy and Climate Change (CRECC), Paris School of Business, France	7	107	4	7	0.571

Source: Author calculation using "R" bibliometric package

4.6:Leading Organizations (RQ3)

The distribution of articles by institutions indicates that Chinese Academy of Sciences, China is the leading institution contributing to CDM research (n = 25 articles) (see **Table 6**). This is followed byMontpellier Business School, France,IPAG Business School, France,Pusan National University, South Korea, and University of Reading, England, each contributing 24, 19, 18,18 articles on CDM.

Table No 6: Top Institution in CDM Research

S. N.	Affiliation	Country	Documents
1	Chinese Academy of Sciences	China	25
2	Montpellier Business School	France	24
3	IPAG Business School	France	19
4	Pusan National University	South Korea	18
5	University of Reading	England	18
6	Griffith University	Australia	18
7	Griffith Business School	Australia	18
8	University of Illinois Urbana-Champaign	United states	17
9	University of Chinese Academy of Sciences	China	17
10	Henley Business School	United Kingdom	17
11	University of Wisconsin-Milwaukee	United states	15
12	University of Pretoria	South Africa	15
13	National Bureau of Economic Research	United states	14
14	Czech University of Life Sciences Prague	Czech Republic	14
15	Gottfried Wilhelm Leibniz Universität Hannover	Germany	13
16	Cornell University	United states	13
17	South Ural State University	Russia	13
18	Beijing Institute of Technology	China	13
19	Central University of Finance and Economics	China	12
20	Drexel University	United states	12

Source: Author calculation using "R" bibliometric package

4.7: Leading Countries (RQ3)

The distribution of articles by countries indicates that authors from various countries have contributed to and published research on CDM. The country-wise analysis reveals that the United States is the biggest contributor to CDM research with frequency of 381. This is followed by the United Kingdom (171), China (160), France (141), Germany (138) and India (123) (see **Figure 4**).

4.8:Most Cited Country

Most citation of a country indicates that quality of research of that country in CDM. The country-wise analysis reveals that the USAreceived maximum citation to CDM research with frequency of 6041. This is followed by the China (2503), France (1950), United Kingdom (1129), Australia (1096) and rest country below 1000 citations (see **Table 7**).

Figure 4: Country's Scientific Production
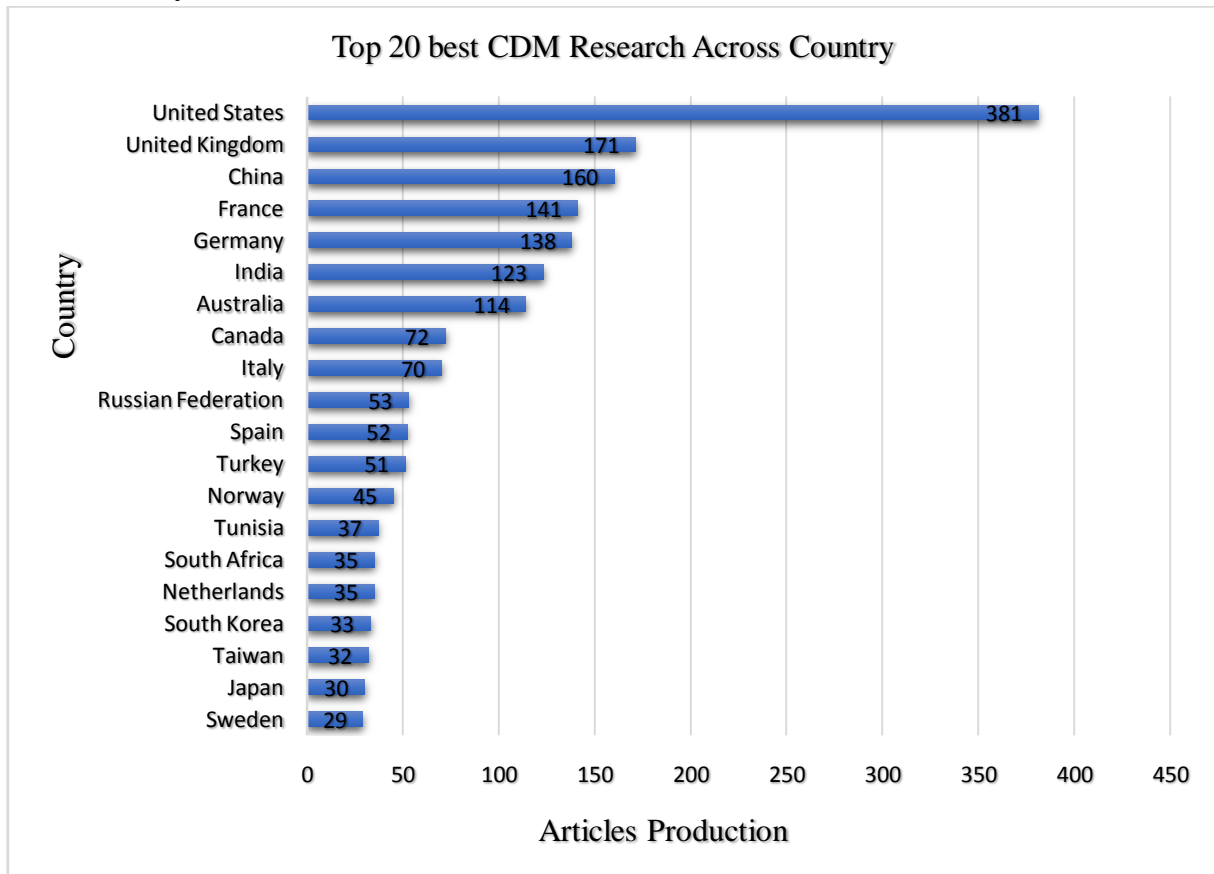
Source: Author calculation using "R" bibliometric package

Table No 7: Most Cited Country in CDM Research

S. N.	Country	Total Citations	Articles	Average Article Citations
1	USA	6041	229	26.38
2	China	2503	143	17.50
3	France	1950	88	22.16
4	United Kingdom	1129	67	16.85
5	Australia	1096	70	15.66
6	Italy	919	44	20.89
7	Germany	764	69	11.07
8	Czech Republic	629	23	27.35
9	Turkey	625	27	23.15
10	Korea	594	21	28.29
11	Japan	513	20	25.65
12	Switzerland	476	12	39.67
13	Canada	460	32	14.38
14	Spain	383	26	14.73
15	India	363	69	5.26
16	Hong Kong	343	7	49.00
17	Netherlands	340	17	20.00

18	Lebanon	268	8	33.50
19	Greece	248	16	15.50
20	Norway	244	28	8.71

Source: Authorcalculation using "R" bibliometric package

4.9: Most Frequent Keywords based on Author keywords

The following section provides the analysis of most frequently occurring keywords given by authors.The keywords reflect the usage of the best possible words to represent one's work. It helps tounderstand research trend and interest in a particular field of a broader research area. **Figure 5**provides a visual representation of the various keywords used by scholars through word cloud. Abigger font size depicts the higher number of occurrences of keywords. The word commoditymarkets are used most number of times by authors and other keywords which are related tocommodity derivatives market research are commodities, volatility, commodity prices,financialization etc also used maximum time (**Ali & Gupta, 2011; Kumar & Pandey, 2013; Kristoufek&Vosvrda, 2014; Luo & Ji, 2018; Mohanty & Mishra, 2020; Ao & Chen, 2020**).

Figure 5: Word Cloud of Author Keywords

Source:Author elaboration using R-bibliometrix package

Table No8: Top Occurrences Author Keywords in CDM Research

S.N.	Keywords	Occurrences
1	Commodity markets	167
2	Commodities	97
3	Volatility	68
4	Commodity prices	55
5	Financialization	51
6	Speculation	40
7	Commodity futures	39
8	Commodity market	36
9	China	35
10	Commodity	34
11	Agricultural commodities	32
12	Hedging	32
13	Futures	29
14	Cointegration	27
15	India	27
16	Price discovery	27
17	Crude oil	25
18	Futures markets	24

| 19 | Forecasting | 23 |
| 20 | Covid-19 | 22 |

Source: Author calculation using "R" bibliometric package

VOSviewer analysis: It performed on three basis one is Based on co-occurrence analysis**,** and another is co-authorship analysis and last one is Bibliographic Coupling based on sources.

4.10: Co-occurrence analysis based on author keywords.

Step of VOSviewer: 1.) Type of Analysis: Co-occurrence, 2.) Unit of Analysis: Author Keywords,Minimum number of occurrences of a keyword is 10 of the 4352 keywords, of which 66 meet the threshold, for each of the 66 keywords. the total strength of the co-occurrence links with other keywords will be calculated. The keyword with the greatest total link strength will be selected, so the number of keywords be selected 66.Some of 66 items in my network was not connected to each other. the largest set of connected items consists of 65 items, So, we proceed adopting on 65 items only and maintain clusters on that basis. It can be divided into 7 clusters based on same characteristics, here we mentioned, clusters and number of items, **Cluster 1 (13 items), Cluster 2 (12 items), Cluster 3 (12 items), Cluster 4 (12 items), Cluster 5 (10 items), Cluster 6 (3 items), Cluster 7 (3 items).**

Figure 6: Highlighted Author Keywords, which have Occurred Maximum Time.

Source:Authors elaboration using VOSviewer package

Table No9: ClustersCo-occurrence Analysis based on Author Keywords.

Cluster 1(13 items)	Cluster 2(12 items)	Cluster 3 (12 items)	Cluster 4(12 items)	Cluster 5 (10 items)
Agricultural commodities	Agricultural commodities markets	Agricultural commodity	Commodities	Asset pricing
China	connectedness	Agriculture	Commodity market	Commodity derivatives
Commodity futures	Covid-19	Causality	Crude oil	Commodity market
Energy	Exchange rate	Cointegration	Energy commodities	Commodity prices
Extreme value theory	Financial markets	Commodity	Financial crisis	Convenience yield
Financialization	forecasting	Futures market	Gold	Futures
Food prices	Futures markets	India	Oil	Hedging
Garch	Granger causality	Market efficiency	Precious metals	Options
International trade	Oil price	Price discovery	Quantile regression	Seasonality
Market integration	Oil prices	Spillover	Risk management	Stochastic volatility
Price transmission	Stock markets	Sustainability	Stock market	**Cluster 6(3 items)**
Price volatility	Volatility spillover	Trade	Structural breaks	Co-movement
Volatility spillovers		**Cluster 7 (3 items)**		Diversification
		Food security		Wavelet analysis
		Speculation		
		Volatility		

Source:Author elaboration using VOSviewer package

4.11: Co-authorship analysis based on Countries:

Step of VOSviewer:1.) Type of Analysis: Co-authorship, 2.) Unit of Analysis: Countries: Minimum number of documents of a country is 5Minimum number of citations of a country is 0. Of the 105countries, 53 meet the thresholds. For each of the 53countries, the total strength of the co-authorship links with other countries will be calculated. The countries with the greatest total link strength will be selected, so number of countries to be selected 53. It can be divided into 7 clusters based on same characteristics, here we mentioned, clusters and number of items, **Cluster 1 (13 items), Cluster 2 (11 items), Cluster 3 (8 items), Cluster 4 (8 items), Cluster 5 (7 items), Cluster 6 (5 items), Cluster 7 (1 items).**

Figure 7: Co-authorship analysis based on Countries:
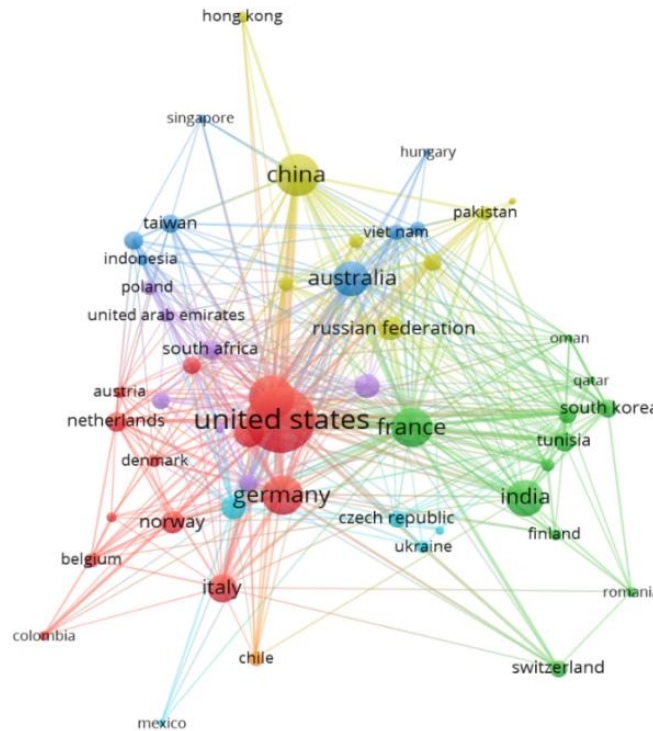
Source:Author elaboration using VOSviewer package

**TableNo 10: Clusters Co-authorship analysis based on Countries:**

Cluster 1(13 items)	Cluster 2(11 items)	Cluster 3 (8 items)	Cluster 4(8items)
Austria	Finland	Australia	China
Belgium	France	Hungry	Hong Kong
Brazil	India	Indonesia	Ireland
Canada	Lebanon	Japan	Kazakhstan
Colombia	Oman	Malaysia	New Zealand
Denmark	Qatar	Singapore	Nigeria
Ethiopia	Romania	Taiwan	Pakistan
Germany	Saudi Arabia	Vietnam	Russian federation
Italy	South Korea	**Cluster 5 (7 items)**	**Cluster 6(5 items)**
Netherlands	Switzerland	Greece	Czech Republic
Norway	Tunisia	Poland	Mexico
United Kingdom		Portugal	Slovakia
United states		South Africa	Spain
		Sweden	Ukraine
		Turkey	**Cluster 7(1 items)**
		United Arab Emirates	Chile

Source:Author elaboration using VOSviewer package

4.12: Bibliographic Coupling based on Sources (Journal):

Step of VOSviewer: 1.) Type of Analysis: Bibliographic Coupling, 2.) Unit of Analysis: Sources:
Minimum number of documents of a source is 7Minimum number of citations of a source is 0. Of the 432 sources, 40 meet the thresholds. For each of the 40 sources, the total strength of the bibliometric coupling links with other sources will be calculated. The sources with the greatest total link strength will be selected, so number of sources to be selected 40. It can be divided into 4 clusters based on same characteristics, here we mentioned, clusters and number of items, **Cluster 1 (21 items), Cluster 2 (11 items), Cluster 3 (7 items), Cluster 4 (1 items).**

Figure 8: Bibliographic Coupling based on Sources (Journal):
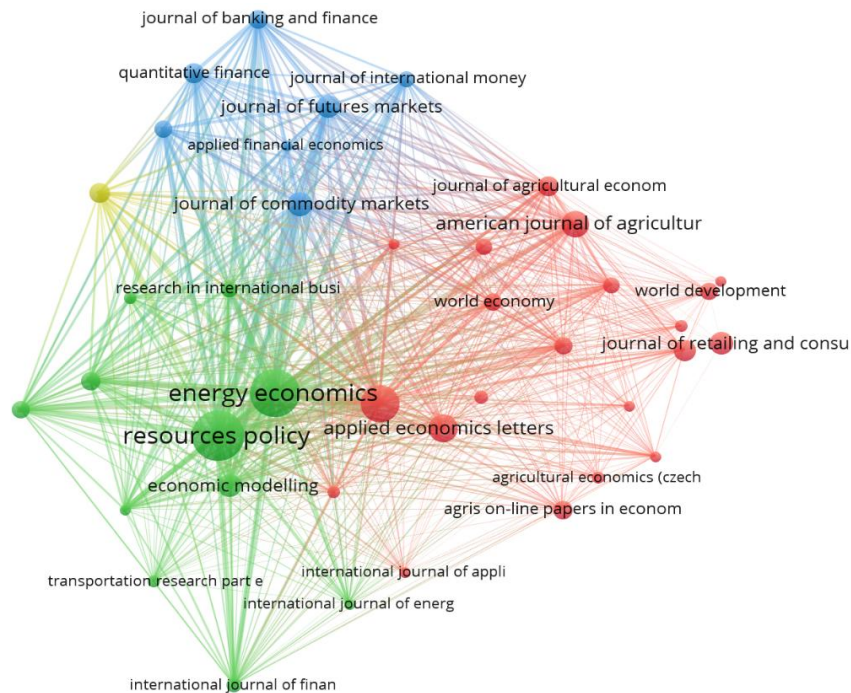
Source:Authorelaboration using VOSviewer package

Table No 11: Clusters Bibliographic Coupling based on Sources (Journal):

Cluster 1(21 items)	Cluster 2(11 items)
Agrekon	Economic modelling
Agricultural economics (Czech Republic)	Energy economics
Agricultural economics (United Kingdom)	International journal of energy economics and policy
Agris on-line papers in economics and informatics	International journal of finance and economics
American journal of agricultural economics	International review of financial analysis
Applied economics	Journal of energy markets
Applied economics letters	Journal of international financial markets, institutions, and money

Australian journal of agricultural and resource economics	North American journal of economics and finance
Ecological economics	Research in international business and finance
Economic and political weekly	Resources policy
Empirical economics	Transportation research part e: logistics and transportation review
Food policy	**Cluster 3 (7 items)**
Indian journal of finance	Applied financial economics
International journal of applied business and economics research	International review of economics and finance
International review of applied economics	Journal of banking and finance
Journal of African economics	Journal of commodity markets
Journal of agricultural economics	Journal of futures markets
Journal of international economics	Journal of international money and finance
Journal of retailing and consumer services	Quantitative finance
World development	**Cluster 4 (1 items)**
World economy	Finance research letters

Source:Author elaboration using VOSviewer package

5: Conclusion:

We believe that even though a significant amount of literature is present on commodity DerivativesMarkets, but the field deficit in bibliometric study. The present study identified 1612 research publications for the period ranging from 2010-2021. The analysis highlights the most impactfulauthors(Chevallier,J.), prominent journals(Resources Policy), publication trend (maximum articles in 2020 and 2021), global and local citation performance, top institutions (Chinese academy of sciences, China). Most cited country(USA), most frequent keywords(commodity markets) and most productive countries (USA). We have observed from analysis; some countries have not conducted research in this field and collaboration networks are weak. Additionally, a collaboration of research in commodity derivatives market can be extended where comparative analysis between countries have been conducted, it is another prospective research area. Network analysis performed on three basis co-occurrence analysis(maintain 7 clusters of different characteristics),Co-authorship analysis(also based on 7 clusters) and lastly is Bibliographic Coupling based on sources(got 4 clusters).

This study has certain limitations. First, Scopus is our sole primary database source forcollecting research studies. Future studies can focus and extend the study utilising other bibliometric and citation databases like WOS. Secondly, we have limited years,1.) due to huge availability of data and 2.) want to check changes after global financial crisis 2008. Third, this study is limited to economics, econometrics, finance, business, management and accounting subject areas. Finally, cutoff points are used in co-occurrence, bibliographic coupling and co-authorship analysis. Therefore, results could vary if these cut-offs are altered.

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