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Intellectual structure, themes and disciplines of credit rating determination by rating agencies – a bibliometric analysis

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Abstract: Credit ratings, given by credit rating agencies, are the opinion about the creditworthiness and the likelihood of timely payment by the issuer. Various factors are analysed by rating agencies to assess the financial soundness of the debt issuer and arrive at ratings. This study presents a bibliometric review of the literature on determinants of corporate credit rating on a sample of 135 articles from January 2001 to June 2021. The articles are analysed to delineate influential aspects, themes, and conceptual, intellectual, and social structure of the knowledge base using different bibliometric techniques. The findings highlight the multi-disciplinary nature of the literature and theoretical foundation based on bankruptcy studies. Further, the keyword co-occurrence analysis suggests corporate social responsibility (CSR), environmental, social and governance (ESG), machine learning, managerial ability, and sustainability as emerging research topics in this field. The study explains the direction and future research scope that will be helpful for academicians, investors, regulators and policy formulators.

Keywords: corporate credit rating; credit rating agencies; determinants; bibliometric analysis; corporate social responsibility; CSR; credit rating; CRAs; ESG.

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1 Introduction

Credit ratings are the opinion of credit rating agencies (CRAs) about the willingness and ability of the borrower to pay off its liabilities as per the terms of the agreement. CRAs judge the creditworthiness of the issuer of debt instruments and help in mitigating information asymmetry in the capital markets (Langohr and Langohr, 2010). Credit ratings are also used for estimating the likelihood of default, pricing of loans, facilitation of a contract and management of portfolio (Frost, 2007). CRAs rely on various factors and judgements to provide ratings in the form of alpha-numeric symbols. Due to a lack of standardised factors, procedures and methodology to arrive at ratings, CRAs have been questioned for their relevance, functioning and accuracy (White, 2009; Pagano and Volpin, 2010). This has attracted the attention of academicians worldwide leading to numerous studies enumerating factors explaining and predicting corporate credit ratings (Ubarhande and Chandani, 2021). While various studies have provided empirical evidence for different factors influencing corporate credit ratings, there is a need for an in-depth analysis of the literature base to understand the direction of the research and identify the emerging factors that could provide a better explanation of corporate credit ratings.

With an objective to perform synthesis of the literature on determinants of corporate credit ratings, we conducted a bibliometric review to encapsulate the progress, direction and trends of the literature. The study answers the following research questions:

- RQ1 What is the publication trend across time and geographical location?
- RQ2 What are the influential aspects of this body of knowledge in respect of articles, authors and sources?

- RQ3 What is the intellectual structure of credit rating determinants knowledge base?
- RQ4 What are the major disciplines and collaboration patterns of this field of knowledge?
- RQ5 What is the conceptual structure involving key themes and topics in the literature and what is the future research scope involved?

The prior review articles related to credit ratings have addressed different research questions like the working of the credit rating industry, methodologies used, determination of credit rates, criticisms of CRAs and the relationship between credit rating announcements and stock prices of the firm (Frost, 2007; Matthies, 2013; Hubler et al., 2019; Ubarhande and Chandani, 2021).

This study is different from the previous research as it performs a comprehensive bibliometric review of literature on determinants of corporate credit rating using citation, co-citation and keyword analysis to capture the richness of the literature, in contrast to traditional literature review as performed in previous studies. The paper contributes in outlining the influential aspects of the literature, themes, disciplines, collaborative networks and upcoming research topics.

The remaining paper is organised as follows: Section 2 describes the sample selection, data extraction and method of analysis, Section 3 analyses the data and presents the results of the bibliometric analysis, Section 4 discusses the future research agenda and Section 5 concludes the study.

2 Data and methodology

2.1 Sample selection

To determine the sample of articles to be included in the review, first, the database selection is done. We have used both *Scopus* and the *Web of Science (WoS)* citation database to maintain the both coverage and quality of articles (Vieira and Gomes, 2009; Mongeon and Paul-Hus, 2016). Second, different combinations of keywords like ‘corporate credit rating’, ‘credit rating’, ‘debt rating’, ‘bond rating’, ‘determinants’, ‘factors’, ‘drivers’ and ‘indicators’ are used to extract the articles from both databases. Third, we applied filters for ‘English language’ and ‘articles published after 2000’ as studies on the credit rating industry increased after the June 1999 notification of the ‘Bank of International Statements (BIS) Basel Committee on Banking Supervision’ (White, 2002). The search resulted in a total of 1,150 articles (698 articles from *Scopus* and 452 articles from *WoS*). 15 more documents were added from the software *Publish and Perish* using the same search strategy to cover all possible articles on the topic. Further, we followed a four-step process as suggested by the PRISMA approach (Figure 1) for screening the articles to build the final sample of our study (Moher et al., 2010). From a total of 1,165 articles identified from the two databases and other sources, the first stage of screening resulted in the exclusion of 781 articles due to missing information, duplicates and irrelevance. The remaining 384 articles went through full-text screening for their eligibility to be included in the sample, resulting in the inclusion of relevant 135 articles to perform bibliometric analysis.

Figure 1 PRISMA approach flow diagram for sample selection (see online version for colours)

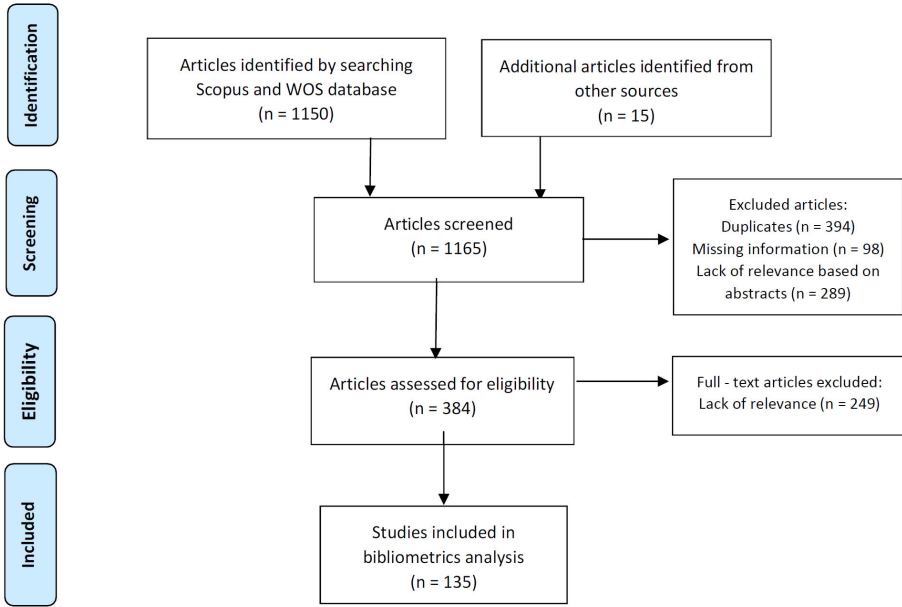
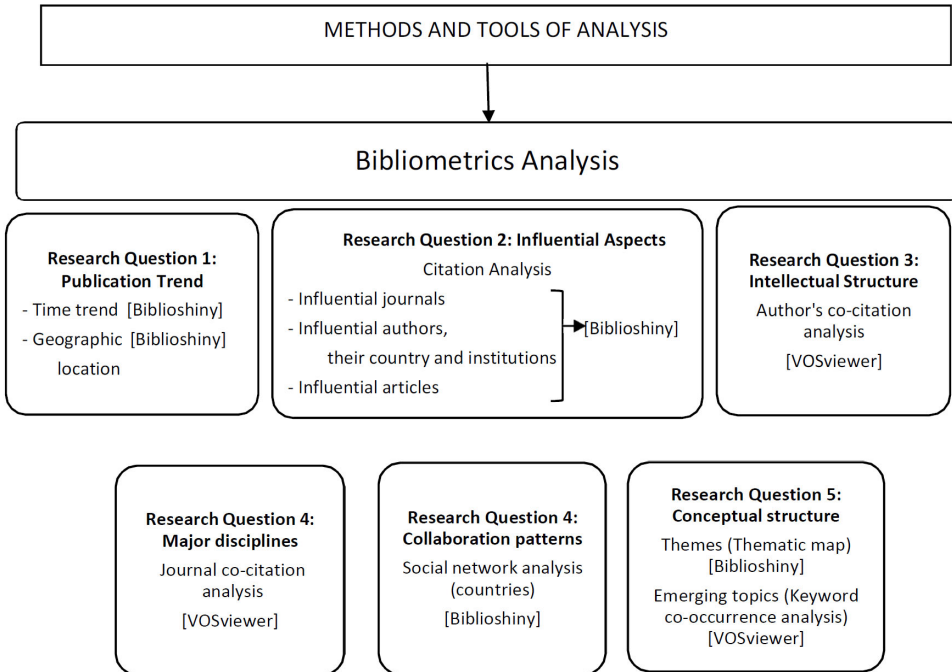


Figure 2 Methods and tools used for analysis



2.2 Analysis methods

Bibliometric citation analysis is performed to map the knowledge anatomy of the literature base (Li et al., 2017) and to identify the key research themes and topics. It helps in drawing out conclusions and finding out research gaps (Denyer and Tranfield, 2009). We applied publication trends, citation analysis, co-citation analysis, thematic analysis and keyword analysis (Bahoo, 2020; Goyal and Kumar, 2021) using VOSviewer software and the Biblioshiny package from R Studio. Figure 2 provides information about the methodology, tools and software used for the analysis.

3 Data analysis and findings

The data analysis is performed in three categories, descriptive analysis to provide an overview of the dataset, citation analysis to identify influential aspects of the literature and scientific mapping to locate intellectual structure, major disciplines, themes, emerging topics and collaborative structure of the literature base.

3.1 Descriptive analysis

3.1.1 Dataset

The dataset for this study includes 135 articles published on determinants of corporate credit rating from January 2001 to June 2021. 135 documents are published in a total of 105 sources authored by a total of 343 authors having 392 keywords. Table 1 provides an overview of the dataset used for this study.

Table 1 Overview of the dataset

<i>Description</i>	<i>Results</i>
Timespan	2001:2021
Documents	135
Sources (journals, books, etc.)	105
Average citations per document	34.33
References	5,838
Author's keywords (DE)	392
Authors	343
Authors of single-authored documents	14
Authors of multi-authored documents	329
Single-authored documents	14
Documents per author	0.394
Authors per document	2.54
Co-authors per documents	2.78
Collaboration index	2.72

3.1.2 Publication trend in time

Figure 3 depicts the annual scientific production of articles on drivers of corporate debt rating during the period 2001 to 2021. The annual publications during the study period show an upward trend with 2020 bagging the maximum number of articles. The figure shows the increase in volume after 2009, probably owing to the global financial crisis of 2008–2009 from where the rating industry has come into the limelight due to their not up to the mark performance in major default events (White, 2013). Since then, studies on understanding rating mechanisms, the factors influencing ratings and accurate prediction of ratings have grown many-fold.

Figure 3 Annual scientific production of 135 articles from 2000-2021 (see online version for colours)

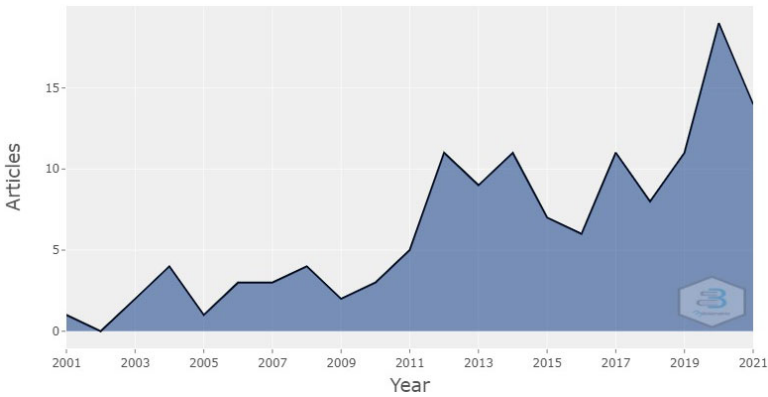


Table 2 Top countries: Number of publications and citations

<i>Country's scientific production</i>		<i>Most cited countries</i>	
<i>Country</i>	<i>Frequency</i>	<i>Country</i>	<i>Citations</i>
USA	70	USA	1,076
China	63	China	253
South Korea	23	UK	237
UK	22	Germany	235
Canada	16	Korea	231
Australia	13	Switzerland	130
France	12	Canada	125
Pakistan	11	Australia	118
Germany	10	Chile	97
Greece	10	Czech Republic	78
Spain	10	Greece	50
Austria	8	Italy	37
India	8	Spain	37
Indonesia	8	Norway	29
Portugal	6	Austria	11

3.1.3 Countries

Table 2 shows the contribution of countries based on published articles and the number of citations. A total of 37 countries have contributed to this research field with the majority being developed nations. The maximum number of articles are published by authors from the USA (70), followed by China (63), South Korea (23), the UK (22), Canada (16) and Australia (13). In terms of citations, again the USA tops the list with China being the distant second. The research on rating and its determinants is concentrated in developed countries and provides room for further research on this area in developing nations where there are widespread information asymmetries (Gao and Zhu, 2015).

3.2 Influential aspects of the literature

3.2.1 Journals

Table 3 lists the top 10 most influencing journals and publishers, from the list of 105 different journals, based on the total number of articles published on the topic and total local citations (TLC) of the journal. TLC includes only the citations received by a paper from other papers in the selected dataset and not from all articles published in the database. The *Journal of Banking and Finance* is the most productive avenue with five documents published in this journal and the *Journal of Finance* has the publication of the highest impact research articles (340 total local citations).

Figure 4 provides the most impactful journals ranked on the basis of the h-index that assesses the quality of a journal based on both productivity and citation impact. It is considered a better measure of the quality and impact of a source (Ingale and Paluri, 2020). The top 3 most impactful journals are *The Journal of Banking and Finance*, *Contemporary Accounting Research* and *Expert Systems with Applications*. The top-ranking journals belong to five areas or disciplines, namely, finance, accounting, computer science applications, economics and management.

Figure 4 Most impactful journals (see online version for colours)

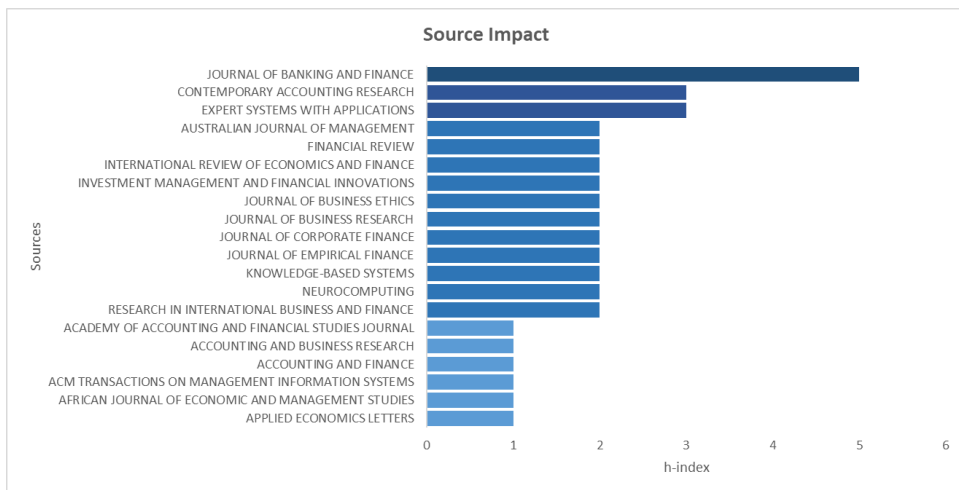


Table 3 Key journals

Rank	Journal name	Publisher	Number of articles	Journal name	Publisher	TLC
1	<i>Journal of Banking and Finance</i>	Wiley-Blackwell	5	<i>The Journal of Finance</i>	American Finance Association	340
2	<i>Contemporary Accounting Research</i>	Wiley-Blackwell	4	<i>Journal of Financial Economics</i>	Elsevier	309
3	<i>Investment Management and Financial Innovations</i>	Business Perspectives	4	<i>Journal of Banking and Finance</i>	Wiley-Blackwell	158
4	<i>Journal of Corporate Finance</i>	Elsevier	4	<i>Journal of Accounting and Economics</i>	Elsevier	151
5	<i>Expert Systems with Applications</i>	Elsevier	3	<i>The Accounting Review</i>	American Accounting Association	109
6	<i>Applied Economics Letters</i>	Routledge	2	<i>Journal of Accounting Research</i>	Wiley-Blackwell	108
7	<i>Australian Journal of Management</i>	Sage	2	<i>Expert Systems with Applications</i>	Elsevier	95
8	<i>Financial Markets Institutions and Instruments</i>	Wiley-Blackwell	2	<i>Journal of Business</i>	The University of Chicago Press	66
9	<i>Financial Review</i>	Wiley-Blackwell	2	<i>Contemporary Accounting Research</i>	Wiley-Blackwell	57
10	<i>International Review of Economics and Finance</i>	Elsevier	2	<i>Journal of Financial and Quantitative Analysis</i>	Cambridge University Press	54

Table 4 Influential authors, their affiliated country and institution

Rank	Author	Institution	Nation	Number of articles	Author	Institution	Nation	TGC
1	Jiraporn, P.	Pennsylvania State University	USA	4	Chen, H.	University of Arizona	USA	632
2	Zhao, Y.	Shanghai University of International Business and Economics	China	3	Chen, W.-H.	National Taiwan University	Taiwan	622
3	Chen, D.	University of Baltimore	USA	2	Hsu, C.-J.	University of Arizona	USA	622
4	Al-Najjar, B.	Birkbeck University of London	UK	2	Huang, Z.	University of Arizona	USA	622
5	Bhattacharya, S.	Symbiosis International University	India	2	Wu, S.	Chang-Gung University	Taiwan	622
6	Bonsall IV, S.B.	Ohio State University	USA	2	Ashbaugh-Shaife, H.	University of Wisconsin	USA	562
7	Chen, C.	Fudan University	China	2	Collins, D.W.	University of Iowa	USA	/562
8	Chen, H.	University of Arizona	USA	2	LaFond, R.	MIT	USA	562
9	Chi, D.-J	Chinese Culture University	Taiwan	2	Bhojraj S.	Cornell University	USA	539
10	Doumpos, M.	Technical University of Crete	Greece	2	Sengupta, P.	Office of the Comptroller of the Currency	USA	539

3.2.2 Authors and affiliations

The 135 documents have 343 authors from 37 countries and are affiliated with 180 institutions. Table 4 depicts the most influential authors based on the number of published documents and their total number of global citations (TGC), i.e., the number of times a document is cited by other documents listed on the database used for the study. The authors' affiliated institutes and countries are also presented in the table. The highest number of documents are published by author Pornsit Jiraporn (4) followed by Yang Zhao (3) and Dong Chen (2). In terms of citations, the top three authors are Hsinchun Chen with 632 TGC, Wun-Hwa Chen having 622 TGC, and Chia-Jung Hsu with 622 TGC. The results reported that most of the authors belong to the 'USA' in both categories. In TGC analysis, eight out of ten authors are affiliated with the USA, the rest belonging to Taiwan. Similarly, authors from the USA have published the highest number of articles followed by China. Finally, 'University of Arizona', 'National Taiwan University' and 'Pennsylvania State University' are among the prominent affiliations of the authors working on this stream of research.

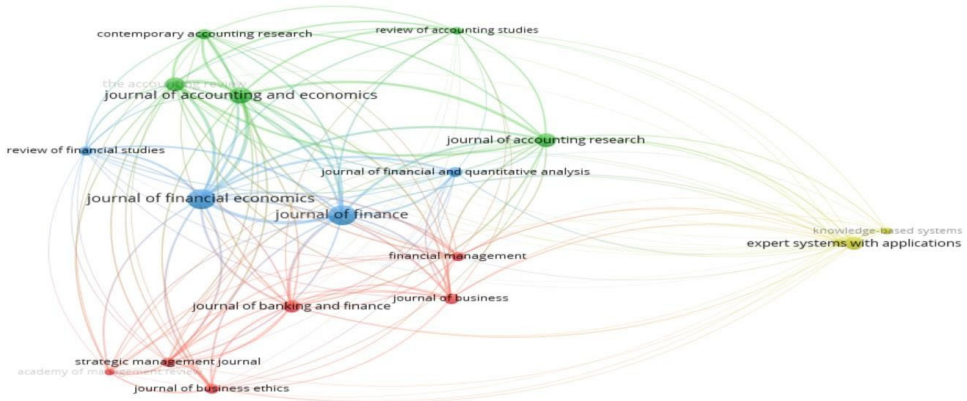
3.2.3 Articles

Table 5 delineates the top 10 most influential documents based on two parameters, Total local citations (TLC) and Total global citations (TGC). The selected 135 articles have 216 TLC and 4,635 TGC. The articles are ranked based on TGC per year (TGC/t) and TLC per year (TLC/t). The dominant position is attained by the articles, Ashbaugh-Skaife et al. (2006), Huang et al. (2004), Attig et al. (2013) and Bhojraj and Sengupta (2003). The majority of the documents which have top rankings in citation analysis, either study the effect of corporate governance (CG) and corporate social responsibility (CSR) on the firm's credit ratings or predict the corporate credit rating using contemporary techniques. This highlights the important factors and techniques for the determination and improvement of the prediction accuracy of corporate credit rating.

Table 5 Influential articles

Rank	Influential articles based on TGC/t			Influential articles based on TLC/t		
	Authors and year	TGC	TGC/t	Authors and year	TLC	TLC/t
1	Ashbaugh-Skaife et al. (2006)	562	35.16	Attig et al. (2013)	11	1.83
2	Huang et al. (2004)	622	34.56	Ashbaugh-Skaife et al. (2006)	24	1.30
3	Bhojraj and Sengupta (2003)	539	28.37	Bhojraj and Sengupta (2003)	23	1.20
4	Attig et al. (2013)	183	20.33	Huang et al. (2004)	16	0.89
5	Bonsall et al. (2017)	74	14.8	Kim and Ahn (2012)	8	0.80
6	Oikonomou et al. (2014)	111	13.87	Cornaggia et al. (2017)	4	0.80
7	Bonsall and Miller (2017)	57	11.40	Lee (2007)	9	0.75
8	Grunert et al. (2005)	189	11.12	Oikonomou et al. (2014)	5	0.625
9	Zhong et al. (2014)	85	10.625	Aman and Nguyen (2013)	5	0.55
10	Lee (2007)	136	9.067	Zhong et al. (2014)	4	0.5

Figure 6 Co-citation map of journals created using VOSviewer software (see online version for colours)



3.3.2 Intellectual structure

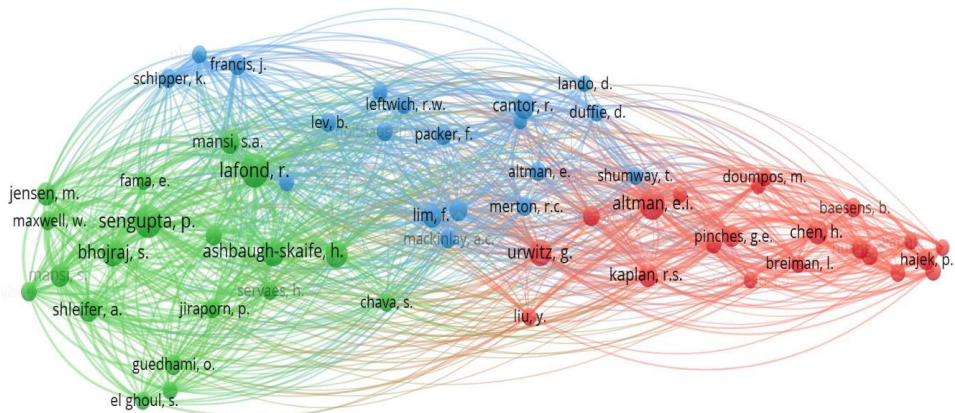
The author's co-citation analysis is performed to analyse the intellectual composition of a literature base. It helps to understand various authors' impact in the research field, their collaboration and the sub-field of study. The analysis was performed on a total of 6,686 authors of 5,973 documents including the references of 135 research papers. Figure 7 depicts the network formed from co-citations of authors using VOSviewer software. It shows nexus among the top 59 authors, filtered based on at least 15 citations, from a total of 6,686 authors. The map displays three clusters having similar co-cited authors together.

In the centre of the network are the authors with articles Blume et al. (1998), Merton (1974), Altman (1969) and Kaplan and Urwitz (1979). These articles are the focal point of the network and are linked to all other studies in different clusters, forming the theoretical and methodological foundation for the credit rating knowledge base. To add, the other authors in the blue cluster have marked their contribution relating to the prediction of bankruptcy with a focus on financial ratios (Beaver, 1966; Altman, 1969; Shumway, 2001; Ohlson, 1980), studying pricing and signs of declining quality of corporate debt (Merton, 1974; Francis et al., 2005; Blume et al., 1998) and understanding the functioning of CRAs, rating industry, biases involved, consistency of ratings (Ammer and Packer, 2000; Cantor and Packer, 1994; Cantor and Packer, 1997; Cantor and Mann, 2003). This cluster highlights the theoretical framework of the credit rating industry and underlines the significance of financial indicators as predictors of credit ratings. The red cluster highlights the methodological development of this body of knowledge. The most eminent and highly co-cited authors in this cluster are Edward I. Altman, Robert S. Kaplan, Gabriel Urwitz and Louis H. Ederington, recognised for their contribution of different methods for evaluating credit risk and critically analysing the existing techniques (Altman, 1969; Altman, 2013; Kaplan and Urwitz, 1979; Ederington, 1985). A few authors have also worked on the determination of credit rating using different models like multivariate and structural models (Pinches and Mingo, 1973; Horrigan, 1966; Doumpos et al., 2015). Towards the right corner of the cluster emerges a group of authors who have studied the application of machine learning and artificial

intelligence techniques to predict corporate debt ratings (Huang et al., 2004; Breiman, 2001; Baesens et al., 2003; Hajek and Michalak, 2013).

The importance of CG factors for credit rating determination is justified theoretically and empirically by the studies highlighted in the green cluster. Towards the inner corner of the cluster, the articles Ashbaugh-Skaife et al. (2006) and Bhojraj and Sengupta (2003) have the highest number of co-citations. These articles constitute the seminal work examining CG and credit rating relationship. Some authors' work in this cluster relates to the importance of CG for a firm's performance (Jensen and Meckling, 1976; Jensen, 1986), cost of debt (Mansi et al., 2004; El Ghoual et al., 2011; Sengupta, 1998; Klock et al., 2005), equity prices (Gompers et al., 2003) and market valuation (Yermack, 1996), illuminating the theoretical background. The other authors have empirically tested the effects of CG or CSR on corporate credit ratings (Mansi et al., 2004; Attig et al., 2013, Jiraporn et al., 2014). Three themes that provide intellectual evolution of this literature base are the role of financial ratios in the probability of default estimation, corporate governance measures and credit ratings and different techniques used for credit rating measurement.

Figure 7 Author co-citation network (using VOSviewer software) based on 59 authors with a minimum of 15 citations (see online version for colours)



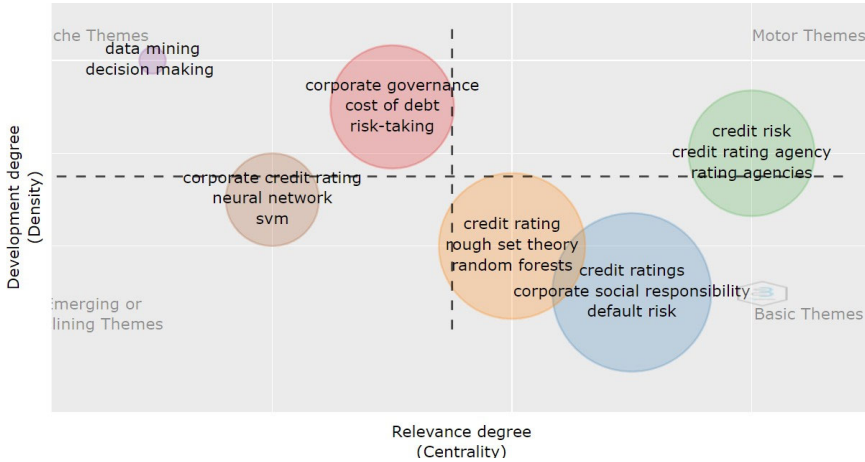
3.3.3 Conceptual structure

3.3.3.1 Thematic analysis

The thematic map (Figure 8) provides different themes of a research domain based on the clustering of the keywords. It is a two-dimensional plot with density (development of a theme) measured on the vertical axis and centrality (relevance of a theme) measured on the horizontal axis with themes placed in four different quadrants. Each theme is shown with a bubble where the bubble name is the word with the highest frequency of occurrence. The upper right corner has themes named 'credit risk, credit rating agencies' indicating 'motor themes', the most widely discussed topics. The lower right quadrant has two different themes 'credit rating and corporate social responsibility' and 'credit rating and rough set theory, random forests'. These indicate basic themes meaning, themes which are important but are not well developed. These themes provide room for

further research. The lower left quadrant indicates emerging or declining themes. ‘Credit rating and neural network, SVM’ indicates an emerging theme. The upper right quadrant indicates ‘niche themes’ that are well-developed isolated themes. ‘Corporate governance, cost of debt, and data mining’ are some of the niche themes. Corporate governance and cost of debt are well developed but still are not proven to be relevant for credit rating determination and are expected to move in other quadrants highlighting the need for research on these topics concerning corporate credit ratings.

Figure 8 Thematic map (see online version for colours)



3.3.3.2 Co-occurrence analysis

The keyword co-occurrence analysis identifies the most frequently studied topic of the literature (Comerio and Strozzi, 2019). Figure 9 demonstrates the overlay visualisation of the keyword co-occurrence network from 2010 to 2020, developed using 30 keywords from a total of 391 keywords, shortlisted based on at least 3 co-occurrences of a keyword. The emerging topics (highlighted in yellow colour) in the literature are shown by keywords ‘CSR’ (17), ‘environmental, social and governance (ESG)’ (7), ‘machine learning’ (5) and ‘corporate financial performance’ (5). The other topics, popular in the last few years (in bright green colour) are ‘ordinal logistic regression’ (5), ‘support vector machine’ (5) and ‘managerial ability’ (3). The CG and its variables namely the board of directors and disclosure, are used as a determinant of credit rating from 2015 to 2017, however, new dimensions of CG are now being emphasised in the recent studies. The financial ratios are frequently used as a predictor of corporate credit rating but as control variables. The most frequently used methodologies over time are ordered probit model and panel data regression (from 2012–2014) followed by ordinal logistic regression and the most recent being machine learning techniques. Hence, the keyword analysis indicates the changing landscape of determinants of corporate credit rating from financial indicators, to various non-financial information like CG measures (board of directors and disclosures) to the most recent being CSR, ESG, sustainability, and other CG measures like managerial ability.

Figure 9 Temporal overlay of a keyword co-occurrence map using VOSviewer software (see online version for colours)

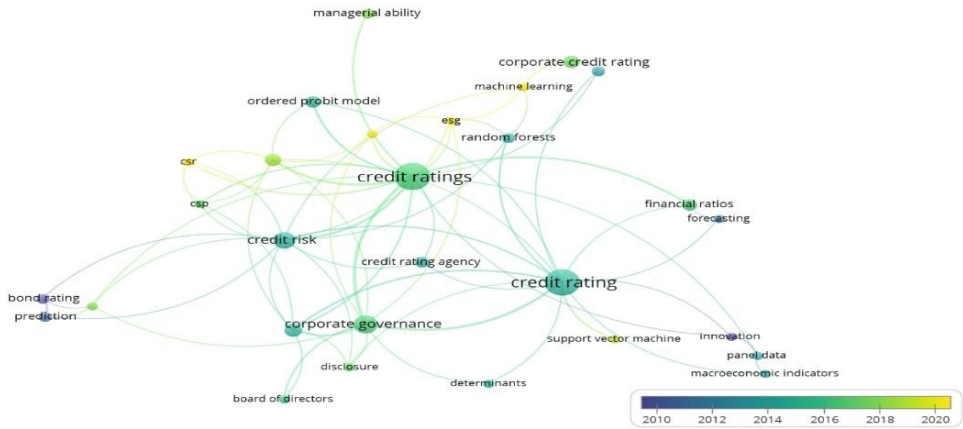
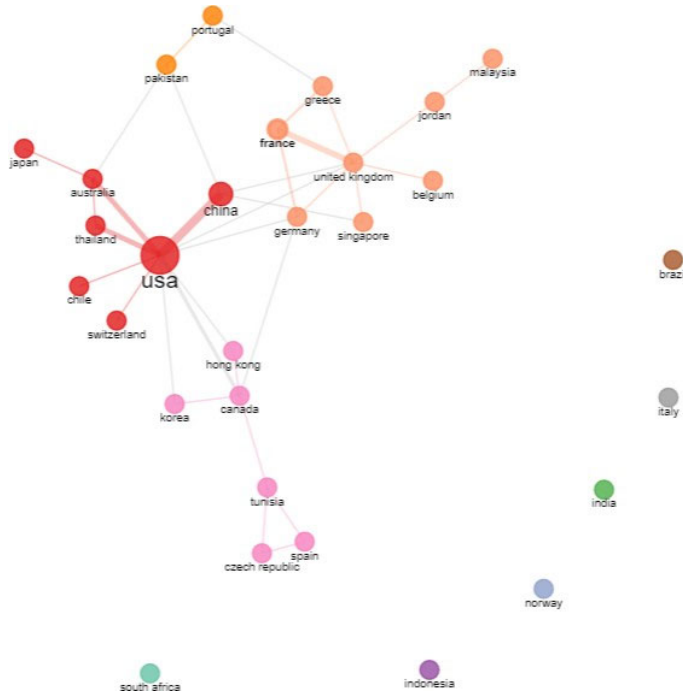


Figure 10 Social structure- geographical collaboration network (see online version for colours)



3.3.4 Social structure

Social structure delineates the interrelationship between various elements of the research domain like authors, countries, institutions and sources. The network highlights the patterns of collaboration wherein the bubbles represent the element (authors/countries/institutions/sources) and nodes represent the association. Figure 10

shows the geographical collaboration network of studies on determinants of corporate credit rating. The most prominent cluster is the red cluster, dominated by the USA having the maximum number of collaborations. Academicians from the USA have collaborations with that from China (5), Australia (3), Thailand (3) and Canada (2). Another prominent collaboration is between the United Kingdom (UK) and France (3). The rest of the countries in clusters have one collaboration each with other countries. Towards the right side are the countries having no collaboration with other countries and constitute emerging economies like Brazil, India, and South Africa.

4 Future research agenda

This section provides the research gaps identified that can be fulfilled by future research:

- 1 We pointed out the dearth of credit rating drivers' studies for emerging economies where it is imperative due to existing information asymmetries. Empirical evidence related to various emerging factors is needed in the context of developing countries.
- 2 The emerging factors identified in the review, like corporate social responsibility, ESG, sustainability, and CG factors like managerial ability, disclosures, can be used to predict corporate credit.
- 3 The study is limited to bibliometric analysis based on a few selected keywords. It is recommended to extend bibliometric analysis using more keywords, a larger period of study and advanced techniques and software.
- 4 To get a better understanding of the factors used in determining corporate credit rating, a systematic review of the literature and meta-analysis could be done by future researchers.
- 5 This field demands interdisciplinary research through more intellectual and social collaboration, especially among scholars from emerging economies.

5 Conclusions

This article presents progress, direction and future trends of the literature on determinants of corporate credit ratings from 2001–2021. It further outlines the conceptual, intellectual and social structure of this research domain. Corporate credit ratings are a prominent element of the credit risk management industry having widespread usage. This area of research gained attention among academic researchers post 2008 US financial crisis wherein CRAs have been criticised for their work and authenticity. Prior researchers have empirically tested various factors to understand their association with corporate credit ratings. With an aim to perform a review of the literature on factors influencing corporate credit ratings, the paper provides valuable insights into this research domain. The bibliometric analysis was performed on 135 articles using the Biblioshiny package from R Studio and VOSviewer. The results reveal that publications on corporate credit rating have accelerated post the financial crisis of 2008 with a dominant position of developed nations. The USA has the maximum contribution in terms of publications and also collaboration with other countries, followed by China representing the emerging world

and the UK. Collaboration among countries is in a nascent stage in this field of research, however, the social structure is expanding with increasing participation from other emerging nations. Further, citation analysis reveals that journals from the finance and accounting discipline, authors Pornsit Jiraporn and Hsinchun Chen and articles related to CG constitute prominent aspects of the literature. The co-citation analysis presented using the VOS-viewer network map exhibits the inter-disciplinary nature of the literature base and chalked out three themes, namely, corporate credit rating and the theoretical foundation, methodological development and the importance of CG measures. The emerging research topics identified through keyword analysis are CSR, ESG, machine learning and managerial ability, signifying room for deeper exploration of these terms for the determination of corporate credit ratings.

The study has outlined a roadmap for academicians and provides future research opportunities by understanding the publications' trends and patterns. Insights about the changing factors impacting corporate credit rating would help the investors (retail and institutional investors) to carry out an independent evaluation of a firm's credit risk and optimise their investing avenues. It would also help the managers of the firm to focus on emerging elements in this field to attract better credit ratings and resultant lower cost of debt. Regulators and policymakers would be able to devise policy interventions around the key elements of this industry highlighted in the study. Finally, the practitioners (financial planners, investment advisors, and financial professionals) would be able to make decisions keeping in mind the important issues involved in the credit risk evaluation of a firm.

References

- Altman, E. (1969) 'Corporate bankruptcy potential, stockholder returns and share valuation', *Journal of Finance*, Vol. 24, No. 5, pp.887–900.
- Altman, E.I. (2013) 'Predicting financial distress of companies: revisiting the Z-Score and ZETA® models', in Bell, A.R., Brooks, C. and Prokopczuk, M. (Eds.): *Handbook of Research Methods and Applications in Empirical Finance*, pp.428–456, Edward Elgar Publishing.
- Aman, H. and Nguyen, P. (2013) 'Does good governance matter to debtholders? Evidence from the credit ratings of Japanese firms', *Research in International Business and Finance*, Vol. 29, pp.14–34.
- Ammer, J. and Packer, F. (2000) 'How consistent are credit ratings? A geographic and sectoral analysis of default risk', *The Journal of Fixed Income*, Vol. 10, No. 3, pp.24–30.
- Ashbaugh-Skaife, H., Collins, D.W. and LaFond, R. (2006) 'The effects of corporate governance on firms' credit ratings', *Journal of Accounting and Economics*, Vol. 42, Nos. 1–2, pp.203–243.
- Attig, N., El Ghouli, S., Guedhami, O. and Suh, J. (2013) 'Corporate social responsibility and credit ratings', *Journal of Business Ethics*, Vol. 117, No. 4, pp.679–694.
- Baesens, B., Setiono, R., Mues, C. and Vanthienen, J. (2003) 'Using neural network rule extraction and decision tables for credit-risk evaluation', *Management Science*, Vol. 49, No. 3, pp.312–329.
- Bahoo, S. (2020) 'Corruption in banks: a bibliometric review and agenda', *Finance Research Letters*, Vol. 35, p.101499.
- Beaver, W.H. (1966) 'Financial ratios as predictors of failure', *Journal of Accounting Research*, Vol. 4, pp.71–111.

- Bhojraj, S. and Sengupta, P. (2003) 'Effect of corporate governance on bond ratings and yields: The role of institutional investors and outside directors', *The Journal of Business*, Vol. 76, No. 3, pp.455–475.
- Blume, M.E., Lim, F. and MacKinlay, A.C. (1998) 'The declining credit quality of US corporate debt: myth or reality?', *The Journal of Finance*, Vol. 53, No. 4, pp.1389–1413.
- Bonsall IV, S.B., Holzman, E.R. and Miller, B.P. (2017) 'Managerial ability and credit risk assessment', *Management Science*, Vol. 63, No. 5, pp.1425–1449.
- Bonsall, S.B. and Miller, B.P. (2017) 'The impact of narrative disclosure readability on bond ratings and the cost of debt', *Review of Accounting Studies*, Vol. 22, No. 2, pp.608–643.
- Breiman, L. (2001) 'Random forests', *Machine Learning*, Vol. 45, No. 1, pp.5–32.
- Cantor, R. and Mann, C. (2003) 'Measuring the performance of corporate bond ratings', *Moody's. Special Comment* [online] <https://www.moody.com/sites/products/DefaultResearch/2001900000426576.pdf>.
- Cantor, R. and Packer, F. (1994) 'The credit rating industry', *Quarterly Review*, Summer, Vol. 19, pp.1–26.
- Cantor, R. and Packer, F. (1997) 'Differences of opinion and selection bias in the credit rating industry', *Journal of Banking & Finance*, Vol. 21, No. 10, pp.1395–1417.
- Comerio, N. and Strozzi, F. (2019) 'Tourism and its economic impact: a literature review using bibliometric tools', *Tourism Economics*, Vol. 25, No. 1, pp.109–131.
- Cornaggia, K.J., Krishnan, G.V. and Wang, C. (2017) 'Managerial ability and credit ratings', *Contemporary Accounting Research*, Vol. 34, No. 4, pp.2094–2122.
- Denyer, D. and Tranfield, D. (2009) 'Producing a systematic review', in Buchanan, D.A. and Bryman, A. (Eds.): *The Sage handbook of organizational research methods*, pp.671–689, Sage Publications Ltd.
- Doumpos, M., Niklis, D., Zopounidis, C. and Andriosopoulos, K. (2015) 'Combining accounting data and a structural model for predicting credit ratings: empirical evidence from European listed firms', *Journal of Banking & Finance*, Vol. 50, pp.599–607.
- Ederington, L.H. (1985) 'Classification models and bond ratings', *Financial Review*, Vol. 20, No. 4, pp.237–262.
- El Ghouli, S., Guedhami, O., Kwok, C.C. and Mishra, D.R. (2011) 'Does corporate social responsibility affect the cost of capital?', *Journal of Banking & Finance*, Vol. 35, No. 9, pp.2388–2406.
- Francis, J., LaFond, R., Olsson, P. and Schipper, K. (2005) 'The market pricing of accruals quality', *Journal of Accounting and Economics*, Vol. 39, No. 2, pp.295–327.
- Frost, C.A. (2007) 'Credit rating agencies in capital markets: a review of research evidence on selected criticisms of the agencies', *Journal of Accounting, Auditing & Finance*, Vol. 22, No. 3, pp.469–492.
- Gao, W. and Zhu, F. (2015) 'Information asymmetry and capital structure around the world', *Pacific-Basin Finance Journal*, Vol. 32, pp.131–159.
- Gompers, P., Ishii, J. and Metrick, A. (2003) 'Corporate governance and equity prices', *The Quarterly Journal of Economics*, Vol. 118, No. 1, pp.107–156.
- Goyal, K. and Kumar, S. (2021) 'Financial literacy: a systematic review and bibliometric analysis', *International Journal of Consumer Studies*, Vol. 45, No. 1, pp.80–105.
- Grunert, J., Norden, L. and Weber, M. (2005) 'The role of non-financial factors in internal credit ratings', *Journal of Banking & Finance*, Vol. 29, No. 2, pp.509–531.
- Hajek, P. and Michalak, K. (2013) 'Feature selection in corporate credit rating prediction', *Knowledge-Based Systems*, Vol. 51, pp.72–84.
- Horrigan, J.O. (1966) 'The determination of long-term credit standing with financial ratios', *Journal of Accounting Research*, Vol. 4, pp.44–62.

- Huang, Z., Chen, H., Hsu, C.J., Chen, W.H. and Wu, S. (2004) 'Credit rating analysis with support vector machines and neural networks: a market comparative study', *Decision Support Systems*, Vol. 37, No. 4, pp.543–558.
- Hubler, J., Louargant, C., Laroche, P. and Ory, J.N. (2019) 'How do rating agencies' decisions impact stock markets? A meta-analysis', *Journal of Economic Surveys*, Vol. 33, No. 4, pp.1173–1198.
- Ingale, K.K. and Paluri, R.A. (2020) 'Financial literacy and financial behaviour: a bibliometric analysis', *Review of Behavioral Finance*, Vol. 14, No. 1, pp.130–154.
- Jensen, M.C. (1986) 'Agency costs of free cash flow, corporate finance, and takeovers', *The American Economic Review*, Vol. 76, No. 2, pp.323–329.
- Jensen, M.C. and Meckling, W.H. (1976) 'Theory of the firm: managerial behavior, agency costs and ownership structure', *Journal of Financial Economics*, Vol. 3, No. 4, pp.305–360.
- Jiraporn, P., Jiraporn, N., Boeprasert, A. and Chang, K. (2014) 'Does corporate social responsibility (CSR) improve credit ratings? Evidence from geographic identification', *Financial Management*, Vol. 43, No. 3, pp.505–531.
- Kaplan, R.S. and Urwitz, G. (1979) 'Statistical models of bond ratings: a methodological inquiry', *The Journal of Business*, Vol. 52, No. 2, pp.231–261.
- Kim, K.J. and Ahn, H. (2012) 'A corporate credit rating model using multi-class support vector machines with an ordinal pairwise partitioning approach', *Computers & Operations Research*, Vol. 39, No. 8, pp.1800–1811.
- Klock, M.S., Mansi, S.A. and Maxwell, W.F. (2005) 'Does corporate governance matter to bondholders?', *Journal of Financial and Quantitative Analysis*, Vol. 40, No. 4, pp.693–719.
- Langohr, H., Langohr, P. (2010) *The Rating Agencies and Their Credit Ratings: What They Are, How They Work, and Why They are Relevant*, John Wiley & Sons.
- Lee, Y.C. (2007) 'Application of support vector machines to corporate credit rating prediction', *Expert Systems with Applications*, Vol. 33, No. 1, pp.67–74.
- Li, C., Wu, K. and Wu, J. (2017) 'A bibliometric analysis of research on haze during 2000–2016', *Environmental Science and Pollution Research*, Vol. 24, No. 32, pp.24733–24742. <https://doi.org/10.1007/s11356-017-0440-1>.
- Mansi, S.A., Maxwell, W.F. and Miller, D.P. (2004) 'Does auditor quality and tenure matter to investors? Evidence from the bond market', *Journal of Accounting Research*, Vol. 42, No. 4, pp.755–793.
- Matthies, A.B. (2013) *Empirical Research on Corporate Credit-Ratings: A Literature Review*, SFB 649 Discussion Paper, 2013-003, pp.1–26.
- Merton, R.C. (1974) 'On the pricing of corporate debt: the risk structure of interest rates', *The Journal of Finance*, Vol. 29, No. 2, pp.449–470.
- Moher, D., Liberati, A., Tetzla, J. and Altman, D.G. (2010) 'Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement', *International Journal of Surgery*, Vol. 8, No. 5, pp.336–341.
- Mongeon, P. and Paul-Hus, A. (2016) 'The journal coverage of Web of Science and Scopus: a comparative analysis', *Scientometrics*, Vol. 106, No. 1, pp.213–228.
- Ohlson, J.A. (1980) 'Financial ratios and the probabilistic prediction of bankruptcy', *Journal of Accounting Research*, Vol. 18, No. 1, pp.109–131.
- Oikonomou, I., Brooks, C. and Pavelin, S. (2014) 'The effects of corporate social performance on the cost of corporate debt and credit ratings', *Financial Review*, Vol. 49, No. 1, pp.49–75.
- Osareh, F. (1996) 'Bibliometrics, citation analysis and co-citation analysis: a review of literature II', *LIBRI*, Vol. 46, No. 4, pp.217–225.
- Pagano, M. and Volpin, P. (2010) 'Credit ratings failures and policy options', *Econ. Policy*, Vol. 25, No. 62, pp.401–431.
- Pinches, G.E. and Mingo, K.A. (1973) 'A multivariate analysis of industrial bond ratings', *The Journal of Finance*, Vol. 28, No. 1, pp.1–18.

- Sengupta, P. (1998) 'Corporate disclosure quality and the cost of debt', *The Accounting Review*, Vol. 73, No. 4, pp.459–474.
- Shumway, T. (2001) 'Forecasting bankruptcy more accurately: a simple hazard model', *The Journal of Business*, Vol. 74, No. 1, pp.101–124.
- Small, H. (1973) 'Co-citation in the scientific literature: a new measure of the relationship between two documents', *Journal of the American Society for Information Science*, Vol. 24, No. 4, pp.265–269, <https://doi.org/10.1002/asi.4630240406>.
- Ubarhande, P. and Chandani, A. (2021) 'Elements of credit rating: a hybrid review and future research agenda', *Cogent Business & Management*, Vol. 8, No. 1, p.1878977.
- Vieira, E. and Gomes, J. (2009) 'A comparison of Scopus and Web of Science for a typical university', *Scientometrics*, Vol. 81, No. 2, pp.587–600.
- White, L.J. (2002) 'The credit rating industry: an industrial organization analysis', *Ratings, Rating Agencies and the Global Financial System*, pp.41–63, Springer, Boston, MA.
- White, L.J. (2009) 'The credit-rating agencies and the subprime debacle', *Critical Review*, Vol. 21, Nos. 2–3, pp.389–399.
- White, L.J. (2013) 'Credit rating agencies: an overview', *Annu. Rev. Financ. Econ.*, Vol. 5, No. 1, pp.93–122.
- Yermack, D. (1996) 'Higher market valuation of companies with a small board of directors', *Journal of Financial Economics*, Vol. 40, No. 2, pp.185–211.
- Zhong, H., Miao, C., Shen, Z. and Feng, Y. (2014) 'Comparing the learning effectiveness of BP, ELM, I-ELM, and SVM for corporate credit ratings', *Neurocomputing*, Vol. 128, pp.285–295.