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## Original Research Article

### The Impact of CFO Characteristics on Z-score of Financial Crisis Warning -- A Case Study of Manufacturing Industry of Listed Companies in China

#### Abstract

This study takes the manufacturing industry of Chinese listed companies from 2018 to 2020 as a sample and uses the fs/QCA method to explore the relationship between the CFO's characteristics and the company's financial Z score. The empirical results show that : 1) the two necessary conditions for a good overall financial structure are the CFO holds a high shareholding of the company and the company is a state-owned enterprise. 2) the company pays attention to specialty and innovation and is willing to invest in attracting talents, which helps to improve the overall financial physique of the enterprise. 3) the company with a stable operation and large scale should hire a CFO who is male and stable in his position, which can improve the overall financial constitution of the enterprise. 4) The large-scale and old companies in the transition period should employ a young and professional financial executive with high salaries to help the company operate with his new ideas and new information, which can significantly improve the overall financial physique of the enterprise. 5) If a small-scale emerging company employs a highly educated CFO, the more professional it can provide the company with rich professional advice, or the newly introduced young talents from outside serve as the CFO to help the company operate by relying on its innovative ideas and information, which can improve the overall financial physique of the enterprise.

Key words : CFO ; Z-score ; fs/QCA

#### 1 Introduction

There are many factors for the success of an enterprise. However, financial strategy accounts for a very important proportion. Therefore, the Chief Financial

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ts, how the activity is carried out including the method, what has been done or what has been produced and the prospects.

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**Comment [AF3]:** The introductory section should contain background and a brief review of related research, problem formulation, objectives (or research objectives), Literature review that includes theory and results relevant research and research benefits, as well as the results to be achieved. This section is about 25 percent of the length of the article

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Officer (CFO) can be said to be the soul of an enterprise. CFOs of many enterprises have become the object of media interviews. At the same time, the annual candidate activities of China's top ten outstanding CFOs are held regularly every year, which shows that CFOs play an important role in enterprise management. From the reports of newspapers and magazines, it is often found that the personality traits or learning experience background of an enterprise's CFO seem to have something in common with the enterprise strategy. For example, the well-known XIAOMI group in China has adopted the asset-light business mode, which is, investing the least capital to obtain the highest rate of return. The financial planning is based on this operation mode as the core development. Therefore, it improves the enterprise valuation, expands XIAOMI's ecosystem, and improves the R & D capacity and the number of patents, The CFO's top priority is to improve brand value and cash flow, and capital turnover (Qi, 2017).

Hambrick & Mason (1984) put forward the "Upper Echelons Theory". The background characteristics of management will affect the organizational effect including strategic choice and performance level. In recent years, many scholars have studied the impact of the characteristics of the senior management team on the enterprise. As the research object, the characteristic range has gradually expanded from the character characteristics, such as gender, age, education, etc., to the professional background such as financial expertise, professional experience, tenure, part-time director, compensation, stock holding, and other incentives characteristics. Although there have been many studies on the relationship between the background characteristics of CFOs and enterprise performance in the current academic circles, Chinese literature pays more attention to the chief executive, and there is relatively little research on CFOs. CFO is a vital role in the company's financial activities. This study will use empirical methods to explore the relationship between various backgrounds and characteristics of the CFO and the soundness of the company's overall financial system. Since the previous literature mostly used linear regression to explore this issue, the innovation of this study is that considering the different business conditions of enterprises, if the linear regression method is used, the

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empirical result of a single solution produced by each regression formula cannot be applied to all samples, compared with the traditional linear regression, the empirical results of fuzzy-set/ Qualitative Comparative Analysis (fs/QCA) method can get more than one set of solutions, which will improve the practical reference of the research results. It is expected that the research results of this study can provide a reference for enterprises to judge the selection and appointment of CFO, as well as a basis for investors to judge the investment object.

## 2 Literature Review

### 2.1 Responsibilities and functions of CFO in enterprise organizational structure

With the continuous development of the business model, there are more and more multinational enterprises in recent years. As a CFO, not only need a highly educated and understand international practices, but also need to have rich financial theoretical knowledge and practical experience, as well as the ability of operation and management, analysis and planning, good communication and coordination, and master modern management means. According to Article 217 of the Company Law of the People's Republic of China : “ A “senior manager” means any manager, deputy manager, finance manager, secretary to the board of directors of a listed company, or any other person specified in the articles of association”. This shows the importance of the position of CFO in the company. Learn from the experience of west CFOs and integrate the management status of Chinese enterprises. The main responsibilities of CFOs include : 1) making rational and full use of enterprise resource planning. 2) ensure the standardization and legitimacy of accounting information system disclosure and establish a normal economic order. 3) participate in strategic decision-making and design reasonable schemes to maximize shareholders' wealth. 4) organize the preparation and implementation of a comprehensive budget. 5) establish a modern financial support system. 6) formulate and implement internal control measures. 7) improve enterprise financial institutions. 8) do a good job in the external financing of enterprises.

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a scientific basis for the development of materials or thoughts or ideas in an effort to solve a problem. The method contains a pattern of thinking in developing ideas to solve problems. The results contain the findings of thoughts, pouring ideas or ideas.

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According to Article 51 of the Code of Corporate Governance of Listed Companies :

"Senior executives shall be appointed in strict accordance with the relevant laws and regulations, and the bylaws. A listed company's controlling shareholder, actual controller, and affiliated parties thereof shall neither intervene with the normal procedures for the selection of senior executives, nor directly appoint or dismiss senior executives by bypassing the general meeting of shareholders or the board of directors." It means a senior manager is second only to the Chief Executive Officer (CEO). Compared with other department leaders, its corporate status is higher. According to Gao and Gao (2004), in business management, the CFO should give full play to its role as an expert, consultant, and assistant in major business decisions, tax planning, and capital structure operation.

## 2.2 Origin, development and calculation model of financial crisis warning Z-score

Financial crisis warning Z-score is a mathematical model designed to distinguish the loan risk to the greatest extent by statistically analyzing the past loan cases of the bank according to the discrimination analysis technology in mathematical statistics, selecting some ratios that can best reflect the financial situation of the borrower, have the greatest impact on the loan quality and have the most predictive or analytical value, conduct credit risk and credit evaluation for loan applicants. Fitzgattrick (1932) first proposed financial early warning research and carried out univariate bankruptcy prediction research. Finally, he found that the discrimination ability of return on net assets and debt equity ratio was the highest. Then, Secrist (1938) used the simple chart method and selected two financial indicators to compare the differences of financial indicators between failed banks and non failed banks in different periods, so as to judge whether banks have financial difficulties. Beaver (1966) first gave the bankruptcy prediction model, that is, the univariate discriminant model. Finally, he found that the debt guarantee rate was the best discriminant variable, and the closer to the bankruptcy day, the lower the misjudgment rate. Beaver (1968) introduced the stock price information in the capital market for research on the basis of Altman (1966), and found that the prediction ability of market return variables was lower

than that of financial indicators. Altman (1968) used multivariate decision analysis for the first time and proposed a Z-value model to predict enterprise bankruptcy. Five decision variables are selected, and the final decision efficiency is greatly improved compared with the previous ones. Subsequently, Altman et al (1977) jointly proposed the Zeta model (Z-score Model) to verify the prior probability and predicted cost difference in the previous assumptions. Finally, its efficiency is better than the Z-value model proposed by Altman (1977), which is also the most widely used model at present. The calculation of the model is listed as follows :

$$Z = 0.012X_1 + 0.014X_2 + 0.033X_3 + 0.064X_4 + 0.999X_5$$

Table 1 : The above variables are listed as follows :

Variable code	Calculation description
X <sub>1</sub>	(Current Assets - Current Liabilities) / Total Assets
X <sub>2</sub>	Retained Earnings / Total Assets
X <sub>3</sub>	(Profit before Tax + Interest) / Total Assets
X <sub>4</sub>	Market Value of Equity / Total Liabilities
X <sub>5</sub>	Sales Revenue / Total Assets
Z-score judgment	<ol style="list-style-type: none"> <li>1. Above 3.0 : judging from the financial data, the operation of the enterprise is safe.</li> <li>2. 2.7-3.0 : from the perspective of predicting bankruptcy, the enterprise may be safe, but it is in the gray area.</li> <li>3. 1.8-2.7 : the enterprise is in a gray area and may go bankrupt within two years; If the business is to survive, it must take drastic changes.</li> <li>4. Below 1.8 : The following : the enterprise may be going bankrupt. After all, it is hard to expect an enterprise with a Z-score of less than 1.8 to recover.</li> </ol>

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Subsequently, Liao and Ying (2011) developed a Z-score model for financial distress in China based on Altman (1977). This study will introduce the calculation basis of this model in detail in the section on methodology.

### 2.3 Literature research on the relationship between CFO characteristics and financial crisis warning

Refer to the literature related to the personal characteristics of the CFO and the soundness of financial physique. According to the personal characteristics of the CFO, it is classified as follows :

#### 2.3.1 The gender of CFO

Yang (2019) found that brain structure differences caused by gender differences between men and women lead to different personality characteristics and behavior orientation, and found that there is no gender bias in the capital market. Women are cautious and prudent in decision-making and are more inclined to risk aversion, so female CFOs will be more inclined to negative earnings management. The overconfidence of male executives will lead to excessive investment tendency, which will lead to excessive trading. The research findings of this paper show that the moderate self-confidence of female executives will affect the rational investment decision-making of enterprises, and can improve the enterprise value and shareholder value. Xie's (2016) research finding shows that female CFOs are more able to improve the robustness of financial accounting reports and the effectiveness of corporate governance than male CFOs. However, some studies have found that female CFOs cannot play a positive role in all aspects. Some aspects do not play a significant role, even bring negative. When the CEO has too much power, the CFO has to listen to the CEO. Female CFOs cannot effectively reduce the risk caused by the stock price collapse of enterprises.

#### 2.3.2 The age of CFO

Zhu et al. (2021) argue that compared with young management, the older the chief financial officer is, the richer his experience and resources are, the more cautious he is in decision-making, able to deal with emergencies with ease, and more inclined to

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avoid risks. The research results of Yang (2021) show that the age of the CFO is positively correlated with the correlation coefficient of earnings per share, indicating that the older CFO has more experience and can bring more earnings to the enterprise.

#### 2.3.3 The tenure of CFO

Li (2020) suggests that the staggered tenure of CFOs has a more and more important impact on the formulation and implementation of enterprise operation and management decisions. Moreover, the staggered tenure of chief financial officers can significantly reduce the familiarity between chief financial officers, reduce their communication and communication frequency, and fully improve the scientificity and rationality of investment decision-making. Han (2018) combined ten indicators such as age, tenure, and education to measure the power of the chief financial officer. The study found that the power of the chief financial officer can have a positive impact on the robustness of accounting. The longer the tenure of the chief financial officer and the richer the work experience, the higher the quality level of accounting information of the enterprise.

#### 2.3.4 The education of CFO

Wei (2020) claims that the education of CFO has a positive and significant correlation with enterprise performance, and further discussed it from the perspective of property rights. It is found that the education of CFOs in state-owned enterprises has a greater impact on performance than that in non-state-owned enterprises. The research results of Liu and Yang (2021) show that there is a positive relationship between the education of the CFO and the company's performance. The higher the CFO's education, the stronger the ability to analyze the business activities and make the decision-making for the enterprise and the stronger the learning ability. They are more competent for the position of CFO and promote the improvement of enterprise performance.

#### 2.3.5 The Compensation and shareholding ratio of CFO

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Lu and Guo (2018) suggest that there is a close relationship between management power and compensation according to the "Mintzberg's Management Roles Theory", that is, when the CFO obtains more power and higher status, it can further enhance his compensation performance sensitivity and increase the impact of compensation payment by intervening with the board of directors and compensation committee or earnings management. Liu (2019) believes that the greater the intensity of equity incentive, the more it can arouse the earnings management tendency of the CFO. Through the analysis of the relationship between COMPEN and earnings quality, the scholar believes that the purpose of CFO holding shares in listed companies is to improve earnings quality. A good COMPEN incentive system can supervise and positively affect the improvement of earnings quality. At the same time, the implementation of an equity incentive policy for the chief financial officer of an enterprise can improve the accounting conservatism of the enterprise itself. Zhu et al. (2021) found that there is a significant positive correlation between the compensation level and the company's performance, which can effectively improve the workability of the CFO and play an incentive role, to improve the enterprise's performance level. Based on the above literature, we summarized the research hypothesis is that the personal characteristics of CFOs are related to the overall financial performance of enterprises to a considerable extent.

the univariate discriminant model.

### 3 Methodology

According to the Z-score Model developed by Altman (1968), it is a metric applicable to the manufacturing industry. Therefore, this study takes the manufacturing industry of China's A-share listed companies from 2018 to 2020 as a sample to explore the impact of CFO characteristics on the company's overall financial physique; According to the industry classification of The China Securities Regulatory Commission (CSRC), this study selects the manufacturing industry of railway, ship, aerospace and other transportation equipment, the manufacturing industry of computer, communication and other electronic equipment, the manufacturing industry of electrical machinery and equipment, the pharmaceutical

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inform about the materials and methods used in the research, including the identification of variables, subjects/materials studied, research instruments, experimental designs or designs used, sampling techniques, data analysis and statistical models used.

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method, only state the name of the method. If necessary, state the source of reference used as a reference.

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manufacturing industry, the manufacturing industry of culture and education, industrial beauty, sports and entertainment products, the manufacturing industry of chemical fiber, leather, fur, feathers and their products and footwear, automobile manufacturing, instrument manufacturing, chemical raw materials and chemical products manufacturing, special equipment manufacturing, furniture manufacturing, wine, beverage and refined tea manufacturing, food manufacturing and other manufacturing. The characteristic data of the CFO of the sample company is obtained from the CSMAR database and the relevant financial data for calculating the other variables. After deleting the samples with incomplete data and removing the extreme values by WINSORIZE method, the total number of samples is 4732.

Considering the large number of sample companies, which are in different development environments and stages, and the results affected by various business conditions are also unequal, the research method adopts the fs/QCA, and makes an in-depth analysis and discussion on more than one set of empirical solutions, to improve the practical reference of the research results of this paper. The model of fs/QCA is as follows :

ZSCORE

= f (GENDER, AGE, EDU, PERIOD, COMPEN, STOCK, SCALE, FIRMAGE, STATE)

### 3.1 Variable description

3.1.1 Dependent variable : the financial crisis warning Z-score applicable to China developed by Liao and Ying (2011) based on Altman (1977) is used as an alternative variable for the overall financial physique. The formula and its indices description are as follows :

$$Z = 0.295 - 0.715X_1 + 7.083X_2 - 0.42X_3 + 0.308X_4 - 1.395X_5 + 2.203X_6 - 0.265X_7 - 1.327X_8 - 0.835X_9 + 1.576X_{10} + 1.092X_{11} - 0.034X_{12} - 0.716X_{13} + 0.018X_{14} - 0.626X_{15} - 0.17X_{16}$$

Where, the description of each code is listed as follows :

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$X_1$	return on equity	$X_9$	current ratio
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X <sub>2</sub>	return on total assets	X <sub>10</sub>	acid ratio
X <sub>3</sub>	earnings per share	X <sub>11</sub>	growth rate of main business
X <sub>4</sub>	retained earnings per share	X <sub>12</sub>	growth rate of Net profit
X <sub>5</sub>	gross profit margin	X <sub>13</sub>	growth rate of total assets
X <sub>6</sub>	operating profit ratio	X <sub>14</sub>	growth rate of earnings per share
X <sub>7</sub>	total asset turnover	X <sub>15</sub>	cash flow- liability ratio
X <sub>8</sub>	asset-liability ratio	X <sub>16</sub>	type of audit report

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3.1.2 Independent variables : according to the research hypothesis summarized from the literature review, this study uses the following six CFO characteristics as independent variables to explore the impact of CFO characteristics on the overall financial physique.

3.1.2.1 The gender of CFO (GENDER) : taking the gender of the CFO of each sample enterprise as the independent variable and setting it as a virtual variable. If it is male, set it as "1", otherwise set it as "0".

3.1.2.2 The age of CFO (AGE) : taking the age of the CFO of each sample enterprise as the independent variable, the calculation basis is from the birth year of the CFO to the end of the sample year.

3.1.2.3 The education of CFO (EDU) : taking the education of the CFO of each sample enterprise as the independent variable and setting it as the virtual variable. There are 5 education levels from technical secondary school and below, college, undergraduate, master's to doctoral students. We set the virtual variables of 1 to 5 respectively according to the education level.

3.1.2.4 The term of office of CFO (TERM) : the term of office of CFO of each sample enterprise is taken as the independent variable, and the calculation basis is from the date of check-in to the end of the year of each sample period.

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3.1.2.5 CFO's annual compensation (COMPEN) : taking the total annual compensation of the CFO of each sample enterprise as the independent variable. Because the absolute value is large, its natural logarithm is taken.

3.1.2.6 The shareholding ratio of CFO (STOCK) : taking the shareholding of CFO of each sample enterprise as the independent variable, and the calculation basis is the number of shares held by CFO divided by the total number of shares issued by the company.

3.2 Control variables : in this study, company scale, years of establishment, and property right are selected as control variables, which are described as follows :

3.2.1 The company's scale (SCALE) : referring to the research of Ge et al. (2021), taking the company scale as the control variable of enterprise financial performance, this study chooses the company scale as one of the control variables, and takes the total assets as the alternative variable of the company scale. Considering a large number of total assets, its natural logarithm is taken.

3.2.2 The company's age (FIRMAGE) : referring to the research of Zhang (2015), it is pointed out that the age of the company has a significant impact on the profitability of the enterprise. Therefore, this study takes the number of years of the company as one of the control variables.

3.2.3 The company's property right (STATE) : referring to Wei and Xu (2016) research on corporate value, the property right is taken as the main variable, and the empirical results also show that the property right is one of the factors affecting corporate value. This study takes the property right as one of the control variables and sets it as a virtual variable. If the sample enterprise is a state-owned enterprise, it is set as "1" and private enterprise is set as "0".

### 3.3 Description of fs/QCA :

fs/QCA is a causality research method different from traditional quantitative methods. In terms of linear regression, to explore the relationship between specific

**Comment [AF11]:** In general, the writing of research results does not use statistical language (such as: significantly different, treatment, etc.). Avoid copying and pasting tables of statistical analysis results directly from statistical data processing software.

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explained variables and explanatory variables, only one group of causality can be obtained. However, the phenomenon constituent factors of social science are very complex, and a specific phenomenon may be the result of the combined action of several groups of different factors, therefore, fs/QCA can provide a more in-depth inspection of causality in the research of social science.

Ragin (1987) first proposed the QCA method, which is a case study-oriented theoretical set research method. This method emphasizes constructing the causal relationship of research topics from small sample data through the repeated test of empirical data and related theories. This is based on the analysis of set theory and Boolean algebra, that is to investigate the relationship between conditions and results from the perspective of a set rather than correlation, and use Boolean algebra algorithm to formalize the logical process when people analyze problems. QCA attempts to go beyond the traditional case study methods, systematically measure the causes of events and the interaction and possible relationship combination between internal generation factors, and try to explain the key factors contributing to events, the interrelationship between factors, and the complex cause combination stimulating events, to deepen the understanding of the complex causality of events. Ragin (1987) combined Boolean algebra and set theory to develop the QCA technology of dichotomous variables, which is used to deal with the explanatory variables and result variables of dichotomous variables, that is, crisp sets qualitative comparative analysis (cs/ QCA). Ragin (2000) introduced fuzzy sets into qualitative comparative analysis and proposed fs/QCA technology.

fs/QCA method is different from the traditional linear regression method. It can provide a variety of element combinations that contribute to the company's financial performance and company value and will provide more substantive research suggestions.

#### 4 Empirical results

Table 2 descriptive statistics (N = 4732)

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Min.	Max.	Ave.	Std.
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ZSCORE	-255.020	363.580	33.273	84.469
GENDER	0.000	1.000	0.650	0.477
AGE	33.000	62.000	46.478	6.328
EDU	1.000	4.000	3.158	0.709
TERM	0.055	14.512	3.836	3.131
COMPEN	10.882	14.932	13.034	0.724
STOCK	0.000	0.103	0.003	0.013
FIRMAGE	8.047	33.148	18.959	5.312
SCALE	10.657	16.241	12.705	1.103
STATE	0.000	1.000	0.134	0.340

Note :please refer to the variable description in the 3 Methodology for the description of each variable code.

As can be seen from Table 1, for the whole sample companies, the range of Z-score ranges from -255.02 to 363.58, indicating that the financial status of the sample companies varies greatly, and the education of CFOs generally have bachelor's degree or above, but the average tenure is short, indicating frequent changes, and CFOs generally hold fewer company shares. In addition, from the average and standard deviation of the sample, the operating conditions and conditions of each sample company are very different, and most variables are abnormally distributed. Therefore, the fs/QCA method selected in this study should be more appropriate.

There are four steps for the operation procedure of fs/QCA. The first step is to convert all variable values into 0-1 values by calibration. The conversion standard needs to input 95%, 50%, and 5% quantile values of variables in fs/QCA software as the conversion basis. Table 2 is the calibration basis of 95%, 50%, and 5% quantile values of each variable. The second step is that fs/QCA software will automatically generate the corresponding truth table, that is, a table of all possible states of the combination of independent variables and dependent variables in the model, to execute the subsequent empirical process.

Table 3 Calibration basis of each variable (N = 4732)

	95%	50%	5%
ZSCORE	171.716	27.560	-91.056
GENDER	1.000	1.000	0.000
AGE	57.000	47.000	36.000
EDU	4.000	3.000	2.000
TERM	10.703	3.111	0.342
SALARY	14.220	13.053	11.805
STOCK	0.016	0.000	0.000
FIRMAGE	27.806	18.586	10.992
SCALE	14.794	12.561	11.1940
STATE	1.000	0.000	0.000

Note :please refer to the variable description in the 3 Methodology for the description of each variable code.

The third step is to perform the necessary condition analysis. As a result of a specific result being caused by the combined effect of many factors, multiple regression analysis contains multiple independent variables, and its empirical results only show the degree of influence of each variable on the dependent variable. In other words, each variable can compensate for the impact on the dependent variable for other variables. Nevertheless, fs/QCA can be used to deeply test that if some conditions are missing, the insufficiency of the influence of these conditions on the dependent variable cannot be made up by other variables. We call them as necessary conditions. ALL The conditions other than necessary conditions are called sufficient conditions, that is, the sufficient conditions can strengthen the effect on a particular outcome. Therefore, the role of performing a necessary condition analysis can be used to test which variable is a necessary condition for the dependent variable. The inspection standard is that the consistency exceeds 0.8, which is a necessary condition.

Table 4 Necessary conditions analysis (N = 4732)

	Consistency	Coverage		Consistency	Coverage
GENDER	0.677	0.535	~GENDER	0.416	0.572
AGE	0.664	0.692	~AGE	0.691	0.671
EDU	0.746	0.651	~EDU	0.597	0.707
TERM	0.633	0.701	~TERM	0.721	0.663
COMPEN	0.720	0.720	~SALARY	0.656	0.662
STOCK	0.836	0.762	~STOCK	0.715	0.801
FIRMAGE	0.763	0.687	~FIRMAGE	0.659	0.747
SCALE	0.640	0.670	~SCALE	0.714	0.689
STATE	0.838	0.751	~STATE	0.697	0.796

Note1 : please refer to the variable description in the 3 Methodology for the description of each variable code.

Note 2 : "\*" stands for "and" ; "~" stands for "negative".

As can be seen from Table 3, the consistency of the two variables included the CFO's shareholding ratio (STOCK) and the sample company is a state-owned enterprise (STATE) both are more than 0.8, indicating that the higher the CFO's shareholding ratio and the sample company is a state-owned enterprise are the necessary conditions for the sound financial position of the enterprise. Finally, the empirical test is carried out to obtain more than one set of solutions and analyze them.

Table 5 the empirical results of fs/QCA (N = 4732)

	Solutions	Raw coverage	Unique coverage	Consistency
1-1	STATE*STOCK*COMPEN*EDU*~AGE*GENDER	0.334	0.006	0.867
2-1	STATE*SCALE*STOCK*COMPEN*EDU*GENDER	0.335	0.005	0.862
2-2	STATE*SCALE*STOCK*TERM*AGE*GENDER	0.280	0.007	0.888
2-3	STATE*SCALE*STOCK*COMPEN*TERM*EDU	0.351	0.014	0.890

3-1	STATE*SCALE*FIRMAGE*STOCK*~TERM*EDU*~AGE*GENDER	0.262	0.009	0.873
4-1	STATE*~SCALE*~FIEMAGE*STOCK*CO MPEN*EDU*AGE	0.287	0.003	0.910
4-2	STATE*~SCALE*~FIRMAGE*STOCK*TE RM*EDU*AGE	0.267	0.001	0.907
4-3	STATE*~SCALE*FIRMAGE*STOCK*CO MPEN*~TERM*EDU*~AGE	0.309	0.010	0.904

Note1 : please refer to the variable description in the 3 Methodology for the description of each variable code.

Note 2 : "\*" stands for "and"; "~" stands for "negative".

It can be seen from Table 4, besides the two necessary conditions for a sound financial position those are 1) the higher the shareholding ratio held by CFO and 2) the property right of the enterprise is state-owned, the rest are sufficient conditions. That is, under the premise of the necessary conditions, the more the sufficient conditions are met, the better the effect of improving the overall financial physique of the company can be achieved. We analyze the sufficient conditions as follows :

The empirical results in Table 4 can be categorized into four types. The first category is that high compensation, high education, and young male CFOs are positively beneficial to the sound financial position of the company. Regardless of the company's scale, this type of company usually focuses on professionalism and innovation and is willing to invest in attracting talents. The second type is in large-scale companies, appointment 1) male CFO; And 2) the CFO is a male with a longer tenure of office; or 1) CFO with higher compensation, higher education, and longer tenure, regardless of gender; Most of this kind of company is a stable, traditional and large company. The CFO has a long tenure and is familiar with the company's affairs.

The third type is a large-scale company with a longer establishment time. The shorter the term of office of the CFO, the higher the education level and the younger the age, it can also significantly improve the overall financial physique of the company. Most of this kind of company is planning transformation. Therefore, they

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will hire young and professionals at high compensation and expect to obtain more advanced information. The fourth type is a small-scale new company that employs a CFO with a high degree of education. It should hire 1) an older CFO or 2) an older CFO with a high compensation, or 3) a younger CFO with a shorter tenure, which can significantly improve the overall financial status of the company. This kind of company is an emerging company. They need to rely on senior financial professionals to provide professional advice to the company or introduce young talents from outside to obtain new information and ideas to help the company operate.

## 5 Conclusion

### 5.1 Conclusion

This study explores the relationship between the characteristics of board members, ESG, and enterprise investment efficiency by fs/QCA. The research findings are summarized as follows :

5.1.1 Enterprises are state-owned and the CFOs hold a higher shareholding ratio of the company both are two necessary conditions for a good overall financial status.

5.1.2 The company pays attention to specialty and innovation and is willing to invest in attracting talents, which helps to improve the overall financial physique of the enterprise.

5.1.3 In a stable, traditional and large company, The CFO is male and has a longer tenure in the position, which can improve the overall financial constitution of the enterprise.

5.1.4 In the large-scale and old companies in the transition period employ young and professional financial talents with higher compensation to help the company operate with their new ideas and new information, which can significantly improve the overall financial physique of the enterprise.

5.1.5 If a small-scale emerging company employs a highly educated CFO, the more qualified it is, the more professional it can provide the company with rich professional advice, or the newly introduced young talents from outside serve as the

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CFO to help the company operate by relying on its innovative ideas and information, which can improve the overall financial physique of the enterprise.

## 5.2 Recommendations

Based on the above research findings, this study puts forward the following suggestions :

5.2.1 For enterprises, talents are the most important assets of enterprises. To master the financial performance of the company, the CFO needs to have rich experience and good professional quality; now the information is more and more developed, many innovative concepts and new technologies are developing rapidly, and the company must keep abreast of it. Therefore, in addition to paying attention to high-level financial executives, the stability of personnel, it is also necessary to consider in order to fierce with peers. After all, enterprises will retreat if they do not advance. Therefore, appropriate on-the-job training must be given to senior personnel, or talents suitable for enterprise development or transformation must be found. The investment cost of professional talents should not be saved, and talents who have contributed to the company must be given appropriate remuneration to motivate high-level talents to be more willing to contribute to the company's operations.

5.2.2 For the CFO incumbents and candidates : As a qualified CFO, it is a must-have skill to provide companies with forward-looking planning and correct financial-related decisions. From the empirical results of this study, it can be seen that what companies need is to be able to provide various operating resources to support the company to lead in an increasingly competitive environment. The resources include new concepts and talents with new skills in line with the development of the times, of course, equally important to the company's are loyalty and stability. Therefore, it is recommended that CFO incumbents or potential candidates should enrich new knowledge, cultivate professional sensitivity, and flexibly use professional knowledge to provide professional services for the company. Rich professional knowledge plus loyal service awareness will be the people that the company values and treats kindly.

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### 5.3 Research limitations and future directions

The characteristics of board members include a wide range of items. However, based on the feasibility of the databases, this study only selects the gender, age, education, tenure, compensation, and the shareholding ratio of CFOs. If more sample data sources can be obtained in the future, we will explore the related topic with more comprehensive indicators for more in-depth discussion.

#### COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

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