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**GLOBAL TRENDS AND CHARACTERISTICS OF THE PUBLICATIONS IN ECONOMIC COMPUTATION AND ECONOMIC CYBERNETICS STUDIES AND RESEARCH FROM 1969 TO 2020 BASED ON BIBLIOMETRIC ANALYSIS**

***Abstract.** The Economic Computation and Economic Cybernetics Studies and Research is an important international journal in the field of economics. It was founded in 1966, and retrieved by the Inspec (Information Service in Physics, Electro-Technology, Computer and Control) database and the Core Collection database of Web of Science in 1969 and 2007, respectively. Since 1969, there are altogether 1615 articles in the journal collected by the Inspec database and Core Collection database of Web of Science. This study uses bibliometric methods to analyze these articles from two perspectives: academic structure and relevance analysis. A detailed study of the publication and citation structures, keywords of articles, research topics, and international co-authorship analysis was conducted. Finally, some suggestions are put forward to the editors and authors of this journal.*

***Keywords:** Economic Computation and Economic Cybernetics Studies and Research, bibliometrics, academic structure, relevance analysis, clustering.*

**JEL Classification: C02, C11, C45, C46, C63**

**1. Introduction**

*The Economic Computation and Economic Cybernetics Studies and Research (ECECSR) (<http://www.ecocyb.ase.ro/index.htm>) is a refereed journal dedicated to publishing original articles in the fields of economic mathematical*

modelling, operations research, microeconomics, macroeconomics, mathematical programming, statistical analysis, game theory, artificial intelligence, and other topics from theoretical developments to research on applied economic problems. *ECECSR* was founded in 1966 and published by the Academy of Economic Studies in Bucharest. Prof. Gheorghe RUXANDA is currently the Editor in Chief (EiC) of this journal.

ECECSR is a leading journal in the field of economic modelling in Romania. It was retrieved by the Inspec (Information Service in Physics, Electro-Technology, Computer and Control) database in 1969. Up to now, this database has collected 1383 publications from this journal. In 2007, ECECSR was indexed in the Core Collection database of Web of Science (WoS). In 2010, the journal began to have impact factor (IF). According to the Journal Citation Reports (JCR) of 2019, its IF is 0.743. In each year, ECECSR published 4 issues. Up to 2020, ECECSR has experienced over 50 years. Therefore, it is necessary to conduct a bibliometric study for ECECSR publications systematically with the objective of identifying the global structure and development trend of the journal.

A bibliometric analysis for a journal can provide a holistic view of the publications' trends and trajectories (Farrukh, Meng et al., 2020). Many authors have published bibliometric overviews to examine the most influential journals so as to celebrate journal anniversaries or analyse journal structures (Van Fleet and Bedeian, 2016, Tang, Liao et al., 2020). For instance, to celebrate the anniversary of *The International Journal of Contemporary Hospitality Management*, Mulet-Forteza and his collaborators presented a bibliometric overview of the publication and citation structure over the past 30 years (Mulet-Forteza, Genovart-Balaguer et al., 2019). Farrukh et al. (2020) analysed the trend of publications in the *Business Strategy and the Environment* Journal since its inception in 1992. To identify the conceptual evolution and development situation of the *International Journal of Fuzzy Systems*, Tang et al. (2018) presented the annual trends of publications and citations, citing sources and the most highly cited papers.

This paper aims to provide a comprehensive bibliometric overview for ECECSR publications. Our study is divided into two parts: academic structure and relevance analysis. In the first part, the publication and citation structure, prolific authors, prolific countries/regions, and most cited papers are analysed statistically. In another part, using visualization tools, the relevance analysis is carried out from three aspects: keywords, author collaboration and country collaboration. In particular, in the study of the transformation between keywords and topics, this paper adopts a time series clustering method. The co-occurrence matrix of high-frequency keywords in document datasets is established by co-word analysis, and then transformed into a similarity matrix by the Ochiai coefficient calculation method (Qin and Feicheng 2007). Afterwards, the topics of a document is found by the nearest neighbour propagation clustering algorithm (Li and Wu, 2019). To explore the relationships between different themes, the factor of time evolution is added. The research heat of each topic during a certain period is analysed and

transformed into time series data. Next, a time series clustering method is used to transform the data into the form of network structure visually.

This study has two objectives. First, it provides a general overview regarding the academic structure of ECECSR, so as to help editors and scholars better understand the past and current status of the journal. Second, it is hoped that the results of this study can provide a guiding role for the future development of ECECSR and engage further researches.

The rest of this study is organised as follows. Section 2 presents the used methods. Section 3 and Section 4 are the academic structure and relevance analysis of the journal, respectively. Concluding remarks are given in Section 5.

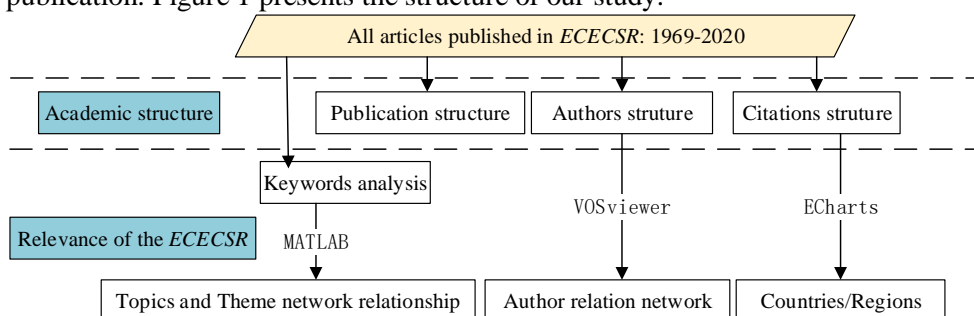
## **2. Methodology**

The term bibliometrics refers to the mathematical and statistical analyses of the patterns that appear in documents (Ramos-Rodriguez and Ruiz-Navarro, 2004). Motivated by the fast development of computers and the internet, bibliometric analysis has been receiving increasing attention from the scientific community (Tang et al. 2020). Bibliometric analysis is a kind of quantitative study of bibliographic material and provides a general picture of a research field that can be classified by papers, authors and journals (Merigo and Yang, 2017). Bibliometric analyses have traditionally been divided into two categories, according to whether they yield activity or relationship indicators. One category provides the data related to the force of impact or the strength of influence of research efforts (Wei, Liao et al., 2020). Another traces the links and interactions between different researchers and different fields of research (Delafenestre, 2019), and the end result is a full description of the content of the research effort and its development (Courtial, Callon et al., 1993). Originally, Armstrong (Armstrong, 1896) produced the first bibliometric study, using statistical methods to study subject scattering in publications (Hood and Wilson, 2001). Up to now, bibliometric has been applied to keywords analysis (Lee, Yoon et al., 2009), co-authorship analysis (Nerur et al., 2008), co-citation analysis (Bornmann and Daniel, 2008) and coupling analysis (Kumar, Sureka et al., 2020).

In our study, the literature comes from the Core Collection database of WoS and Inspec database. WoS, which can date back to 1900, is one of the most trusted publisher-independent global citation database. More than 12000 authoritative and influential academic journals in the world are included in WoS, covering natural science, engineering technology, biomedicine, social science, art and humanities. Inspec, published by the Institution of Electrical Engineers, is one of the most important and frequently used databases in the fields of physics, electronic engineering, electronics, computer science and information technology. First, we use the retrieval formula: Publication Name = “economic computation and economic cybernetics studies and research” to search the publications in “All Databases” from 1969 until now (26 June 2020), and it returns 1615 records (here 768 records in Core Collection database of WoS from 1969 to 2006 and 847

records in Inspec database from 2007 until now). Regarding the document types, there are 1613 articles, occupying a share of 99.88%. Other types of published work include reviews (2).

MATLAB (available at <https://www.mathworks.com>) (Sobie, 2011) is a business mathematics software by the American MathWorks company. It is a high-level technical computing language and interactive environment for algorithm development, data visualization, data analysis, and numeric computation. MATLAB is a combination of the word matrix and laboratory, matrix factory (matrix Lab). VOSviewer (available at <http://www.vosviewer.com>) (Van and Waltman, 2009) is a bibliometric visualization software developed by Van Eck and Waltman in 2010. The full name for VOS is visualization of similarities. ECharts (available at <https://echarts.apache.org/zh/index.html>) (Li, Mei et al., 2018) is an open-sourced, web-based, cross-platform framework that supports the rapid construction of interactive visualization. ECharts is regarded as a leading visualization development tool in the world, and ranks the third in the GitHub visualization tab. In this paper, we use MATLAB to make Topic and Theme network analysis, VOSviewer helps us to make co-authorship analysis and keywords analysis, and ECharts is used to visualize the countries/Regions of publication. Figure 1 presents the structure of our study.



**Figure 1. The Framework of Our Study**

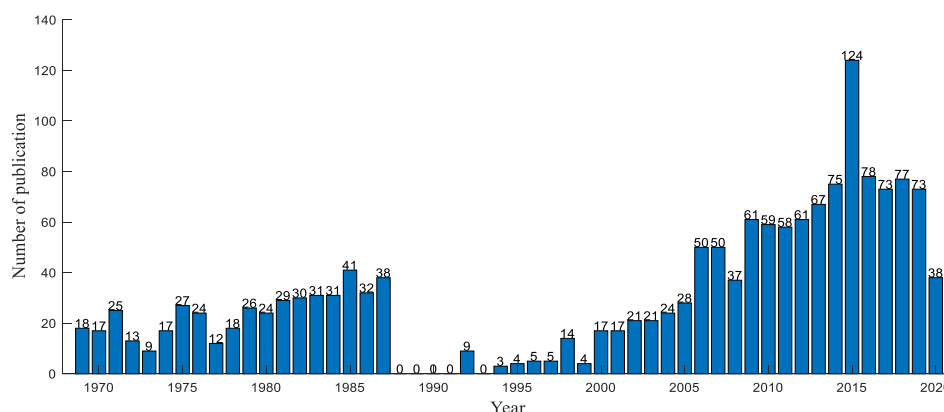
### 3. Academic structure of ECECSR

This section makes a general overview regarding the academic structure of ECECSR in terms of the following four parts: 1) publication and citation structure, 2) the most cited articles, 3) prolific authors, and 4) prolific countries/regions.

#### 3.1. Publication and Citation Structure

Figure 2 presents the annual distribution of publications in ECECSR according to the data from the Inspec and WoS Core Collection database. As can be seen from Figure 2, from 1969 to 1987, the number of articles has a stable development trend. In 1988, the journal began a hiatus until 1991. Next, ECECSR published a small number of articles around no more than 10 in each year. In the new century, the journal backed to a normal mode and presented a sustained development trend. In the last decade, ECECSR published about 70 articles each year except the year of 2015. Note that up to 26 July, 2020, only two issue can be found in WoS. Therefore, the number of papers in 2020 is only 38.

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**Figure 2. Annual Numbers of Publications of ECECSR from 1968 to July 2020**

Table 1 shows the annual citation structure of the publications in *ECECSR* from 2006 to July 2020 since the journal was indexed in the Core Collection database of WoS in 2007. Note that initially the orientation of this journal is economic modelling in Romania. Therefore, most articles published before 2006 did not have citations. We use four thresholds to identify the number of papers that obtained at least 15, 10, 5, and 1 citation(s), respectively. As can be seen from Table 1, 2011 and 2015 have the most papers (5) exceeded 15 citations, followed by the year of 2016 (4). In 2016, except the number of papers cited more than 15 times, all other indicators ranked first.

**Table 1. Annual citation structure of the publications in *ECECSR***

Year	≥ 15	≥ 10	≥ 5	≥ 1	TP	TC	AC	H-index
2006	0	0	0	10	50	13	0.26	2
2007	0	0	4	27	50	75	1.5	4
2008	1	2	6	23	37	83	2.24	5
2009	1	2	13	51	61	208	3.41	7
2010	1	2	10	39	59	149	2.53	6
2011	5	6	11	39	58	207	3.57	8
2012	3	5	10	40	61	221	3.62	7
2013	2	3	11	41	67	206	3.07	6
2014	3	6	10	49	75	257	3.43	8
2015	5	7	9	35	124	244	1.97	8
2016	4	7	16	54	78	303	3.88	8
2017	3	4	11	51	73	183	2.51	7
2018	0	1	5	36	77	80	1.04	5
2019	0	0	1	19	73	32	0.44	3
2020	0	0	0	0	19	0	0	0
Total	25	45	113	502	847	2158	2.55	17
Percentage	2.95%	5.31%	13.34%	59.27%	-	-	-	-

TP: total publications; TC: total citations; AC: average citations

On the whole, more than half of the articles were cited at least once. Before 2009, the total number of citations in each year was less than 100. Furthermore, the total citations for 2018, 2019, and 2020 were also less than 100. Later published articles are less likely to be seen by other researchers and need more time to catch up their majority citations. This is also the reason why the total citations, the average citations and H-index (Zhou, Xu et al., 2020; Hirsch, 2005) from 2017 to 2020 were gradually decreasing. In general, the development prospect of this journal is bright. From 2007 to 2016, all indicators were increasing gradually, and more than half of the papers were cited.

Next, let us consider the most cited articles published in *ECECSR*. Table 2 lists the top 10 most cited articles in the journal over the last 51 years. The author information, publication year, number of citations and average number of citations per year are provided in Table 2. Among these 10 articles, the research topic about decision making occupied a majority share. Interestingly, the highly cited articles published in 2012, 2015 and 2016 are all about decision making. The most cited article ranking first published in 2014 investigated the risk preference of investors in stock markets.

**Table 2. Top 10 most cited studies in *ECECSR* according to WoS**

Rank	Title	Author(s)	Year	Citation	CY
1	Characteristics of investors' risk preference for stock markets	Wen, FH; He, ZF; Dai, ZF; Yang, XG.	2014	76	10.9
2	A new combinative distance-based assessment (CODAS) method for multi-criteria decision-making	Keshavarz Ghorabae, M; Zavadskas, EK; Turskis, Z; Antucheviciene, J.	2016	74	14.8
3	MCDM methods WASPAS and MULTIMOORA: Verification of robustness of methods when assessing alternative solutions	Zavadskas, EK; Antucheviciene, J; Saparauskas, J; Turskis, Z.	2013	57	7.1
4	On fuzzy mathematical programming and tolerances in planning	Negoita, CV; Sularia, M.	1976	51	1.1
5	Application of neuromorphic set to multicriteria decision making by Copra's	Bausys, R; Zavadskas, EK; Kaklauskas, A.	2015	46	7.7
6	Multicriteria decision making approach by VIKOR under interval neutrosophic set environment	Bausys, R; Zavadskas, EK.	2015	45	7.5
7	Linguistic induced generalized aggregation distance operators and their application to decision making	Zeng, SZ; Su, WH.	2012	38	4.2

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<b>8</b>	Ranking redevelopment decisions of derelict buildings and analysis of ranking results	Antucheviciene, J; Zavadskas, EK; Zakarevicius, A.	2012	36	4.0
<b>9</b>	Inventory management optimization as part of operational risk management	Michalski, G.	2009	35	2.9
<b>10</b>	Applications of WASPAS method as a multi-criteria decision-making tool	Chakraborty, S; Zavadskas, EK; Antucheviciene, J.	2015	29	4.8

CY: Average number of citations by year

### 3.2. Prolific Authors

In this section, the MATLAB software (Berens, 2009) was used to carry out the analysis for publication information statistics of authors. In Table 3, the detailed division of the publication status of the top 15 prolific authors were presented, with their positions as the first author, the second author, the third author, and others.

**Table 3. The top 15 most cited authors in *ECECSR***

Author name	First	Second	Third	Others	total
STOICA M	21	8	3	0	32
STROE R	6	6	5	3	20
ALTAR M	14	4	0	0	18
DUMITRU V	15	3	0	0	18
MANESCU M	18	0	0	0	18
ZAVADSKAS EK	1	10	5	2	18
STANCU S	11	3	0	3	17
LUNGU I	11	5	0	0	16
ALBU C	2	6	6	1	15
PURCARU I	15	0	0	0	15
STEFANESCU S	5	10	0	0	15
ANDREI T	10	3	0	0	13
PESCARU V	12	0	1	0	13
SCARLAT E	8	2	3	0	13
SHAH N H	9	2	2	0	13

Table 4 provides the number of articles and percentages finished by one author, two authors, three authors, and more than three authors, respectively. The number of articles written by a single author accounts for more than a quarter of all articles, and the number of articles decreases as the number of authors increases.

This indicates that the authors of this journal prefer to complete the research independently.

**Table 4. The author structure of *ECECSR***

	One author	Two authors	Three authors	Others
Count	510	508	313	284
Percentage	31.58%	31.46%	19.38%	17.59%

### 3.3. Prolific Countries/Regions

Table 5 shows the top 15 countries/regions in terms of publication volume. In the statistics process, if one paper is written by two or more countries/regions, then this paper is considered as a co-authorship work and each country will be counted once (Liao et al., 2019). As *ECECSR* was originally published in Romania, it is certainly that Romania is at the top of the list, accounting for 58.33% of all publications in this journal. China is in the second position with a proportion of 7.62%. Specifically, the country with the most citations is Romania (1038), followed by China (494) and Lithuania (483). Although Lithuania published only 2.42% of the articles, the average number of citations (12.38) is much higher than that of other countries. One reason is that several highly cited papers were written by Lithuania scholars. Keshavarz Ghorabae et al. (2016) presented a new Combinative Distance-based ASsessment (CODAS) method to handle MCDM problems in 2016, which has been the only Highly Cited Paper from *ECECSR* according to the Essential Science Indicators.

**Table 5. The top 15 prolific countries/regions in *ECECSR***

Rank	Countries/Regions	Documents	Percentage	Citations	AC
1	Romania	942	58.33%	1038	1.10
2	China	123	7.62%	494	4.02
3	Iran	70	4.33%	231	3.30
4	Lithuania	39	2.42%	483	12.38
5	Turkey	37	2.29%	49	1.32
6	USA	36	2.23%	54	1.50
7	Spain	32	1.98%	111	3.47
8	India	31	1.92%	54	1.74
9	Malaysia	25	1.55%	53	2.12
10	Taiwan	21	1.30%	26	1.24
11	Czech Republic	17	1.05%	28	1.65
12	South Korea	16	0.99%	2	0.13
13	France	15	0.93%	20	1.33
14	Italy	15	0.93%	35	2.33
15	Poland	13	0.81%	120	9.23

AC: Average number of citations



### 3. Relevance analysis of ECECSR

This section addresses the relevance analysis from three aspects: keywords, author collaboration and country collaboration.

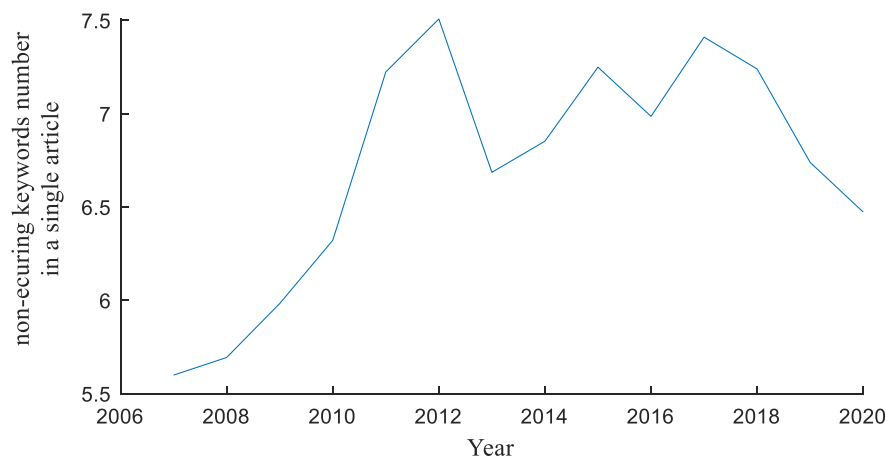
#### 3.1. Keyword Analysis

In this section, a total of 847 articles were collected from WoS Core Collection database, according to the keywords provided by authors. We obtained 6196 author keywords in total and 4387 author keywords appeared only once. Table 6 lists statistics for these keywords. Recurring author keywords and non-repetitive author keywords are listed combined with the number of articles published. It can be found that the average number of author keywords provided in an article does not fluctuate much during the publication years. Most authors provided 7 to 8 keywords to describe their research. As shown in Figure 3, we can find that the authors of ECECSR publications provided increasingly number of non-repetitive keywords changing with time. It indicates that the research topics of ECECSR have been more and more abundant in recent years.

**Table 6. Statistics for author keywords (2007-2020)**

Year	Recurring keywords	Non-repetitive keywords	Number of articles	RK/N	NK/N
2007	274	252	45	6.09	5.60
2008	208	205	36	5.78	5.69
2009	372	359	60	6.20	5.98
2010	392	373	59	6.64	6.32
2011	459	419	58	7.91	7.22
2012	502	458	61	8.23	7.51
2013	488	448	67	7.28	6.69
2014	551	514	75	7.35	6.85
2015	558	522	72	7.75	7.25
2016	561	517	74	7.58	6.99
2017	577	541	73	7.90	7.41
2018	592	543	75	7.89	7.24
2019	536	492	73	7.34	6.74
2020	126	123	19	6.63	6.47
Total	6196	4387	847	-	-

**Note.** RK/N: Recurring keywords/Number of articles; NK/N: Non-repetitive keywords/Number of articles



**Figure 3. The average number of non-repetitive author keywords (2007-2020)**

To better understand the research content of ECECSR, we further make a statistical analysis of all keywords (keywords appear in title, abstract, author keywords and keywords plus), and calculate the annual occurrence frequency of each keyword and the total occurrence frequency in the last 14 years from 2007 to 2020. Then, we use ECharts (A declarative framework for rapid construction of web-based visualization) to visualize the evolution status of the top 18 keywords.

In Figure 4, corresponding to each year, when a keyword appears in this year, a small circle will appear on the coordinate of the keyword. The more the keyword appears, the larger the circle will be. It can be seen from Figure 4 that the keyword “model” appears most frequently. Since 2007, it did not appear except in 2018 and 2020. In other years, its frequency is relatively stable than other keywords. ‘Performance’ has the largest circle in 2011 and has been used by authors frequently in recent years. The term “economic growth” emerged mainly in 2013 and 2018, with other years also appeared on a smaller scale. “Management” mainly appeared between 2014 and 2017. Since the burst of “Cointegration” in 2011, this keyword has been decreased year by year.

On the whole, ECECSR has relatively stable research content since there are small fluctuations regarding high-frequency keywords. The journal mainly focused on economic mathematical modelling, which conforms to the orientation of the journal. On the other hand, maybe the journal needs to add novel elements to increase the freshness and innovation.

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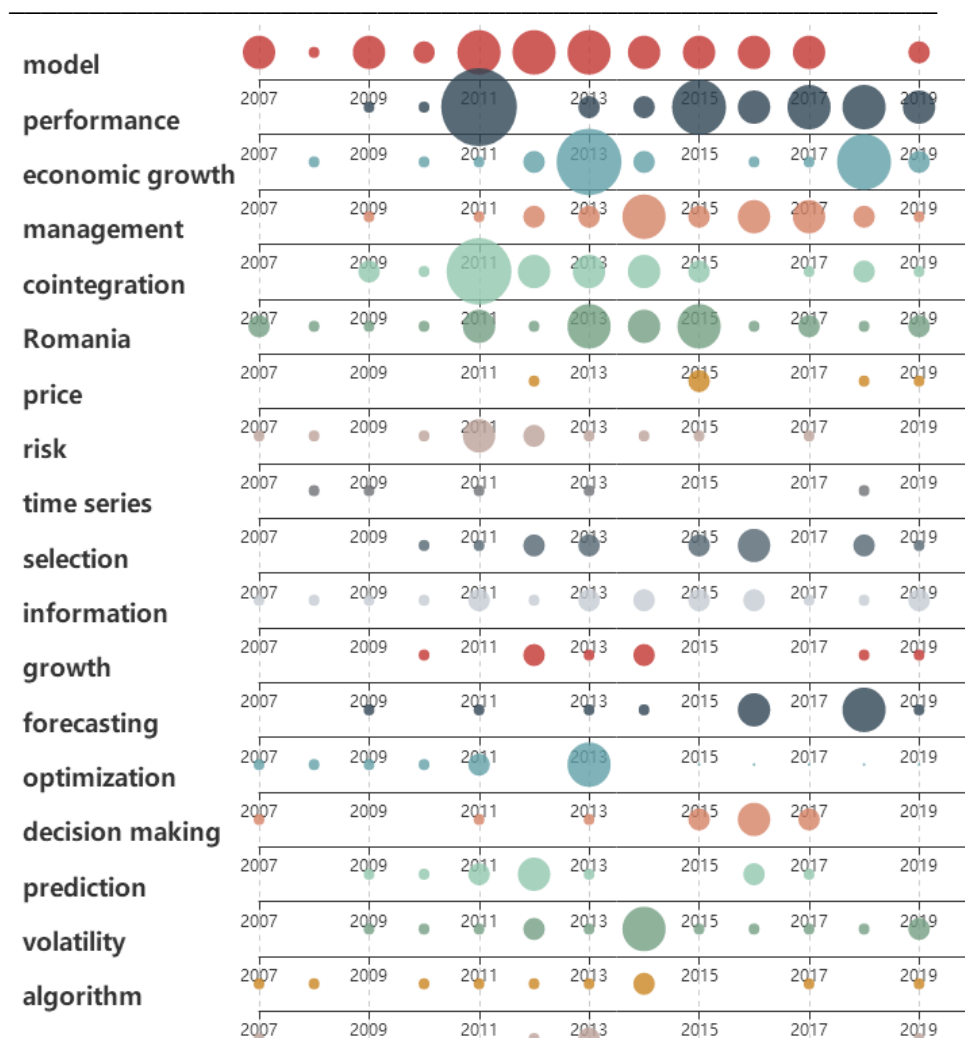


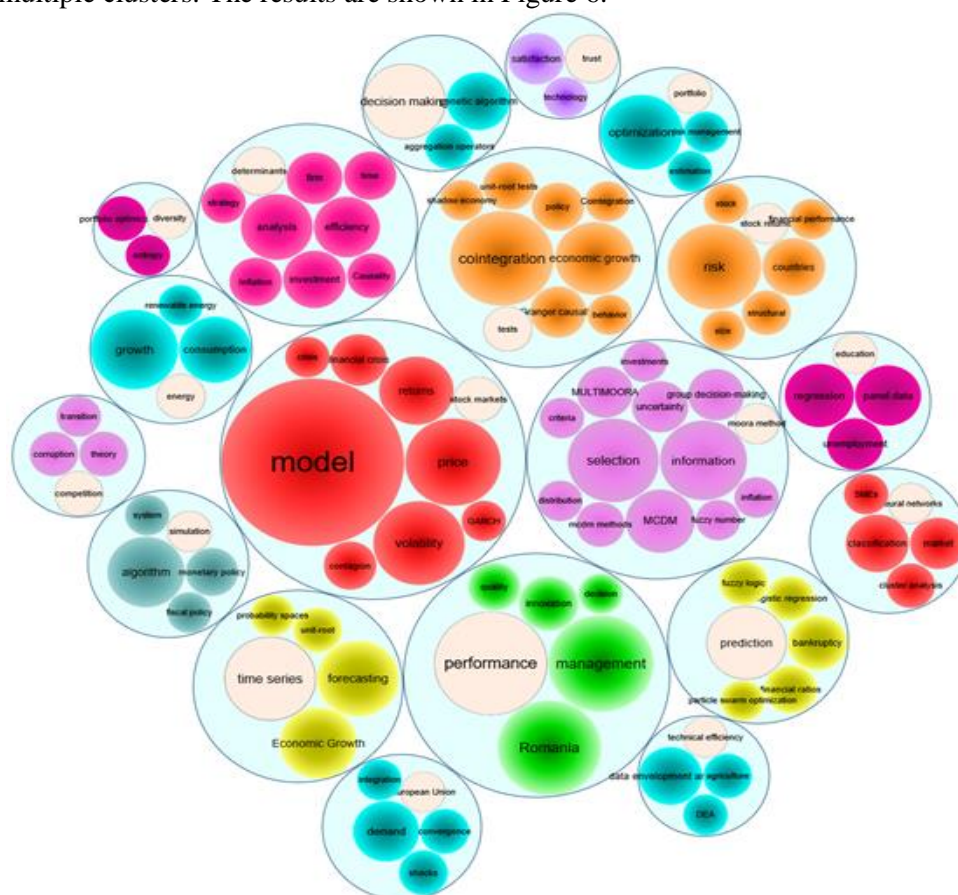
Figure 4. The evolution of the top 18 keywords from 2007 to July 2020

The VOSviewer software was used to analyse the network structure of all keywords in the publications. The keywords with occurrence frequency less than 3 were removed, and the remaining keywords were presented in Figure 5(a). To see the evolution status of keywords through time, Figures 5(b), 5(c) and 5(d) respectively present the co-occurrence of keywords in three periods: 2007-2011, 2012-2016 and 2017-2020. In all stages, the keyword “model” appears most frequently. From 2012 to 2016, there were a large number of papers published. Hence, the network diagram was relatively complex. However, the network structure in three stages did not change much.



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and Dueck, 2007) is used to automatically gather all high-frequency keywords into multiple clusters. The results are shown in Figure 6.

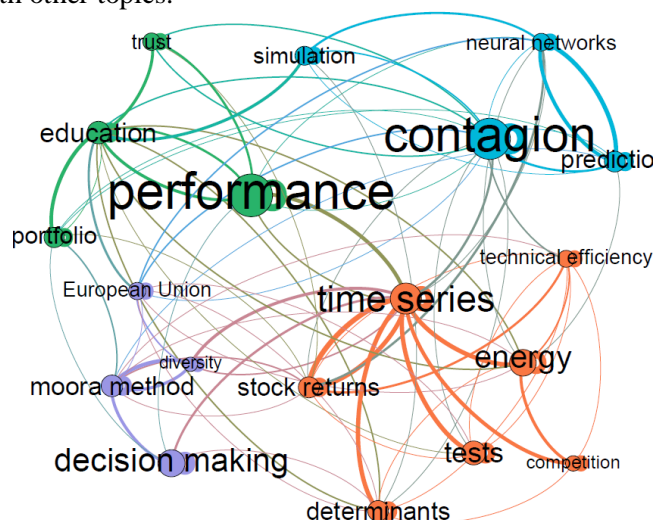


**Figure 6. Topic results obtained by keyword clustering**

In Figure 6, each small circle with a specific colour represents a keyword. The size of the small circle denotes the frequency of the keyword appeared in the literature dataset. In other words, the larger the small circle is, the higher the degree of attention associated with the keyword is. The large circle formed by several small circles represents a cluster. The correlation between the keywords in the cluster is strong and they describe a theme together. A small circle in the cluster whose colour is different from other members is the centre of the cluster. The relationships among the members in each cluster are close. For example, the cluster whose centre is “neural networks” has members include “SMEs (Small and Medium-sized Enterprises)”, “classification”, “market” and “cluster analysis”. All of them are related to data mining research. In the cluster with the central word

“technical Efficiency”, the keyword “DEA” is actually a shorthand for “Data Envelopment analysis”. Due to the rigidity of the computer, these two words are not grouped together. However, the topic division of the Affinity Propagation algorithm groups them together. Note that the topic division is not to simply divide the keywords with similar meanings together, but to divide the keywords that have close relations and can describe a same theme together. Moreover, the topic centre is also automatically obtained by the clustering algorithm. The topic centre is not necessarily the keyword that appears most frequently, but the keyword that has the closest relationship with all other keywords in the cluster.

To explore the relationships between topics from the perspective of time, we count the popularity of each topic according to the time sequence, converted them into the form of network structure by the time series clustering method, and finally gathered the results, as shown in Figure 7. In the network graph, each vertex represents a topic. The larger the vertex is, the hotter the topic is. The connections between vertices represent the relationships between subjects. The thicker the line is, the closer the relationship is. As we can see from Figure 7, “time Series” has strong ties with other topics.



**Figure 7. A network of relationships between topics**

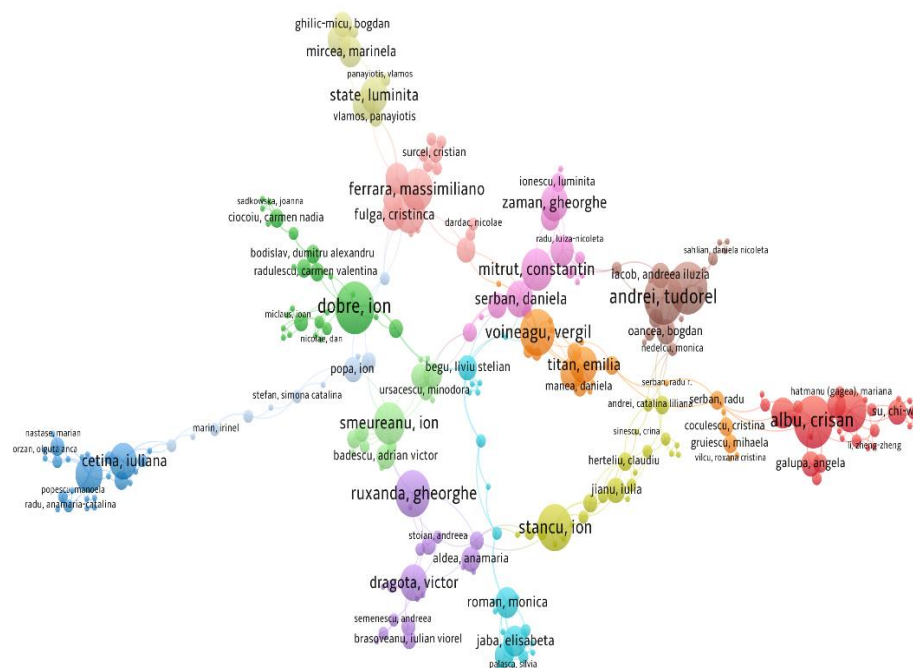
### 3.2. Author collaboration network

This section uses the VOSviewer software to visualize the collaboration status between the authors of ECECSR publications, as shown in Figure 8. In Figure, each circle represents an author. The larger the circle is, the more active the author is. The line between two circles represents the collaboration relationship between two authors. The thicker the line is, the closer the co-authorship relationship between two authors is. At the same time, the software divides the authors roughly through relational networks. We can find that most of the small groups are presented in the mode of star structure. In other words, one or two



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authors who published actively are surrounded by a group of authors who have less publications.



**Figure 8. Co-Authorship Network**

### 3.3. Country/region collaboration network

To learn about the cooperative relationships between countries/regions of ECECSR publications, we make the country/region collaboration network in Figure 9. In Figure 9, the dots indicate countries/regions, and the line connecting two countries/regions indicates that authors from the two countries/regions have collaboration relationships. The thicker the line is, the closer the collaboration relationship is. The countries/regions marked in red have no collaborative publication with other countries/regions. As can be intuitively seen from Figure 9, those countries that have publications in ECECSR are mainly concentrated in Eastern Europe such as Romania and Lithuania. Not surprisingly, Romania has the most collaborative relationships with other countries/regions including Italy, France, England, Greece, USA, China and Malaysia. In addition, several distant countries from Romania such as China, the USA and Chile also have relatively

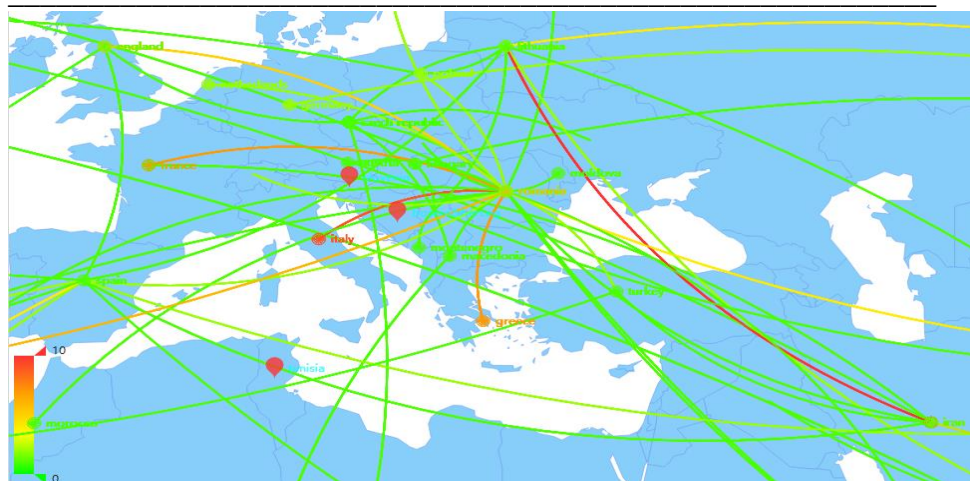
strong collaborations with other countries/regions, especially with Romania. This result can be attributed to academic visits and international research exchanges.

11 countries/regions represented by 11 red dots that do not have collaborations with other countries are distributed around the world. It is worthy to note that South Korea, which ranks the 11th in terms of publications but has low citation counts, is one of the only 11 countries that does not have international co-authorship publications. However, we cannot conclude that its low citation is due to the lack of innovation in its thesis. As has been shown in past literature, there exists a positive impact between the level of international collaboration and citation performance (Liao et al. 2020). With the advances in information and communication technology and institutional changes, scholars can easily obtain relevant knowledge by collaborating with other peers with diverse areas of expertise and backgrounds. Accessing external complementary knowledge and skills through, especially scientists working in more developed environments, seems to have positive effect on high impact publications (Confraria, Godinho et al., 2017).



**Figure 9. Co-authorship map showing the collaborative countries/regions**





**Figure 10. Co-authorship map showing the collaboration with countries/regions around Romania**

#### **4. Conclusions**

ECECSR has been indexed by the Inspec database and the Core Collection of WoS database since 1969 and 2007, respectively. It is necessary to conduct a comprehensive bibliometric overview for ECECSR publications. This study analyzed 1615 articles from 1969 to 2020 based on these two databases. We used the MATLAB, VOSviewer and Apache ECharts software packages to carry out statistical and visual analysis, and obtained several interesting findings and suggestions, such as:

(1) Since the journal was indexed by WoS, there has been a small increase in the number of published articles. Since 2007, the average citation of articles shows an unstable growth trend, but at a slower rate. The proportion of highly cited articles is small. In the future, it is important to focus on high-quality manuscripts to publish in this journal. Most of the cited papers in this journal are about “economic mathematical modeling”.

(2) In terms of the author structure, more than a quarter of the articles are published by a single author. It is hoped that the journal will attach more importance to collaborative articles.

(3) Through the analysis of author keywords, it can be found that the publication content of the journal is relatively stable. The number of non-repetitive keywords has an increasing trend, which indicates that the research content was gradually enriching. Through the analysis of the subject of the journal, we can find that the journal has a clear orientation and the main research is mainly carried out around “economics”, “mathematics” and “computer”.

(4) The most active country in ECECSR publications is Romania who covers more than half of all articles. The ECECSR articles come from a variety of sources, mainly in Eastern Europe. Several countries/regions, including Romania, Lithuania and China, work closely with other countries. The average citations of the publications originated from Lithuania is higher than the citations of other countries/regions. Although South Korea has a large number of publications, its citation performance is poor. One important factor is that South Korea does not cooperate with other countries/regions in ECECSR. It is suggested that authors from South Korea should strength their cooperation with the scholars from other countries/regions.

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