



CPA Audit and Corporate Financial Fraud: An Analysis Based on Game Theory Model

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Abstract. China's capital market and securities market have been developing rapidly in recent years, but the related systems have not been improved accordingly. In the process of development, many financial fraud incidents have occurred, which have seriously damaged the public interests. Based on the game theory, this paper analyzes the game behavior of CPA audit, enterprise management and supervision department. By constructing the payment matrix, this study obtains the optimal solution of participants and puts forward some corresponding suggestions, which has certain theoretical and practical value.

Keywords: Financial Fraud · Game Theory · Nash Equilibrium

1 Introduction

With the development of China's economy and the growing capital market, more and more enterprises choose to go public in order to expand financing and earn more profits. At the same time, some negative things also appear with the prosperity and development of the securities market. After years of development, China's securities market has grown from immature to mature, from lack of supervision to increasingly perfect supervision, which has made great contributions to the growth of the national economy. However, the securities market is still developing, and there are many problems, such as the frequent occurrence of financial fraud, which has caused a series of credibility crises in the securities market, which not only caused serious economic losses to investors, creditors and other stakeholders, but also threatened the healthy and stable development of the national economy. The frequent occurrence of this incident shows that at present, China's capital market lacks a perfect and efficient supervision system, and the external audit does not give full play to its functions. Enterprise financial fraud is a choice made by relevant management personnel after weighing the advantages and disadvantages, and it is also a game behavior in which the decisions of both sides have direct interaction. The management may commit financial fraud based on the interests of the enterprise, while the professional skills and professionalism of auditors have an impact on the audit quality, and will also have an impact on the behavior strategy of the company managers [1]. Based on this, this paper constructs a static game model of incomplete information between management and CPA audit of listed companies, solves Nash equilibrium, analyzes the

influencing factors of the optimal strategy between management and auditors, and puts forward relevant preventive and governance suggestions.

2 Game Process

2.1 Game Between CPA and Enterprise

Establish a game model based on the assumption that all participants in the game are rational.

2.1.1 Participants

Certified public accountants and audited enterprises.

2.1.2 Strategy

The audited entity has two pure strategies [2]: financial fraud and no fraud; Certified public accountants have two pure strategies: collusion and non-collusion with the audited entity; Both sides are independent of each other and do not transmit information to each other. It is a static game of incomplete information. There are four strategic combinations of both sides, namely (fraud, collusion), (fraud, non-collusion), (no fraud, collusion) and (no fraud, non-collusion).

2.1.3 Payment Function

Assuming that the audited entity's income value is E_0 under normal operation without fraud, the part of the income that is more than normal income due to financial fraud is E_1 ; The income from the routine audit of the audited entity by certified public accountants is Y_0 , and the extra income from collusion with the audited entity is Y_1 ; The penalty imposed by the regulatory agency for enterprise fraud is P_0 , and the probability of detection is X_0 ; The punishment imposed on auditors by the regulatory agency when the CPA colluded with the audited entity is P_1 , and the probability of being detected is X_1 ; The probability of enterprise financial fraud which is not detected by certified public accountants is X_2 ; The cost of CPA auditing the enterprise is C ; The loss caused by the audited entity's fraud and CPA's refusal to collude with it is L . According to the above assumptions, the payment matrix can be constructed (Table 1).

According to the payment matrix, the expected return values of different strategy combinations are calculated respectively to find out whether there is Nash equilibrium. The expected return function of certified public accountants is shown in formula (1):

$$E = \alpha_1\beta_1(G_0 + G_1 - P_1X_1) + \alpha_1(1 - \beta_1)G_0 + (1 - \alpha_1)\beta_1(G_0 - C - L) + (1 - \beta_1)(1 - \alpha_1)(G_0 - C) \quad (1)$$

The expected return function of the enterprise is shown in formula (2):

$$E = \alpha_1\beta_1(E_0 + E_1 - P_0X_0) + \alpha_1(1 - \beta_1)E_0 + (1 - \alpha_1)\beta_1(E_0 + E_1X_2) + (1 - \beta_1)(1 - \alpha_1)E_0 \quad (2)$$

Table 1. CPA and enterprise strategy portfolio income.

CPA	
Collusion α_1	Non-collusion $1 - \alpha_1$
Fraud β_1	
$(E_0 + E_1 - P_0X_0, Y_0 + Y_1 - P_1X_1)$	$(E_0 + E_1X_2, Y_0 - C - L)$
Enterprise	
No-fraud $1 - \beta_1$	
(E_0, Y_0)	$(E_0, Y_0 - C)$

Find the first derivative of the expected return function of CPA and enterprise respectively, and make the first derivative zero to get the optimal solution of both parties, as shown in formula (3) and formula (4):

$$\alpha_1 = \frac{E_1X_2}{P_0X_0 + E_1X_2 - E_1} \tag{3}$$

$$\beta_1 = \frac{C}{P_1X_1 - G_1 - L} \tag{4}$$

From the obtained optimal solution β_1 , it can be seen that the greater the cost C of auditing enterprises by certified public accountants, the greater the possibility of financial fraud in enterprises, the greater the punishment P_1 imposed by regulators for collusion between certified public accountants and enterprises, the lower the probability of collusion between certified public accountants and enterprises, and the greater the profit Y_1 obtained by auditors when colluding with enterprises compared with conventional auditing, or the greater the loss L caused by auditors' refusal to collude with enterprises, the greater the probability β of financial fraud in enterprises.

From the optimal solution α_1 , it can be seen that the greater the profit that an enterprise gains from financial fraud compared with normal operation, or the greater the probability that a certified public accountant does not find the enterprise fraud, the greater the probability of collusion with the enterprise. The larger the punishment P_0 made by the regulatory agency when it detects the enterprise fraud, the larger the probability X_0 of being detected, and the smaller the probability that the CPA colludes with the enterprise.

2.2 Game Between Enterprise and Regulator

There are two kinds of pure strategies for enterprises and regulators, namely, fraud and no fraud, supervision and unsupervised, and the combination of four strategies: (fraud and supervised), (fraud and unsupervised), (no fraud and supervised) and (no fraud and unsupervised) (Table 2).

C_1 is the cost required by the regulatory authorities to supervise the enterprise; S_1 represents the loss caused by false financial reports to the public; The expected return function of regulators is shown in formula (5):

$$E = \alpha_1\beta_1(P_0 - C_1) + \alpha_1(1 - \beta_1)(-C_1) + (1 - \alpha_1)\beta_1(-S_1) \tag{5}$$

Table 2. Revenue from the strategic combination of enterprise and regulator.

Regulator	
Supervised α_1	Unsupervised $1 - \alpha_1$
Fraud β_1	
$(E_0 + E_1 - P_0, P_0 - C_1)$	$(E_0 + E_1, -S_1)$
Enterprise	
No-fraud $1 - \beta_1$	
$(E_0, -C_1)$	$(E_0, 0)$

The expected return function of the enterprise is shown in formula (6):

$$E = \alpha_1 \beta_1 (E_0 + E_1 - P_0) + \alpha_1 (1 - \beta_1) E_0 + (1 - \alpha_1) \beta_1 (E_0 + E_1) + (1 - \beta_1) (1 - \alpha_1) E_0 \tag{6}$$

Then, the optimal solutions are obtained respectively, as shown in formula (7) and formula (8):

$$\alpha_1 = \frac{C_1}{P_0 + S_1} \tag{7}$$

$$\beta_1 = \frac{E_1}{P_0} \tag{8}$$

From the optimal solution, it can be seen that the higher the cost C_1 required by the regulators to supervise, the greater the probability of fraud. The punishment of fraudulent enterprises P_0 and the negative impact of false financial reports on the public S_1 increase at the same time, so the probability of fraudulent enterprises will decrease; The larger the extra profit E_1 obtained by enterprises through fraud compared with normal operation, the higher the probability of supervision by regulators. However, if the punishment for fraudulent enterprises P_0 increases, the probability of supervision will decrease.

To sum up, from the perspective of enterprises, if the cost of audit and supervision by certified public accountants and regulatory institutions increases and the benefits obtained by collusion increase, the more likely listed companies are to engage in financial fraud [3]. When the regulatory authorities increase the punishment for fraudulent enterprises and collusion in the audit, and the severity of the impact on the public increases, the probability of enterprises choosing fraud will be reduced. From the perspective of certified public accountants, if corporate fraud exceeds the normal earnings more and the probability of fraud is not detected by the regulatory authorities increases, then the probability of certified public accountants choosing collusion will also increase. From the regulator’s point of view, whether for enterprises or CPAs, increasing penalties will always have good expected results.

3 Conclusions

This paper builds a static game model of incomplete information between the management of listed companies and CPA audit, solves Nash equilibrium, and then analyzes

the optimal strategy choice between management and auditors. The research draws the following conclusions: Firstly, the higher the cost of CPA auditing the enterprise, the greater the possibility of financial fraud. Secondly, the greater the punishment for the collusion between certified public accountants and enterprises, the lower the probability of collusion between certified public accountants and enterprises. Thirdly, if the regulatory authorities find that the fraud of enterprises is punished severely, the probability of being found will increase, and the probability of collusion between certified public accountants and enterprises will decrease. Fourthly, when the regulatory authorities impose more penalties on fraudulent enterprises and collusion, the impact on the public will be worse, and the possibility of enterprises choosing fraud will be reduced. Fifthly, the regulatory authorities' increasing punishment will help to form a deterrent effect, which will reduce the possibility of financial fraud by management. Sixthly, with the increase of corporate fraud exceeding the normal income, the possibility of financial fraud of the management will increase if the regulatory authorities fail to find it, and then the probability of CPA choosing to collude with it will also increase.

4 Suggestions

4.1 Severely Punish Those Who Violate the Law and Discipline

The main factor of many financial fraud incidents is that the lower illegal cost can bring higher income, and the cost and income don't match. Many enterprises and certified public accountants are willing to pay "low cost" for high income. Therefore, increasing punishment and strictly enforcing relevant laws and regulations can effectively prevent fraud [4]. Although China's legal norms are not perfect at present, if law enforcement officers can act in strict accordance with rules and regulations, they can still play a deterrent role to some extent. At present, a series of fraud and non-compliance behaviors within the industry are not enough punishment for fraud, which is irrelevant to individual enterprises and fails to touch its key points. In view of this, government departments should investigate the criminal responsibility of those who cheat according to law, and make an example by putting the law into practice. At the same time, it can also improve the operability of the litigation rights of the injured investors, strengthen the joint liability generated by the partnership system, increase the cost of violation from all aspects, and reduce the possibility of fraud.

4.2 Standardize the Business Relationship Between Enterprises and Certified Public Accountants

Some enterprises will engage in financial fraud and publish false financial information for the sake of financing, stock price and other interests. Although the board of directors of enterprises decides the employment of auditors, the financial report issued by auditors will also affect their remuneration. If certified public accountants' issue true audit reports in strict accordance with the prescribed procedures when auditing them, they are likely to be threatened by management and unable to obtain business. Therefore, in order to obtain income, some certified public accountants collude with enterprises and publish

false financial information during auditing. Therefore, in order to reduce the occurrence of this kind of situation, it is necessary to change the employment system of accounting firms first, and the supervisory department can be responsible for the employment of accounting firms. Secondly, it is necessary to make the accounting of the related expenses of the audited entity public, and the regulatory agencies should supervise the related expenses; Finally, it is necessary to strengthen the separation of management right and ownership, strengthen the internal control and supervision of management, and reduce the possibility of fraud and collusion [5].

4.3 Strengthen the Professional Ethics Construction of Auditors

Although this paper assumes that all participants are rational economic men in the study of game theory, without considering moral factors, morality plays a key role in reality. Professional training and education for auditors should be held regularly or irregularly, so as to improve the professional ability of auditors, and to prevent the distortion of enterprise information quality caused by the low skill level of auditors [6]. Especially in today's era of knowledge-based economy, it is essential for auditors to update their knowledge. In order to improve auditors' professional ethics, it is necessary to gradually increase auditors' training courses, improve the content of education and training, and make vocational education more effective. At the same time, practitioners should carry forward the atmosphere of fairness, justice, honesty and trustworthiness, inherit excellent corporate culture and create a good working atmosphere [7].

The above suggestions on the prevention of financial fraud are only to reduce the possibility of fraud from the external perspective of the enterprise. However, it is more important to further strengthen the governance of the internal supervision system of the enterprise [8], establish an effective restraint mechanism, improve the internal control system, and strengthen the moral restraint and punishment of managers, so as to fundamentally avoid the occurrence of financial fraud.

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