



## Research article

## Mapping knowledge domains on managerial overconfidence

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## ABSTRACT

Managerial overconfidence issues have attracted extant research interest given its influence on corporate strategy and operating performance with the growing development of modern behavioural economics. In this paper, bibliometric tools of VOSviewer and CiteSpace are used to reflect the research trend, hot spots and evolving route of managerial overconfidence theme. The publishing and citation numbers of managerial overconfidence paper are experiencing an overall increasing trend from 1992 to 2021. We sum up the top source journal, institutions, countries and the top 10 highly cited papers, and 272 keywords are distributed in the occurrence graph related to the theme of managerial overconfidence. Twelve keyword clusters from individual, organisational and social levels are identified. The research span is divided into four periods: preliminary, exploratory, growth and outbreak periods, and important research hot spots are summed up with highly cited keywords. The extant literature measurement and variables of managerial overconfidence are summarised in four types, and the integrated research frame of managerial overconfidence is proposed. Future research expansion of managerial overconfidence can be carried out from five aspects of harmony classification, improved measurement, multi-variate test, positive paradigm and cultural distinction.

## 1. Introduction

Hubris is used to describe the overconfidence of managers which came from a Greece myth (Graves, 1985). Although stories may have different editions, the uniform ultimate results are that hubris will cause punishment and curse; it is a source of failure and tragedy (Bollaert and Petit, 2010). In 1960s, overconfidence was put forward in applied psychology (Skala, 2008). As a cognitive bias or deviation, overconfidence implies the trend of individual inclination to be overestimate (Langer, 1975; Malmendier&Tater, 2008). The definition of managerial overconfidence can be divided into three categories: illusion of control, miscalibration and the better than average effect (Moore&Healy, 2008). The first category of overconfidence means the overestimation of one's own capability, level of control and chance of success. 'Over' implies that the practical results are poorer than the realistic outcome, and 'estimate' is up to one's own anticipation, not the true prospect. When people overestimate their ability to control, they will obtain the illusion of control (Presson&Benassi, 1996). The second category of overconfidence describes that the decision makers often have a larger probability interval covering the realistic calibration; they believe in themselves excessively beyond the accuracy of extant information (Ben-David, 2007). The third

category was pointed out by Svenson (1981) in which people prefer to remember their success and tend to forget their failure; they are more than the average crowd compared with other realistic appraisals (Taylor & Brown, 1988; Larrick, 2007).

Corporate managers tend to be more confident than other team members. Upper echelons theory holds that corporate behaviour and its performance is a psychological reflection of top managers characteristics (Hambrick& Mason, 1984). Thus, analysing the relationship between variables of overconfidence and financial performance must be explored (Reger&Huff, 1993; Salehi et al., 2021). This analysis will help us obtain a clear picture of the psychological foundation of corporate strategic theory whilst providing us with understanding of some explanations about corporate bounded rational choice and irrational investment behaviours. Research of managerial overconfidence has been lasting since 1960s. However the concept of overconfidence remains within a multi-dimension with different definitions and measurable variables design. However, present literature focuses on a single theme. Therefore, overconfidence, including the measurement methods, related inner factors and mechanism of CEO's overconfidence imposing on corporate specific behaviour, must be thoroughly summarised. Roughly 20 reviews exist about managerial overconfidence from a normative way

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(Sadler-Smith, 2017; Cragun, 2020; Heavey et al., 2022). However, no bibliometric paper exists that outlines the related literature of CEO's overconfidence. There is now no clear understanding about the present research situation and future trend of managerial overconfidence. Bibliometric tools can provide a clear knowledge map of a specific theme. This study uses bibliometric tools to filter the literature for overconfidence. This study uses VOSviewer and CiteSpace as bibliometric tools to examine the present research status and hot papers, the cooperation network of authors and main institution and the cluster attribute of overconfidence (van Eck and Waltman, 2010). This study attempts to solve three important questions as follows. Firstly, we demonstrate CEO's overconfidence literature research status on the basis of the publishing and citing trend with four stages. Secondly, we use knowledge mapping systems to show core journals, highly cited papers and categories of different fields of CEO's overconfidence. Thirdly, cluster and highly occurrence keywords analysis will explain the implications of each cluster and clarify the CEO's overconfidence evolving path.

## 2. Materials and methods

### 2.1. Data collection and search strategy

To secure the quality of the knowledge mapping, reliable sources must be retrieved. The Web of Science (WoS) database has over 12,000 leading journals with abundant literature allowing researchers to obtain highly qualified literature from year 1900–2021. Three important citation indexes exist in the WoS Core Collection: Science Citation Index Expanded (SCI-EXPANDED), Social Science Citation Index (SSCI), Arts&Humanities Citations Index (A&HCI), covering economic, managerial, psychological, strategic and other interdisciplinary fields. In this paper, the target literature in WOS core collection was collected on December 31, 2021. With different citation strategy comparisons, the search strategy was set as follows: *TOPIC: (CEO overconfidence) OR TOPIC:(managerial overconfidence OR TOPIC: (Executive overconfidence)*. The indexes include SCI-EXPANDED, SSCI and A&HCI. More than 10 refined categories were obtained: economics, business finance, management, business, operations research management science, psychology multidisciplinary, psychology social, psychology applied, psychology experimental and multidisciplinary sciences, with document types of 670 articles, 20 reviews, 9 proceeding papers, 43 early access, 4 book chapters and so on. To carry out bibliometric analysis, two types of 'article' and 'review' were obtained with a total of 690 (Li, 2020; Xia and Zhong, 2021). Through a thorough theme check, 15 weak relationship strength papers, mainly about the investor overconfidence, were eliminated. The final number of the is 675.

### 2.2. Methods

Visualisation of mapping knowledge domains (MKD) technology dates to 2003. An international seminar was organised by the National Academy of Sciences of the United States, including the sessions on data format and access, data analysis algorithms, visualisation and interaction design and promising applications. Later, a special issue on MKD was published in the Proceedings of the National Academy of Science of the United States of America (PNAS) on April 6, 2004. Literature on MKD has been growing rapidly, and MKD research has combined applied mathematics and information science with computer science, which turns to be a new direction of scientometrics. Several MKD tools have been developed, such as CiteSpace by Professor Chen Chaomei and VOSviewer by Nees Jan van Eck and Ludo Waltman. MKD tools can help us solve five 'Ws' (the first letter of When, Where, Who, What, Why) and one 'H' (the first letter of How) problems. 'When' describes the time of a specific theme, including the growth and trend of the related literature. 'Where' reveals the geographic distribution of institutions and regions to obtain the international scientific research cooperation. 'Who' masters the statistical distribution of important highly cited authors with the

scientometric parameters. 'What' is to exhibit the research front evolution and inner structure of different clusters. 'Why' introduces the mechanism and reason of future direction of a theme. 'How' provides some instructions for the managerial reality and for future research prediction.

Five steps are carried out to analyse the mapping knowledge domains of CEO's overconfidence with the VOSviewer tool as follows (see the illustration in Figure 1). (1) Data select. The theme of CEO's overconfidence was set in the WoS database. Then, the text analysis unit was obtained for the visualisation processing. A total of 675 literature was obtained from year 1992–2021. (2) Co-citation analysis. According to the cited value and co-citation network, the top literature of CEO's overconfidence was combed. (3) Citation analysis. The cited sources and worldwide institutions of CEO's overconfidence were obtained to show the geographic distribution and international research cooperation. (4) Cluster view. On the basis of probabilistic latent semantic analysis, different clusters of CEO's overconfidence were obtained. (5) Keyword occurrence analysis. The knowledge front moving of CEO's overconfidence was acquired through yearly keywords analysis.

In VOSviewer, the basic colour view of a theme depends on the ordinary density rule. The colour of a point in the map is determined based on the item density of the point. Let  $\bar{d}$  denote the average distance between two items, that is Eq. (1),

$$\bar{d} = \frac{2}{n(n-1)} \sum_{i < j} \|x_i - x_j\|. \quad (1)$$

The item density  $D(x)$  of a point  $x = (x_1, x_2)$  is then defined as Eq. (2)

$$D(x) = \sum_{i=1}^n w_i K\left(\frac{\|x - x_i\|}{h\bar{d}}\right) \quad (2)$$

where  $K: [0, \infty) \rightarrow [0, \infty)$  denotes a kernel function;  $h > 0$  denotes a parameter called the kernel width; and  $w_i$  denotes the weight of item  $i$ , that is, the total number of occurrences or co-occurrences of item  $i$ . The kernel function  $K$  must be non-increasing. VOSviewer uses a Gaussian kernel function given by Eq. (3)

$$K(t) = \exp(-t^2) \quad (3)$$

It follows from (2) that the item density of a point in a map depends on the number of neighbouring items and on the weights of these items. The larger the number of neighbouring items and the smaller the distances between these items and the point of interest is, the higher the item density will be. In addition, the higher the weights of the neighbouring items is, the higher the item density will be.

## 3. Results

### 3.1. Publication and citation situation of CEO's overconfidence

A total of 675 published papers on CEO's overconfidence were obtained from 1992 to 2021 in the WoS core collection. Figure 2 shows the number of publication and citation records of CEO's confidence papers in the past three decades. An ascending trend can be seen from the two curves over the 30 years. Especially in the latest five years, the total number of papers is 406, accounting for 60.14% with a total number of 675; the number of citations in the latest five years is 17,110, accounting for 74.76% of the total citation count of 22887. Thus, CEO's overconfidence has attracted increasing worldwide research interest these years. The research stages are divided into four parts with a similar numerical standard referring to some published papers (Chen, 2019). In the preliminary period (1992–2004) as we defined, nine papers were published in the 13 years. The maximum citation count was up to 50 in the year 2003. However, no paper was published in seven years. Years from 2005 and 2011 is defined as the exploratory period, with the average value of papers of nearly 5 papers per year, the citation number increased

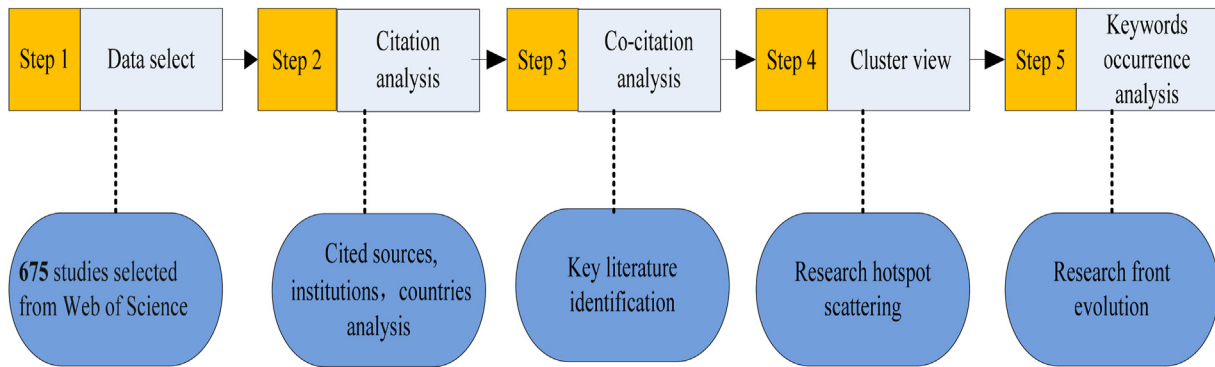


Figure 1. Steps of mapping knowledge domains analysis.

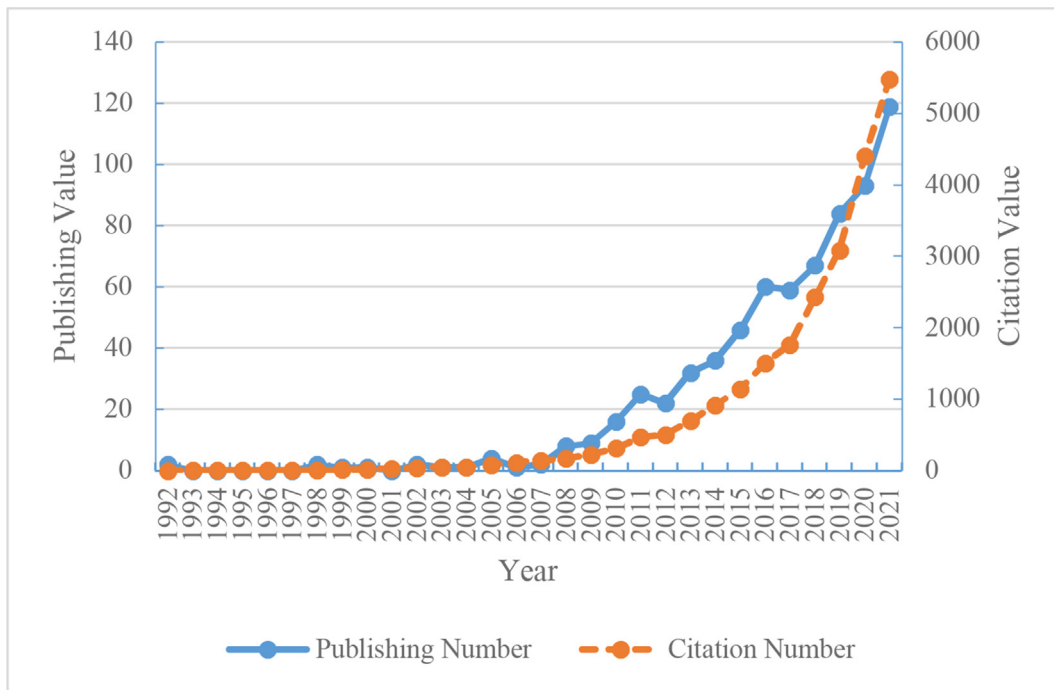


Figure 2. Number of published and citation record of CEO's confidence literature.

from 80 in 2005 to 311 in 2011 with a steady increase. The third stage is the growth period from 2012 to 2016, with the average published paper exceeding 20 per year with a fast-growing yearly trend; the citation number exceed 300 per year with the maximum value of 1505 in 2016. The fourth stage is called the outbreak period from 2017 to 2021. The average number of published papers is more than 80 per year; the citation average exceeds 4,000 per year. Figure 2 shows that in the past five years (2016–2021), the number of papers increased by 76.66%. In the past 10 years (2012–2021), the number of papers of CEO's overconfidence theme increased by 440.91%, indicating that the research topic of CEO's overconfidence is undergoing a fast-growing trend.

With the type of citation function in VOSviewer system, we set the unit of analysis of sources. There are 231 journals publishing the theme of CEO's overconfidence, the minimum number of documents of a source threshold value is set 9, there are 20 journals meeting the condition. For each of the 20 sources, the total strength of citation links with other sources will be calculated. The sources with the greatest total strength will be selected. A detailed analysis of top 20 journal with related literature published was exhibited in Figure 3. The Journal of Corporate Finance has the most documents of 51, the Journal of Finance has the most citations of 5018 and the maximum value of total link strength of

576. According to Figure 3, the literature on managerial overconfidence appeared in *European Financial Management*, *European Journal of Finance* and *Managerial & Decision Economics* earlier, and the recent journals on this subject include *Journal of Financial Economics*, *Journal of Finance* and so on. With the unit of country analysis, we set 23 as the minimum number of documents of a country, of the 52 countries (regions), there are 10 countries meeting the thresholds: USA (329), PRC (129), England (82), Singapore (23), Australia (53), Canada (36), Germany (49), Taiwan (35), South Korea (35) and France (34). The top four organisations are University of California Berkeley (13), The University of Texas at Dallas (13), Cornell University (12) and University of Illinois (12) in the USA.

### 3.2. Highly cited literature of CEO overconfidence

With the results searching in the WoS database, the top 10 highly cited paper in CEO's overconfidence field are listed in Table 1, scattering from 2005 to 2016. There are four papers published in the *JOURNAL OF FINANCE* and three in the *JOURNAL OF FINANCIAL ECONOMICS*, one in *JOURNAL OF CORPORATE FINANCE*, *STRATEGIC MANAGEMENT JOURNAL* and *JOURNAL OF ACCOUNTING & ECONOMICS*. The maximum citation count is 1300 with the average citation per year is

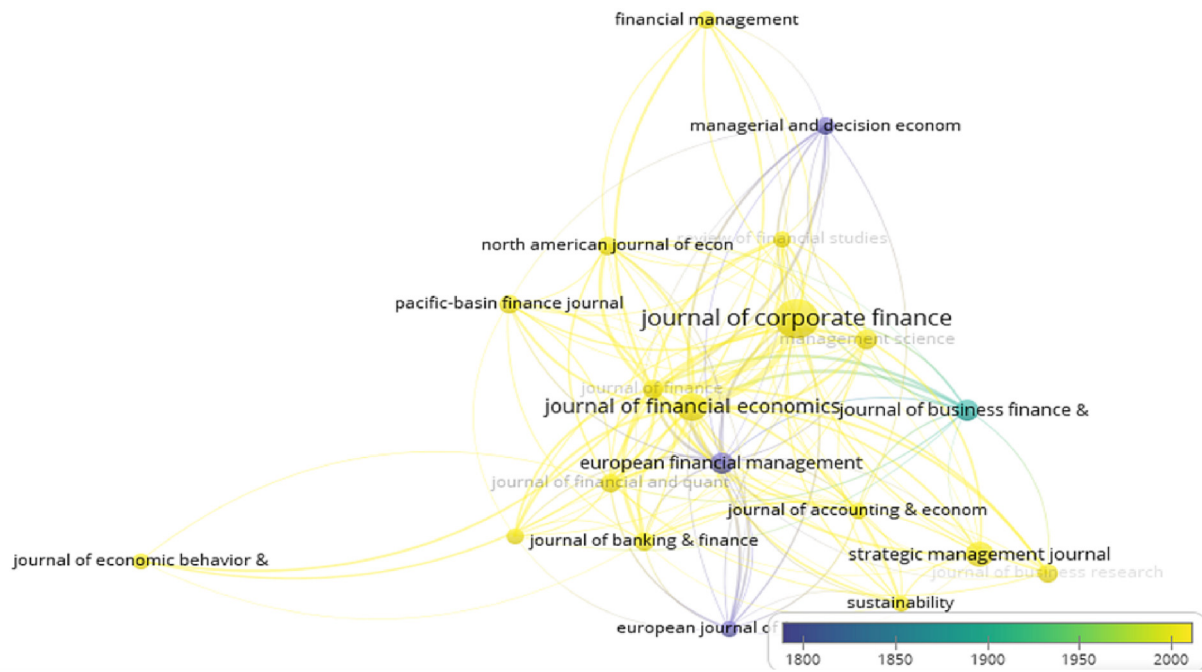


Figure 3. Top 20 journals with overconfidence literature published.

Table 1. Top 10 highly cited paper.

Author	Paper Title	Journal title	Citation counts	Average citation per year	Publication Year
1 Malmendier, U; Tate, G	CEO overconfidence and corporate investment	JOURNAL OF FINANCE	1300	81.25	2005
2 Malmendier,U; Tate, G	Who makes acquisitions? CEO overconfidence and the market's reaction	JOURNAL OF FINANCIAL ECONOMICS	969	69.21	2008
3 Hirshleifer, D; Low, Angie; Teoh, Siew Hong	Are Overconfident CEOs Better Innovators?	JOURNAL OF FINANCE	535	53.50	2012
4 Malmendier, Ulrike; Tate, Geoffrey; Yan, Jon	Overconfidence and Early-Life Experiences: The Effect of Managerial Traits on Corporate Financial Policies	JOURNAL OF FINANCE	463	42.09	2011
5 Huang, Jiekun; Kisgen, Darren J.	Gender and corporate finance: Are male executives overconfident relative to female executives?	JOURNAL OF FINANCIAL ECONOMICS	379	42.11	2013
6 Faccio, Mara; Marchica, Maria-Teresa; Mura, Roberto	CEO gender, corporate risk-taking, and the efficiency of capital allocation	JOURNAL OF CORPORATE FINANCE	375	62.50	2016
7 Graham, John R.; Harvey, Campbell R.; Puri, Manju	Managerial attitudes and corporate actions	JOURNAL OF FINANCIAL ECONOMICS	340	37.78	2013
8 Hiller, NJ; Hambrick, DC	Conceptualising executive hubris: The role of (hyper-) core self-evaluations in strategic decision-making	STRATEGIC MANAGEMENT JOURNAL	323	19.00	2005
9 Schrand, Catherine M.; Zechman, Sarah L. C.	Executive overconfidence and the slippery slope to financial misreporting	JOURNAL OF ACCOUNTING & ECONOMICS	300	30.00	2012
10 Goel, Anand M.; Thakor, Anjan V.	Overconfidence, CEO Selection, and Corporate Governance	JOURNAL OF FINANCE	297	21.21	2008

81.25 and the minimum citation count is 297 with the average citation per year is 21.21 of the 10 papers.

From the perspective of the research paradigm of managerial overconfidence, there exist one normative and nine empirical papers of the top 10 highly cited paper. To solve the lack of theory to explain how managerial self-concept affects their behaviours, core self-evaluation (CSE), which includes four dimensions of personality was put forward, and some prepositions between CSE and corporate strategic choices are given (Hiller and Hambrick, 2005). As for the research theme, the nine empirical top cited papers can be divided into three categories: the first category is to discuss the specific factors, such as early experiences, which may influence managerial overconfidence. This paper gives an example of a CEO's personal trait which will potentially get their financial choice confined. They claim that CEOs who have lived through the

Great Depression will be likely to be averse to more liability and military experience and will endow CEOs more aggressive financing leverage inclination (Malmendier et al., 2011). The second category focuses on the behaviours or consequences of managerial overconfidence which will cause: overconfident managers will overestimate their future expected return rate of investment project in corporate investment decision-making process (Malmendier and Tate, 2005; Goel and Thakor, 2008), many corporate mergers and acquisitions failed and corporate value will be destroyed because overconfident managers overpay their target companies (Malmendier and Tate, 2008). Contrastingly, CEO's overconfidence has some positive significance that in risky innovative investment, more patents and citations will be obtained, which will benefit shareholders (Hirshleifer et al., 2012). Overconfident CEOs may vary by country. USA CEOs exhibit more risk-tolerant and optimistic

behaviours than non-USA CEOs. CEO personality traits, such as time preference and risk-aversion, are related to their compensation contract (Graham et al., 2013). A detailed analysis of 43 firms with financial misreporting shows that roughly 75% of the sample was due to CEOs overconfidence reflecting an optimistic bias that is not necessarily intentional (Schrand, 2012). The third category focuses on the gender difference of managerial overconfidence. Female CEOs exhibit lower overconfidence in less volatile earnings, lower financial leverage, undertaking less acquisition and a higher chance of survival compared with male CEOs (Huang, 2013; Faccio et al., 2016).

### 3.3. High-frequency keywords analysis of CEO overconfidence

In VOSviewer system, there exist three types of keyword unit choice as to the co-occurrence analysis: all keywords, author keywords and keywords plus. We choose the first mode with the full counting method. Given that the VOSviewer software cannot judge plurals, capitalisation and synonyms, we must incorporate keywords manually to avoid simply according to the single item, such as 'firm', and 'firms' were merged as firm, 'INCENTIVE' 'incentive' were counted as incentive, 'performance' 'firm performance' were counted as performance. Table 2 presents three columns with variables: occurrence variable reflects the frequency of the keywords; year variable reflects the first time a keyword appears and total link strength variable reflects the situation of a certain keyword in the network. Given that the centrality value of the keywords is zero, it is omitted from the table. Of the 2,763 keywords, the minimum number of occurrences threshold is set as 5; 272 keywords meet the threshold. The top 20 keywords are shown in Table 2. The keyword CEO overconfidence ranks first with 356 occurrences and 2,257 total link strengths, the keyword ownership ranks 18th with 39 occurrences and 329 total link strengths and the keyword impact ranks 20th with 46 occurrences and 306 total link strengths.

All the 272 related keywords are presented in Figure 4 in the overlay visualisation form the process in the VOSviewer system. Each frame is a high-frequency keyword. The lines reflect the relationship between a keyword and its neighbour keyword. The bigger the frame, the greater centrality the keyword has. In terms of colour, the darker the frame is, the earlier the keyword appeared in the related literature. The yellow keywords are those that have come up in recent years. In Figure 4, keyword CEO overconfidence frame has the largest size, the keywords

**Table 2.** Top 20 keyword occurrences.

Rank	Keyword	Occurrence	Year	Total link strength
1	CEO overconfidence	356	2005	2257
2	performance	156	2000	1111
3	acquisition	117	2003	902
4	investment	115	2010	824
5	corporate governance	101	2007	747
6	risk	74	2010	566
7	risk-taking	69	2013	504
8	market	68	2003	497
9	compensation	60	2009	495
10	information	73	1998	493
11	determinants	65	2000	491
12	incentives	59	2008	474
13	optimism	57	2005	416
14	firm performance	54	2005	406
15	management	57	2007	404
16	upper echelons	53	2015	400
17	agency costs	46	2005	368
18	ownership	39	2003	329
19	returns	40	1998	308
20	impact	46	2008	306

antecedents, profitability, impact, cognition, cash flow and choice are quite dark, which means they came up in the research papers earlier, and the keywords turnover, patents and so on.

### 3.4. Cluster analysis of CEO overconfidence

To obtain the clusters of CEO overconfidence, CiteSpace tool is used. The node types 'keywords' is chosen, and the selection criteria are 'TOP 50', which means choosing the top 50 of the most cited or occurred items from each yearly slice; the network pruning mode is set as 'Pathfinder' and 'Pruning sliced networks'. In Figure 5, there are 465 nodes and 2,079 links of the merged network; the keyword label threshold value is set as 145; node labels threshold is set as 30. All the labels of 12 keyword clusters are extracted with Log Likelihood Ratio (LLR) algorithm. The modularity Q-value is 0.4561, and the weighted mean silhouette S-value is 0.7344. Generally, if modularity Q-value is larger than 0.3, the structure of the separated clusters is significant, if the silhouette S-value is larger than 0.5, the clusters are highly effective. Therefore, the result of the CEO overconfidence keyword clusters is convincing, and the quality of the knowledge mapping is satisfactory.

Table 3 presents the 12 clusters of CEO overconfidence, which are termed as follows: 'corporate governance' (C1), 'stock price crash risk' (C2), 'performance' (C3), 'policy' (C4), 'accuracy' (C5), 'strategic decision making' (C6), 'firm value' (C7), 'loss aversion' (C8), 'tone analysis' (C9), 'corporate social responsibility' (C10), 'decision making' (C11), 'strategic persistence' (C12). The first cluster (C1), labelled as corporate governance, has the most number with 67 keywords, the 12th cluster (C12), labelled as the strategic persistence, has the largest silhouette value 0.843, and the average year of the 12 clusters ranges from 2008 to 2016.

The C1 cluster focuses on the relationship and the mechanism of how corporate governance influences the managerial overconfident biases. Good internal corporate governance will promote the contracting efficiency and reduce the organisational agency cost if the board of directors can be effectively monitored (Chen, 2011). External governance refers to investor protection and institutional property, which will ease the contradictions between managers and shareholders during risky project investment processes (GS Isabel-María and Emma, 2018). Internal controls can regulate the relationship between CEO overconfidence and innovation in Chinese listed companies and the effect is quite different because of ownership heterogeneity (Li and Zhang, 2022).

The C2 cluster investigates how CEO's overconfidence will cause firm-level stock price crash. Overconfident CEOs will underestimate the failure probability of investment projects because they believe that the negative net present value will continue to operate, thus they will use their position's power to conceal or delay the bad news from spreading within the imperfect capital market until the day they must admit the accumulated poor consequences on their own at a certain critical time point, thus the failure of delivering bad news will induce the bombing of stock price crash (Benmelech et al., 2010; Kim et al., 2016). CEOs in the stock price crash companies fail to deliver bad news due to their career concerns and compensation contract article design (Al Mamun et al., 2020). Leng et al. (2021) manifested the bankruptcy risk caused by managerial overconfidence of a large data set of UK companies, there proves to be a higher risk of bankruptcy in innovative environments.

The C3 cluster describes financial innovative performance, which will be affected by CEO's overconfidence. Based on empirical tests of American firms, abnormal stock performance is positively related to the degree of CEO's overconfidence, meanwhile, firms with overconfident CEOs may have higher returns on net operating assets (Kim et al., 2019; Vitanova, 2021). Overconfidence are positively associated with firm performance and improve the level of performance. Agency costs did not have any significant effect on firm performance and management entrenchment leads to deterioration in firm performance (Salehi and Moghadam, 2019; Salehi et al., 2021). Taking the business cycle into consideration, a firm's financial performance in different expansion and recession periods is



Figure 4. Related keywords of managerial overconfidence between 1992 and 2021.

CiteSpace, v. 5.8.R3 (32-bit)  
 February 10, 2022 3:40:28 PM CST  
 WoS: C:\Users\win10\Desktop\20220101\citespace\data  
 Timespan: 1992-2021 (Slice Length=1)  
 Selection Criteria: g-index (k=25), LRF=3.0, L/N=10, LBY=5, e=1.0  
 Network: N=465, E=2079 (Density=0.0193)  
 Largest CC: 458 (98%)  
 Nodes Labeled: 1.0%  
 Pruning: Pathfinder  
 Modularity Q=0.4561  
 Weighted Mean Silhouette S=0.7344  
 Harmonic Mean(Q, S)=0.5627



Figure 5. Clusters view of managerial overconfidence.

influenced quite differently (Reyes, 2020). In addition to overconfidence as an independent or dependent variables test, some moderate effect tests exist, such as the impact of International Financial Reporting Standards (IFRS) adoption on CEO's overconfidence (Ak and Aj, 2017).

The C4 cluster reveals that CEO's overconfidence is related to corporate operating, investing and financing policies. Overconfident

CEOs will keep the dividend at a lower level to prepare for more developmental opportunities and pursue aggressive tax policies (Deshmukh et al., 2013; Kubick and Lockhart, 2017). CEO's overconfidence is beneficial for shareholders because it can help obtain innovative opportunities in risky projects (Hirshleifer, 2012). Personality traits of CEOs will make them prefer internal equity financing, Great Depression

**Table 3.** Twelve cluster parameters of managerial overconfidence.

cluster rank	cluster label	number	silhouette value	average year
1	corporate governance	67	0.690	2010
2	stock price crash risk	55	0.600	2016
3	performance	43	0.719	2011
4	policy	41	0.619	2013
5	accuracy	40	0.807	2008
6	strategic decision making	39	0.742	2010
7	firm value	38	0.777	2009
8	loss aversion	38	0.834	2010
9	tone analysis	30	0.824	2015
10	corporate social responsibility	26	0.793	2016
11	decision making	25	0.783	2008
12	strategic persistence	16	0.843	2010

experience makes them averse to debt and bank loaning, whereas CEOs with military experience seem to carry out higher leverage policies (Malmendier et al., 2011).

The C5 cluster presents the measurement principle and behaviour of CEO's overconfidence. Overconfidence may not be universal, thus individual difference and cross culture should be emphasised (Muthukrishna, 2018). As a typical cognitive bias, overconfidence reflects individuals in which the extent overestimates the accuracy of their forecasts with continuous new information inflow (Griffin, 1992). Corrective feedback behaviours can serve as a measurement level of CEO's overconfidence in which they would reluctantly absorb more information to adjust their initial judgement (Chen et al., 2015).

The C6 cluster reflects the role of managerial cognition in organisational strategic foresight. In an uncertain commercial environment, effective strategic management will enable a company to win a market advantage, and probably an satisfactory financial success. Examining the extent and organisational context of managerial cognitive biases will help alleviate the negative side of top management team and will help obtain the interplay between psychological cognition and outside condition (Li and Sullivan, 2020).

The C7 cluster examines the paradox mechanism that CEO's overconfidence will promote firm value through environmental, social and governance investment (Gao and Han, 2020; Lee and Kim, 2021). Similarly, Cho (2021) pointed out that CEO's overconfidence will mitigate the under-investment problem in a competitive industry, and firm value is positively related to the level of over-investment.

The C8 cluster explores the optimal compensation contract design and the effect of risk on the CEO market with risk aversion assumption. With a market equilibrium model, CEO's incentive strength should rise if they can affect the degree of firm risk (Edmans and Gabaix, 2011). When managers are set as loss averse, the general shape of the optimal contract increases, and the convex in principal-agent model with middle and high outcomes (Dittmann et al., 2010).

The C9 cluster refers to CEO's tone analysis in financial announcement. In routine managerial activities, CEOs have opportunities to express their opinion and individual judgement through earnings announcement, such as conference calls. Their tone will be affected by the reality of corporate finance and by the compensation contract and their dispositional confidence (Marquez et al., 2019). Overconfident CEOs will choose an optimistic accounting statement (Buchholz et al., 2018). Thus, text analysis software was used to check the letters open to shareholders signed by CEOs in some major companies (Craig and Amernic, 2018). Nonetheless, the auditing committee and board will alleviate this type of overconfidence; female board ratio is also negative to the level of positive tone (Bassyouny, 2020).

The C10 cluster checks the relationship between CEO's overconfidence and fulfilment of corporate social responsibility (CSR).

Pursuit of motive and mechanism is decomposed into two parts: nondiscretionary CSR (NCSR) and discretionary CSR (DCSR). Testing the joint effect of CEO's overconfidence and CSR's influence on cost of equity reveals that the risk of CEO's overconfidence can be alleviated by CSR initiatives with diversification of corporate resources (Tseng and Demirhan, 2021). CSR is believed to have a hedging feature, and CEO's confidence level is negatively to the level of CSR (McCarthy, 2017). In CSR, hubristic and narcissistic CEOs will behave differently due to peer pressure; hubristic CEOs will only engage even less if they find that their peer firms are dismissive about CSR (Tang et al., 2018). There are evidences indicating that CEO overconfidence Korean listed companies is positively related to the voluntary disclosure of greenhouse gas emissions (Lee, 2021).

The C11 cluster deals with how CEO's overconfidence will affect organisational decision making. Based on prospect theory and other behavioural models, findings show that power distribution will lead to subjective overconfidence (Fast et al., 2012); emotional and rational processes will interact under uncertainty and risky environment; centralised decision-making power will create rapid solution; the ultimate quality depends on their acceptance of different advices (Hans et al., 2016). In failed merger and acquisition, Hwang et al. (2020) demonstrated that CEO's power-led overconfidence in undesirable investment decision making is due to their neglect of outside circumstance.

The C12 cluster manifests the relationship between CEO's overconfidence and corporate strategic persistence on the basis of attribution theory. Top managers generally engage in relatively higher levels of opinion conformity and flattery (Stern and Westphal, 2010), which will strengthen their overconfidence, thereby leading to biased strategies. When facing poor performance, CEOs may ascribe financial failure to outside economic factors in which their faulty strategy will not be changed in time, such strategic persistence will cause future continuous low corporate performance (Park et al., 2011).

According to the individual-organisation-society different perspective, the individual level focuses on the relationship between managerial demographic attributes, such as gender, experience, age, tenure variables and psychological overconfidence, including C5, C8 and C9. The organisational level often discusses the corporate age, scale, industry innovative capacity and property of nature, which will deeply influence its managerial overconfidence, corporate governance, culture and decision making logic, including C1, C2, C3, C4, C6, C7, C11 and C12. The social level refers to the relationship between CEO's overconfidence and CSR bearing probability, including C10.

## 4. Discussion

### 4.1. Evolution of managerial overconfidence over the four periods

With the keyword co-occurrence function of CiteSpace tool, attached to the four stages of CEO's overconfidence, we try to summarise the dynamic evolving research route. The top 10 occurrence keywords are presented in Table 4 respectively as preliminary, exploratory, growth and outbreak periods. The keyword information (bold and italic font in the table) is a high occurrence word in all the four stages, indicating that information flow will promote organisational awareness in the process of corporate decision making (Kuvaas, 2002). Five other keywords, namely, performance, acquisition, firm, corporate governance and market (the underline style in the table) rank top 10 in the latter three stages related to the consequences of managerial activities.

In the preliminary period (1992–2004), bad corporate decisions and causes are investigated, and cognitive explanations of managerial overconfidence are given. A CEO, especially in a prominent company, will overestimate their past abilities and over-commit to actions to increase their celebrity stature (Hayward, 2004). Three common biases, including overconfidence, the illusion of control and beliefs, in small numbers may lower the risky perception of managers (Simon et al., 2000). The prediction test of future Dow Jones Industrial Average to describe the too

**Table 4.** Top 10 occurrence keywords in four periods.

Keywords			
<u>information</u> (3)	<u>market</u> (13)	<u>performance</u> (42)	<u>performance</u> (91)
strategic decision making (2)	<u>performance</u> (13)	investment (36)	<u>acquisition</u> (76)
determinant (2)	<u>corporate governance</u> (11)	<u>market</u> (31)	<u>firm</u> (59)
return (2)	<u>firm</u> (10)	<u>firm</u> (30)	investment (58)
organisation (2)	optimism (10)	<u>corporate governance</u> (28)	<u>corporate governance</u> (56)
performance (2)	takeover (8)	<u>acquisition</u> (28)	determinant (44)
uncertainty (2)	<u>information</u> (6)	incentive (22)	<u>market</u> (44)
environmental analysis (1)	agency cost (6)	<u>information</u> (20)	risk taking (42)
executive migration (1)	<u>acquisition</u> (6)	compensation (18)	<u>information</u> (41)
industry (1)	investor psychology (6)	optimism (17)	management (34)
preliminary period (1992–2004)	exploratory period (2005–2011)	growth period (2012–2016)	outbreak period (2017–2021)

narrow range of managers when they undergo a realistic investing project, they will make wrong choice and put them in a risky situation, which may even cause a significant loss due to ill-fated decisions (Hammond et al., 1998). To alleviate market failure, managers should imagine the abnormal circumstance and try to be challenged by their companions and outside experts. A case study of the Lincoln Electric Company unveils that the root cause of their bank loan crisis is the overconfidence of their leaders in addition to unfamiliarity in the product and labour market (Hastings, 1999). During this stage, the research methods are mainly interviewing top managers and case studies, which emphasise the psychological tendency and attribute of managers in the decision-making process.

In the exploratory period (2005–2011), there exists an obvious increasing number of papers related CEO's overconfidence in the behavioural economic perspective. The behaviour finance differs from classic finance in which CEOs and investors will make decisions in a non-standard belief, non-standard preference with not full information supply (Dellavigna, 2009). The potential consequences of CEO's overconfidence are discussed, which will cause corporate investment distortions (Malmendier, 2005), overinvestment (Hsiao, 2011), increasingly sensitive cash flow in Chinese state-owned listed companies (Huang, 2011), value-destroying acquisition (Doukas, 2007; Malmendier, 2008; Bogan, 2009), a weaker risk-taking compensation contract design for overconfident managers (Niu, 2010; Gervais, 2011), more welcomed than rational managers in value-maximising corporate governance context (Goel, 2008), more accurate earnings forecasting (Hilary, 2011) and greater innovation in the competitive industry (Galasso, 2011). In addition to the positive test of CEO's overconfidence in managerial behaviours, the inner construct of optimism and confidence of managers are determined as to when and to what extent the overconfidence will not be harmful (Trevelyan, 2008). During this stage of structural equation modelling, panel data, meta-analysis and group experiment are often used.

In the growth period (2012–2016), there exist 196 related papers published within those years. The comparison between female and male CEOs regarding their investment decision shows that male CEOs are more overconfident, and similar findings exist as to more volatile earnings in that the higher leverage, the lower the chance of survival of firms with male CEOs (Huang and Kisgen, 2013; Faccio et al., 2016). Executive overconfidence will promote financial misreporting (Schrand and Zechman, 2012), use less conservative accounting (Ahmed and Duellman, 2013), have higher stock price crash risk (Kim and Zhang, 2016), roughly one-sixth higher dividend payout (Deshmukh et al., 2013) and a higher

intensity of share repurchasing (Shu et al., 2013) in organisational level. There exists a survey comparison about the founder CEO and the agent CEO, which is riskier in that external and internal moderators will influence the positive relationship (Tang et al., 2016). Similarly, discussion exists about the Sarbanes-Oxley Act which imposed stricter penalty on poor quality information disclosure, resulting in the hiring of more less overconfident CEOs (Bharati et al., 2016).

In the outbreak period (2017–2021), the total number of papers rose to 482. Some new expansions have transpired in managerial overconfidence research. From the individual level, in addition to gender, age, education, birth sequence, military experience, CFO professional experience, even CEO's hobby of flying airplanes influence on managerial optimism or overconfidence are examined. From the corporate organisational level, CEO's overconfidence is related to internal-control willingness (Liu, B and Li, L, 2021), corporate cash holdings (Aktas et al., 2019; Chen, 2020), ownership decisions into foreign markets (Lai, 2017), entrepreneurial orientation (Bernoster, 2018), stock price crash risk (AlMamun, 2020), corporate tax aggressiveness (Kubick, 2017; Chyz, 2019), corporate debt maturity structure (Ataullah, 2018), ambidextrous innovation (Wong et al., 2017), corporate R&D (Zavertiaeva, 2018), value loss of corporate diversification (Andreou, 2019), bank systemic risk (Liu, 2020), the timeliness of goodwill impairments (Chung, 2021; Killins, 2021), abnormal audit fee (He et al., 2020), sample data are geographically diverse: firms in Tehran Stock Exchange, Korean listed firms, non-financial listed firms in Japan, listed companies in China. With the sustainable development and environmental protection appeal, there are papers about carbon information disclosure (He et al., 2021), pollution control (Theissen, 2020) and political connection (Wang et al., 2018) from the social level.

#### 4.2. Measurement principles of managerial overconfidence

Direct measurement of managerial overconfidence is facing difficulties because of its psychological inherent characteristics, and it is often dynamic in different time spans or locations. Existing papers revealed five types of methods dealing with managerial overconfidence measurement.

Based on language or speech text analysis. Word usage exhibits speaker's characteristics (Rovenpor, 1993). Executive speech will reflect their individual psychological attributes coherently compared to social media compliment and stock purchase behaviours. Overconfidence of managers are reflected through statistical analysis of confident or optimistic words (Malmendier and Tate, 2005). Later, the discrete distribution of managerial overconfidence was turned to continuous distribution through the value of total confident words divided by the total number of speech (Hribar and Yang, 2016). In addition to speech and financial statements, there are papers using Twitter text analysis. This indirect measurement principle will obtain the desired posture or identity of a firm at the time of release, and various factors related to the style and psychology of the authors, whereas the limitations is that the total text may be ghost written and thus not applicable to assess the psychology of the CEOs.

Based on managerial behaviours. The common behaviours include biased earnings forecast, higher levels of organisational investment, different personal choices of stock option exercise and abnormal frequency of merger and acquisition. Overconfident CEOs will overestimate net profit and income. Lin et al. (2005) used biased income to measure levels of overconfidence; net profit should be substituted due to the common revenue forecast routines in some emerging market. Campbell et al. (2011) found that overconfident CEOs will over-invest due to their optimistic forecast of projects and if their firms are located at the front 20% of the all the populations as to the investment return ratio, they are deemed to be more overconfident than their peer firms. Organisational phenomena reflect and reinforce characteristics of the executive. As for stock option, CEOs may have different choices due to their judgement of future stock price, such that they may postpone to exercise options, keep



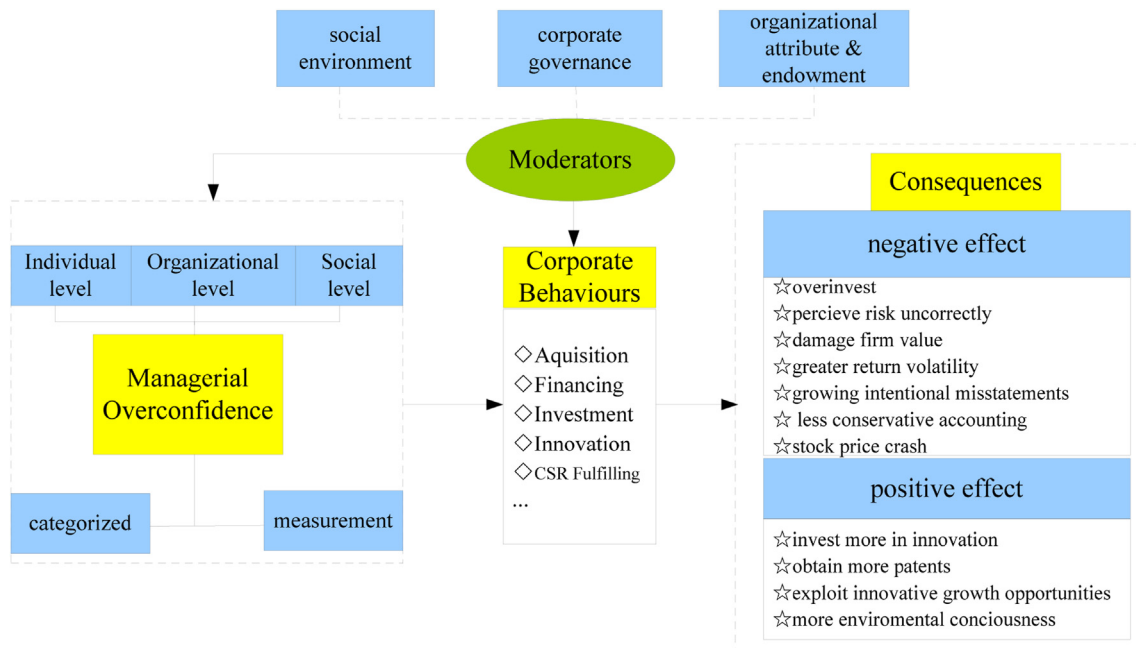


Figure 6. Integrated research frame of managerial overconfidence.

the positions longer and increase shareholding to maximise their benefit. When the above actions happen, CEOs are believed to be overconfident (Malmendier and Tate, 2005). Overconfident CEOs will initiate more merger and acquisition activities because they overestimate their managerial ability. Doukas and Petmezas (2007) defined overconfident CEOs as ones who have carried out more than five merger and acquisition cases within three years.

Based on organisational performance and media praise. It is assumed that the good performance of firms will foster overconfidence, and a positive relationship exists between them. Chen et al. (2015) calculated the return ratio with 12 months price data away from the set event point, but this method is less popular because market conditions are complex. Social media comments will provide insights into how others perceive the individual and CEO's confidence may be driven (Hayward and Hambrick, 1997), ratings of popular journals or newspaper positive appraisal on CEOs will be used to measure the extent of the managerial overconfidence.

Based on macro or industrial index measurement. Some researchers used business climate index and business confidence index to measure the managerial overconfidence. The implying logic is that overconfident managers will estimate the future performance with extension from firm level to industrial level. However, many opposing ideas state that validity is questionable because the cross-construct of the measure will be less trustworthy (Liang, 2015).

The above four types of measure of overconfidence are indirect style. There are also some direct measurement routes based on psychological experiment, interview and survey focusing on the processing of overconfidence exhibition (Tang et al., 2015).

#### 4.3. Moderators and theoretic frame of managerial overconfidence research

In recent years, the research focus is moving from the relationship between managerial overconfidence and corporate performance to the moderating effect, the moderators include social environment, corporate governance, organisational attribute and endowment.

Social environment will affect the discretionary freedom of managers, which will involve overconfidence and strategic decision making. Market environmental factors, such as inclusiveness, competitiveness, dynamics, complexity and instability will moderate managerial overconfidence and

its consequent behaviours. The system and culture of a host country and motherland will also influence the independent and dependent variables.

Effective corporate governance can alleviate principal-agent problems and reduce the incidence probability of biased decision. If independent directors carry out their functions, negative managerial overconfidence will be lessened (Malmendier and Tate, 2008). These ideas are verified in merger and acquisition activities with a powerful director board (Kolasinski and Li, 2013). In addition, types of institute investors, disagreement opinions of institute investors and CEO power and board vigilance will also influence CEO's overconfidence.

Organisational resources are the cornerstone of enterprise strategy fulfilment. The heterogeneity of numerical and qualitative enterprise endowment will bring good or bad effects for corporate strategic design. CEOs in firms with plenty of intangible assets, redundant resources and strong cash flow will become more overconfident than their counterparts. Organisational attribute variables, such as age, scale, industry and property attribute, will also serenely influence the decision-making logic of managers. I and Tang (2013) pointed out that age and scale of firms will weaken the positive relationship between managerial overconfidence and corporate risk-taking inclination.

With a systematic comb of managerial overconfidence papers in strategic management and corporate finance, we obtain the integrated research frame with managerial overconfidence-corporate behaviours-consequences (Figure 6).

## 5. Conclusions and future trends

### 5.1. Conclusions and limitations

On the basis of the knowledge mapping tool of CiteSpace and VOSviewer, the 675 papers related to managerial overconfidence theme are examined to present the research hotspot, cluster structure and evolutionary routes. As for the publishing number trend, the research trend of managerial overconfidence can be divided into four stages: preliminary period (1992–2004), exploratory period (2005–2011), growth period (2012–2016) and outbreak period (2017–2021). Especially, after 2012, the growing trend of managerial overconfidence shows that diverse research is being carried out in individual, organisational, social levels. In terms of the top journals of publishing medias, the *Journal of Corporate Finance* ranks first, and the *Journal of Finance* has the most citation.

Geographically, the authors are scattered in 52 countries and regions, and the top 10 countries with publishing records are USA, PRC, England, Singapore, Australia, Canada, Germany, Taiwan, South Korea, and France. The top four institutions or universities are in the USA.

Based on the occurrence keywords analysis of CEO overconfidence papers, the top 20 keywords on the consequences and characteristics of CEO's overconfidence are presented. The centrality parameters of top occurrence keywords are zero, which indicates that related literature must explore different issues of CEO's overconfidence. The cluster analysis using CiteSpace revealed 12 keyword clusters, including individual, organisation and social levels. The analysis of the four periods reveals that papers in the early stage focused on the CEO individual attribute and personal experience, and gradually, the related research expanded with corporate behaviours of merger and acquisition, financing, investment, innovation and fulfilling of corporate social responsibility. In addition to the organisational level of research papers that are dominant at present, recent papers focused on the relationship between managerial confidence and environmental protection behaviours in the social of greener economic context.

The measurement and variable design of CEO's overconfidence are divided into five types: based on the language or tone analysis, managerial behaviours, market performance, macro or industrial index. With a summary analysis of CEO overconfidence literature in four periods, the integrated research frame of extant papers is put forward.

## 5.2. Future research trends

Existing studies on CEO's overconfidence seem to be valuable and diverse, which will be helpful for future research. Based on the integrated research frame of CEO's overconfidence, further research may investigate as follows:

### 5.2.1. Harmony classification

Psychological overconfidence can be classified into three types. Future research of managerial overconfidence must clarify the specific type and its context. Comparison of the different types of managerial overconfidence and their influence on corporate behaviours and performances will not lead to contradictory results. The mechanism of CEO's overconfidence in managerial practice must be further revealed and effective managerial remedies for alleviating bad consequences must be determined.

### 5.2.2. Improved measurement

Overconfidence as an inherent attribute, in an indirect way, some variables designed to reflect CEO's overconfidence seem not very hard. However, some unavoidable noise and error exist, which will cause unreliable results. Some authors believe that managerial overconfidence is dynamic with the outside environment and organisational context. Thus, a case study on CEO interviews will be more suitable for CEO's overconfidence research with process orientation.

### 5.2.3. Multivariate test

Managerial overconfidence is not a single cognitive concept; it is highly complicated because of the complex corporate strategic context. In managerial decision-making reality, greedy, hubris, and narcissism will interact with one another, so multivariate test will depict more naturally, and the conclusion will be more persuasive. A few good examples exist to focus on the effects of hubristic and greedy behaviours on corporate human and social capital allocation (Haynes et al., 2015). We should understand managerial overconfidence from the perspective of the management team rather than the CEO's personal perspective. Existing studies regard the CEO as the representative of the manager, ignoring the importance of the team. Will the CEO's overconfidence "infect" other members of the team? If the answer is yes, what will happen to the overconfident management team? Can other members give friendly tips to the overconfident CEO in time? In particular, can the presence of female members of the team "neutralize" the overconfidence of male CEOs? These are questions worth exploring.

### 5.2.4. Positive paradigm

Every coin has two sides. There seems to be an excess in the discussion about the negative effect of CEO's overconfidence, which will cause acquisition of improper premium, over-investment in risky projects, financial misstatements and so on. Thus, the positive merit of CEO's overconfidence in promoting innovative potentials must be neglected to fulfil more CSR. Moreover, many commercial successful myths exist due to CEO's overconfidence with strategic vision in disruptive product and market innovation. Therefore, more positive effects in a particular company in the different stages of the life cycle or a certain industry must be examined.

### 5.2.5. Cultural distinction

Eastern civilization is quite different from the western one. Now there are many imitating research by eastern scholars to check the consequence of CEO's overconfidence in the similar variables and research design. However, in developing countries, such as China, CEOs are deeply influenced by heritage of Confucianism and its state-owned public ownership property. Thus, distinctions in the two cultures on managerial overconfidence must be explored. We can expand the application scenario of managerial overconfidence research. Most of the existing studies take large-scale listed companies as the research objects, which naturally filters or ignores most of the start-up enterprises and family enterprises. The role of overconfidence of managers in these two kinds of enterprise situations may change from negative to positive, the blood ties in family enterprises may control the overconfidence of managers at a suitable and appropriate level, which is beneficial to the development of enterprises; The entrepreneurial orientation and innovation commitment shown by the overconfident managers in the start-up enterprises will help the enterprises to successfully cross the survival period and establish competitive advantages.

## Declaration

### Author contribution statement

Shiliang Xia: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data.

Jingjing Duan: Contributed reagent, materials, analysis tools; Wrote the paper.

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Data associated with this study has been deposited at <https://osf.io/qc5zw/>

### Declaration of interest's statement

The authors declare no conflict of interest.

### Additional information

No additional information is available for this paper.

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