An Empirical Study on the Impact of CFO Overconfidence on Corporate Financial Risk: Empirical Evidence from Chinese Listed Companies

Wenrui Zhong and Weihao Yan

Abstract—**Previous studies research on the impact of overconfidence, which mainly focused on the positions of CEO or the chairman of the board, while ignoring the possible impact of CFO overconfidence on enterprises. Based on the sample of Chinese A-share listed companies in Shanghai and Shenzhen stock Markets from 2008 to 2019, this paper quantifies the situation of overconfidence of senior executives from the personal characteristics of CFOs and discusses and empirically tests the influence of CFO overconfidence on corporate financial risks. The study found that an overconfident CFO significantly increases the financial risk of an enterprise, especially for the non-stated-owned corporates, and the corporates employing big four accounting institutions for auditing.**

Index Terms—**CFO, overconfidence, financial risk.**

I. INTRODUCTION

As a participant in the capital market and an important subject of the real economy, the risks taken by enterprises have multiple meanings. For an enterprise, risk-taking refers to its tendency, trade-offs, and decisions in the face of an uncertain business environment. Generally speaking, undertaking of high-risk projects helps to obtain corresponding high returns for the enterprise, while it also objectively promotes the development of the real economy. In other word, the risk aversion behaviors reflect the possibility of loss concerned by enterprises and they choose to sacrifice the high returns that may be brought simultaneously, which always means a loss for the economic growth.

The level of risk reflects the choice and preference of investment projects by managers when making investment decisions. Under rational circumstances, enterprises should evaluate the projects' risk and choose them according to various indicators, such as a project with NPV greater than 0, or IRR greater than the required rate of return. However, in the real economy, managers' choice of investment projects will be influenced by a variety of irrational factors, such as managers' loss aversion, ambiguity aversion, anchoring, mental accounting, conservation, and overconfidence. Manager's overconfidence is one of the most widely studied personal characteristics.

For a company, the CEO and CFO are two important members of its top management team. The CEO is mainly responsible for important daily business decisions of the enterprise, while the CFO is in charge of the company's financial decisions and the quality of accounting information. Although CFO is subordinate to the CEO, it still has a significant impact on professional financial decisions. In other words, the CFO's overconfidence has much influence on the financial risk of the enterprise.

Since previous studies have made a detailed analysis of the personal characteristics of CEOs, but the CFO's is not sufficiently researched, this paper focuses on the position of CFO and analyses the impact of CFO overconfidence on corporate financial risks. Through the research, it is found that the overconfidence of CFO can significantly enhance the financial risk of enterprises, and such an effect varies with the characteristics of enterprises

In this paper, the first part introduces the background and relative researches about managers' overconfidence and financial risk. In the second part, the basic three hypotheses of this article are developed. In part four, the model is built and taken to analyze the hypothesis has proposed. The last part performs the conclusion of the whole paper.

II. LITERATURE REVIEW

According to the theory presented by Kahneman and Tversky in 1979, some psychological principles are adaptable in risk decision making, such as isolation effect and certainty effect [1]. Benabou and Tirole in 2002 pointed out that as a psychological phenomenon, overconfidence can result in an automatic underestimation of negative signals and overestimation of positive ones [2]. To be specific, Tate in 2005 proved that overconfident managers are more likely to overestimate the return on investment and prefer to believe that the cost of external capital is too high. As a result, they overinvest when they are internally flush and invest less when they need external finance [3].

As a subjective psychological feature, how to quantify managers' overconfidence is also a focus of scholars' research. For example, female CFOs are expected to be more cautious in their financial decisions, when compared with male CFOs, and they are more risk-averse in their daily work [4]. Moreover, Schrand and Zechman suggest that the man with higher levels of education may become more confident in their own abilities and the accuracy of their judgment, and are more likely to exhibit overconfidence [5]. Forbes's research in 2005 showed that the elder managers are likely to have experienced more failures or decision-making errors in the past, which helps them correctly understand their own capabilities and knowledge, thus reducing the error of judgment caused by an overestimation of their capabilities

and knowledge [6]. As for the manager's financial background, it is proved that the managers with financial background have experienced the "highly sensitive" environment of the financial industry, their special understanding of the capital meaning and keen insight on risk prevention and control are significantly better than those without such experience, as a result, they are less likely to perform overconfidently [7], [8]. Rigorous academics and scientific research training for a long time have improved their rigor in decision-making, and their high reputation has increased their risk sensitivity [9]. Lastly, the complex background of returned executives makes them have international social network and relationship resources, and they can fully integrate and utilize global resources to optimize the allocation of enterprise resources. Therefore, they are more likely to show the tendency of overconfidence with their ability [10]-[12].

Financial risk may be caused by the uncertainty of the external operating environment and internal operating activities. Generally speaking, there are two types of variables to measure enterprise financial risk: one is based on market data and the other is based on accounting data. Research has pointed out that the Chinese securities market is not perfect, and there are still many speculative activities, so the fluctuation of stock returns cannot reflect the financial risks of enterprises, as a result, measuring the financial risk based on the accounting data is more recommended in such a situation [13].

Scholars have done a lot of research on the measurement of financial risk. For example, they have taken statistical analysis, model building, and some other methods to put forward a variety of quantitative measurements of corporate financial risk.

The analysis method of financial risk by univariate model means to analyze the possibility of the financial risk by taking a single financial ratio. Beaver in 1996 has found out that, in terms of financial risk measurement, the debt coverage ratio is the most appropriate index, followed by the asset-liability ratio [14].

The multivariate model analysis method in financial risk prediction refers to the integration of multiple representative financial indicators in a function to analyze the possibility of the occurrence of financial risks. One of the most commonly adopted methods is called Z Score. In 1968, Altman proposed the Z-Score model, which includes five different ratios, and the function is shown as follows [15].

$$Z = 0.012X1 + 0.014X2 + 0.033X3 + 0.006X4 + 0.999X5$$

where X1=Working capital/Total assets
X2 = Retained Earnings/Total assets
X3 = Earnings before interest and taxes/Total assets
X4= Market value equity/Book value of total debt
X5 = Sales/Total assets

Such a model has fully taken advantage of the information from the financial report, and it comprehensively reflects the financial risks from different aspects of the enterprise.

From the point of current research situation, there is a large amount of literature on the managers' overconfidence, most of them focused on the chairman and general manager positions, research on overconfidence of CFO still less, so the innovation of this article is from the perspective of the CFO, analysis the CFO of overconfidence may have influence to the enterprise financial risk. At the same time, this article updated the research data to 2019.

III. Hypothesis Development

According to cognitive psychology, overconfidence comes from cognitive bias. Gervais et al in 2002 stated that overconfidence will directly have an impact on the corporate's decision making, so it is necessary to find out how does overconfidence affects the operation of the corporate [16]. The impact of such cognitive bias on investment efficiency can be divided into two aspects: on the one hand, before decision making, the cognitive bias may lead to an overestimation of the future benefits from the project and underestimation of the possible risks from the project, resulting in excessive investment; On the other hand, managers may overestimate his ability to acquire resources, while there may be a lack of sufficient resources to support the project in operation, resulting in insufficient investment. Either of the two aspects will hurt the financial status of the enterprise, so the first hypothesis is proposed:

Hypothesis I: the overconfident CFO may result in a higher financial risk for the corporate.

State-owned enterprises are the important economic pillar of state power. To some extent, their investment decisions are not only the embodiment of the personal will of senior executives but also the embodiment of the political functions of state-owned enterprises. Research shows that state-owned enterprises should fulfill corresponding political and social responsibilities while pursuing profit maximization [17]. As a result, the state-owned enterprises are more conservative in the face of financial risk.

Hypothesis II: Compared with state-owned enterprises, the overconfidence of non-state-owned enterprises' CFOs has a more significant enhancing effect on enterprise financial risk.

Bushman and Smith (2001) pointed out that the audit institutions employed by enterprises are closely related to the quality of their information disclosure, and the audit process of large-scale audit institutions is more standardized and stricter, thus guaranteeing the quality of information [18]. Moreover, compared with companies that employ large accounting firms, companies that employ small firms to conduct audits are more likely to have distorted information and less transparency.

Hypothesis III: The overconfident CFO in the corporate employing the Big-four to audit will more significantly influence the corporate's financial risk level.

IV. Methodology, Data and Statistics

A. Sample Selection and Data Sources

In this paper, a-share listed companies from 2009 to 2019 were selected as primary samples, and 26267 observed values were obtained after removing the samples with missing variables. In order to prevent the influence of extreme values, winsorize indentation of 1% or so is applied to all continuous variables. Stata 15 is used for data statistics in this paper, and the data are all from the CSMAR database.

B. Measuring CFO's Overconfidence

Since overconfidence is a subjective factor, it is necessary to find an alternative variable to measure it. In the existing literature, indexes such as the exercise of stock options held by managers or the evaluation of managers by mainstream media are often used to measure the manager's overconfidence. However, Chinese listed companies implement stock option incentives for only a short time, while the media reports are highly subjective [19]. As a result, this paper adopts personal characteristics as a substitute variable for managers' overconfidence, and its specific construction indicators are as follows:

1) Gender: According to the research findings, men are more likely to show overconfidence than women. Therefore, if the general manager is male, the variable Gender is 1; otherwise, it equals 0.
2) Age: The elder CFO tends to be more cautious than the youngers, so the variable "Age" equals to 1 if the CFO is older than the average age, otherwise, the item equals to 0.
3) Degree: If the CFO has a master's degree or above, the value is 1; otherwise, the value is 0
4) Financial Background: It refers to the CFO's financial background. If the CFO has worked in a regulatory department, a policy bank, a commercial bank, an insurance company, a securities company, a fund management company, a securities registration, and clearing company, a futures company, an investment bank, a trusted company, an investment management company, an exchange, or any other financial institution, the variable is set to 1, otherwise, it is set to 0.
5) Wage: The research has pointed out that illusion of control is an important type of overconfidence. [20] To be specific, if the CFO's actual compensation is greater than the appearance of expected or average compensation, they will believe that their status is relatively higher than others, which may result in overconfidence [21]. As a result, if the CFO's salary is higher than average, this variable will equal 1, otherwise, 0.

As the article proposed by Yu in 2013, information reflected by different variables will also be different, so a single feature cannot measure managers' overconfidence comprehensively. As a result, in this article, a synthetic variable is constructed to define manager overconfidence, the calculation formula is as follows:

$$\text{Confidence Level} = \text{Gender} + \text{Age} + \text{Degree} + \text{Wage} + \text{Financial Background} \quad (1)$$

If the confidence level is no less than 4, the variable "overconfidence" (OC) will equal to 1, or it will be 0.

C. Measuring Financial Risk

$$\text{Z-score} = 1.2 \times 1 + 1.4 \times 2 + 3.3 \times 3 + 0.6 \times 4 + 0.999 \times 5 \quad (2)$$

where, $X_1 = \frac{Working\ Capital}{Total\ Asset}$, $X_2 = \frac{Retained\ Earning}{Total\ Asset}$, $X_3 = \frac{EBIT}{Total\ Asset}$, $X_4 = \frac{Market\ Value\ of\ Stock}{Total\ Asset}$, $X_5 = \frac{Sales\ Revenue}{Total\ Asset}$.
Generally speaking, the higher the Z value is, the better the financial status of the enterprise is and the smaller the financial risk [22].

D. Model Construction

To test the hypothesis of this paper, we set the model to be tested as follows:

$$Z\_score_{i,t} = \alpha_0 + \beta_1 \times OC_{i,t} + \beta_i Controls + \varepsilon_{i,t} \quad (3)$$

where *z*-score is used to measure a company's financial risk. The OC measures whether the CFOs are overconfident, and the control variables are introduced as follows [23]:

1) Size: To measure the market value of the company, in the article, the natural logarithm of the company's total market capitalization is taken.
2) Growth: Indicates the rate of change of an enterprise's operating revenue in the current year compared with the same period last year.
3) Board: The size of the companies' boards, which is measured by the number of Board members
4) ROA: Return on Asset
5) Dual: It measures the dual position of general manager, "1" if there is a Dual-position, "0" otherwise
6) BM: The book-to-market ratio is the ratio of the company's shareholders' equity to the company's market value.
7) ListAge: Company listed years, from the listing of the company to the t year
8) FirmAge: Refers to the Company duration, from the date of incorporation to the present year t
9) Top1: Shareholding ratio of the largest shareholder, the ratio of the number of shares held by the largest shareholder to the total share capital
10) Dturn: The monthly average excess turnover rate, the difference between the monthly average turnover rate in the t year and the monthly average turnover rate in the T-1 year

E. Variable Description

In Table I, the descriptive statistical analysis results of the main variables involved in this paper are given.

The maximum value of *z*-score is 41.426, while the minimum value of *z*-score is -0.189. Moreover, according to the mean of overconfidence, there are nearly 22% of CFOs are overconfident, which still occupies a small proportion of the sample. (The result is shown in appendix I).

TABLE I: CFO OVERCONFIDENCE AND FINANCIAL RISK

	Z_score
OC	-0.252***
	(-3.51)
Size	0.438***
	(2.68)
ROA	14.81***
	(14.86)
Growth	-0.546***
	(-5.94)
Dual	0.0868
	(0.61)
BM	-0.493***
	(-3.69)
FirmAge	-1.484**
	(-2.06)
Board	-0.376*
	(-1.96)

ListAge	-1.015***	
	(-4.42)	
Top1	-1.838***	
	(-3.37)	
Dturn	-0.0632	
	(-1.02)	
_cons	1.408	
	(0.37)	
N	26267	
adj. R2	0.637	
Individual	Yes	
Year	Yes	

Top1	-2.511***	-1.486*
	(-4.22)	(-1.83)
Dturn	0.00362	-0.0932
	(0.04)	(-1.22)
_cons	-8.199	0.493
	(-1.61)	(0.11)
N	9513	16754
adj. R2	0.699	0.614
Individual	Yes	Yes
Year	Yes	Yes

V. RESULTS OF MULTIVARIATE TESTS

A. CFO Overconfidence and Corporate's Financial Risk

First of All, to test whether the CFO's overconfidence has a significant impact on the corporate's financial risk, the dependent variable, *z*-score, the independent variable, oc, and some control variables are added into the model for regression, and the results are shown as follows.

According to the regression, the regression coefficient before OC is significantly negative at 1% confidence, which indicates that CFO overconfidence significantly reduces *Z*-score. Therefore, there is an obvious negative correlation between CFO overconfidence and corporate financial risk.

B. CFO Overconfidence in the Corporates of Different Nature

To test whether the results from stated-own and non-state-owned companies are significantly different, a heterogeneity test is done. The sample is divided into two groups based on its nature, and the results are shown in Table II.

The results reflect that compared with the stated-own corporates, the CFOs' overconfidence will have a more significant impact on the corporate's financial risk, which proves that hypothesis II is reasonable.

C. CFO Overconfidence in the Corporates of Big Four or Not

Based on the criterion of "whether auditors come from the big four international accounting firms", this paper divides enterprises into two categories and carries out a heterogeneity test. The results are as Table III.

According to the results, overconfidence CFO for the corporates employing the big four international accounting firms as auditors of companies, the coefficient of "OC" item was not significant under 10% level, while for enterprise not employing big four, its coefficient of "OC" was significantly negative under the 1% confidence level, indicating that the CFO's overconfidence for companies to hire a smaller firm to audit, its financial risk enhancement effect is more significant.

TABLE III: CFO OVERCONFIDENCE AND FINANCIAL RISK WITHIN CORPORATES EMPLOYING DIFFERENT AUDIT INSTITUTIONS

	(1)	(2)
	Big4=0	Big4=1
OC	-0.00173	-0.224***
	(-0.01)	(-2.84)
Size	0.701	0.502***
	(1.56)	(2.99)
ROA	15.67***	15.24***
	(6.57)	(15.60)
Growth	-0.540	-0.551***
	(-1.45)	(-5.43)
Dual	-0.338	0.168
	(-0.94)	(0.98)
BM	-0.288**	-0.611***
	(-2.15)	(-3.98)
FirmAge	0.806	-1.993***
	(0.80)	(-2.71)
Board	-0.142	-0.406**
	(-0.47)	(-2.10)
ListAge	0.0346	-0.977***
	(0.10)	(-3.74)
Top1	-3.400***	-2.375***
	(-2.76)	(-3.82)
Dturn	0.0713	-0.0742
	(0.33)	(-1.07)
_cons	-13.36	1.610
	(-1.18)	(0.39)
N	1240	21974
adj. R2	0.777	0.642
Individual	Yes	Yes
Year	Yes	Yes

TABLE II: CFO OVERCONFIDENCE AND FINANCIAL RISK WITHIN DIFFERENT CORPORATE NATURE

	(1)	(2)
	SOE=1	SOE=0
OC	-0.124	-0.290***
	(-1.42)	(-3.01)
Size	0.701***	0.510**
	(3.18)	(2.47)
ROA	15.19***	13.17***
	(10.27)	(10.97)
Growth	-0.293***	-0.686***
	(-4.93)	(-5.39)
Dual	-0.117	0.197
	(-0.97)	(1.19)
BM	-0.285***	-0.990***
	(-3.79)	(-3.50)
FirmAge	-0.989	-1.559*
	(-1.29)	(-1.90)
Board	-0.166	-0.435
	(-1.19)	(-1.12)
ListAge	-0.0861	-1.091***
	(-0.36)	(-4.14)

D. Robustness Test

Taking enterprises in a single industry as test samples can avoid the specific requirements of industry characteristics on enterprise risk-taking to a certain extent. Therefore, this paper takes enterprises in the manufacturing industry as samples for test, and there is no substantial change in the results.

Moreover, this paper also changes the measurement method of CFO overconfidence by using confidence level (mentioned as cf in the table), that is, the higher the value of confidence level, the higher the CFO overconfidence level. (The result is in appendix II).

VI. CONCLUSION

As an important executive of an enterprise, the CFO's characteristics have a significant impact on the financial situation of the enterprise. Based on the personal characteristics of overconfidence and the data of listed companies in Shanghai and Shenzhen from 2009 to 2019, this paper examines the influence of CFO overconfidence on the financial risks of listed companies. On this basis, it further explores the differences in the influence of CFO overconfidence on the financial riskof enterprises with different characteristics, and the results are concluded as follows:

First of all, CFO's overconfidence can significantly improve the level of financial risk-taking of enterprises. Specifically, an overconfident CFO is more likely to lead to overinvestment and underinvestment, both of which have a significant negative impact on the financial situation of the enterprise, because of an overoptimistic mentality.

Second, the overconfidence of CFOs has a more significant effect on the financial risk level of enterprises that employ non-" big Four "accounting firms to conduct audits. Compared with the "Big Four", other small and medium-sized audit institutions have lower standards, stringency, and information quality assurance, and are more likely to have deviations and distortions, so the CFO is more likely to bear additional risks.

Third, CFO overconfidence increases financial risks of non-state-owned enterprises more significantly, because the multiple nature of state-owned enterprises makes CFO's personal will less reflect in decision-making.

However, due to the limitations of length and data acquisition, there are few indicators to describe managers' overconfidence in this paper. In future studies, more indicators will be included in order to more objectively describe the personal characteristics of manager.

APPENDIX

The result of variable description and robustness test are shown in the appendix.

APPENDIX I: THE RESULT OF ROBUSTNESS TEST

Variable	Obs	Mean	Std. Dev.	Min	Max
Z_score	26267	5.701	5.338	-0.189	41.426
OC	26267	0.229	0.42	0.000	1.000
Size	26267	22.621	1.165	19.359	28.726
ROA	26267	0.043	0.063	-0.517	0.320
Growth	26267	0.192	0.566	-.825	7.781
BM	26267	0.996	1.151	0.000	12.531
Dual	26,267	0.260	0.439	0.000	1.000
FirmAge	26267	2.751	0.466	0.000	3.555
Board	26267	2.117	0.298	0.000	2.708
ListAge	26267	2.005	0.923	0.000	3.332
Top1	26267	0.346	0.153	0.000	0.755
Dturn	26267	-0.121	0.470	-2.494	1.469

APPENDIX II: THE RESULT OF ROBUSTNESS TEST

	Test 1	Test 2
OC		-0.270***
		(-3.49)
cf	-0.144***	
	(-6.46)	
Size	0.444**	0.771***
	(2.70)	(7.43)
ROA	14.85***	15.36***
	(20.93)	(20.42)
Growth	-0.546***	-0.599***
	(-3.77)	(-3.80)
BM	-0.494**	-0.713***
	(-2.12)	(-3.50)
FirmAge	-1.480**	-2.133***
	(-2.36)	(-6.45)
Board	-0.378***	-0.438***
	(-2.92)	(-4.18)
ListAge	-1.022***	-0.968***
	(-5.86)	(-12.71)
Top1	-1.822***	-2.272***
	(-5.75)	(-3.71)
Dturn	-0.0638**	-0.0894**
	(-2.27)	(-2.67)
_cons	1.665	-3.718*
	(0.73)	(-2.08)
N	26267	22204
adj. R2	0.637	0.661
Individual	Yes	Yes
Year	Yes	Yes

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

In the whole process, the author herself collects, organizes, thinks, revises and finally completes this article.

ACKNOWLEDGMENT

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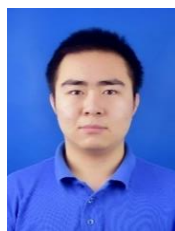
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