Multivariate Linear Regression Method Based on STATA Analysis of Influencing Factors of Internal Control Quality

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ABSTRACT
In order to improve internal control quality of the business, this article explores this problem from culture which includes interpersonal trust. In this paper, the data of interpersonal trust, decision power allocation internal control and company financial performance from 2010 to 2019 are taken as samples, and the multivariate linear regression method is used to establish the model and observe the multivariate linear regression relationship by using STATA software. The results show that the linear model with interpersonal trust as the independent variable, decision power allocation as the moderator variable and internal control quality as the dependent variable has higher prediction accuracy, that is, interpersonal trust is significantly negatively correlated with the quality of internal control and decision power concentration has a negative moderating effect on the relationship between interpersonal trust and internal control quality.

Keywords: *Multiple Linear Regression; STATA software; Interpersonal Trust; Internal Control Quality; Decision Power Allocation; Property Rights*

1. INTRODUCTION

Internal control is a network of institutional arrangements and structural relations that connect the formal and informal relationships of stakeholders within an enterprise. Its purpose is to achieve a balance between powers, responsibility and benefits among the relevant stakeholders, and through the establishment of specific control mechanisms to prevent speculative behaviour, promote cooperation ability and reduce the risk so that expected targets will be predicted more accurately [2].

From the perspective of practice, China's enterprises do not lack of internal control system construction, but financial fraud and management fraud phenomenon are still common. The reason is that the internal control system design and implementation practice is only focused on the company's internal and external governance. From a theoretical perspective, internal control is an institutional system composed of formal system, informal systems and implementation mechanism [7]. Its essential feature is trust mechanism. Interpersonal trust, as a part of informal system, is bound to affect the quality of internal control. Therefore, it is very important to study the influence of interpersonal trust on the quality of internal control.

Moreover, it is a pity that there is little literature researching internal control as a power balancing system by combining decision power, interpersonal trust and its mechanism. Most of them ignored the enterprise decision-making within the configuration for the important influence of internal quality control. As a result, checks and balances of power cannot be realized and internal control cannot be effective.

Thus, we select listed companies between 2010 and 2019 as the main research samples, discussing the influence of interpersonal trust on the quality of the internal control and the influence of decision-power allocation on interpersonal trust and internal control quality. The multivariate linear regression method is used to establish the model and obserbe its multivariate linear regression relationship.

Embedding trust mechanism in the internal control research, this study partly improves the influencing factors of internal control quality, and provides empirical support for subsequent in-depth exploration of the

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mechanism of action between interpersonal trust and internal control quality. In addition, this paper takes the power allocation in the organizational structure as an entry point to reveal the different influence level of interpersonal trust on the quality of internal control.

2. HYPOTHESIS DEVELOPMENT

Internal control consists of formal systems, informal systems and implementation mechanisms [5]. Informal system is mainly a code of conduct accepted by people unconsciously, and interpersonal trust is one of its main foundations. Therefore, as an informal system, interpersonal trust will inevitably have an impact on internal control. At the same time, interpersonal trust is an important part of the internal environment, and the internal environment is the cornerstone of the internal control framework. The control system and control process that are separated from the internal environment cannot be implemented. The basic status of the internal environment determines the influence of interpersonal trust on the remaining elements of internal control, which will inevitably affect the quality of internal control.

Interpersonal trust depends on interpersonal relationship and Interpersonal trust can easily lead to the phenomenon of pulling relationships and emphasizing human feelings, which is not conducive to the construction and maintenance of rules and systems. Excessive dependence on acquaintances and excessive vigilance against strangers greatly hinder the expansion of normal communication behaviours and the functioning of the internal control system. Further analysis, when the relationship between the parties and the system executor is close, the formal internal control system may not be implemented or implemented at a discount. Even if this non-implementation has a negative impact on the organization, as long as it is beneficial to the insiders, it can be not implemented or implemented at a discount. Relationships, favours, and even bribery take precedence over the formal internal control system, and the internal control system cannot exert its binding force. In this case, internal control quality is low. This leads to our first empirical hypothesis, stated as follows:

H1. Under the premise that other conditions remain unchanged, interpersonal trust is negatively related to the quality of internal control.

Power allocation is the core of organizational structure. As the key to power allocation, decision-making power allocation restricts the path and way of trust, and the level of trust determines the way power is allocated in the organization.

Judging from the situation of listed companies in my country, from 2010 to 2019, the proportion of Chinese listed companies adopting the centralized mode of chairman and general manager to allocate decision-making power increased from 16.66% to 29.75%.

The concentration of decision-making power in corporate governance has its advantages. On the one hand, according to the concentration of decision-making power can alleviate agency conflicts [6]. The more serious the management agency problem is, the more likely the managers will take improper actions in order to enjoy a comfortable life or pursue short-term benefits, resulting in a decline in the quality of internal control. The centralization of decision-making power can weaken the agency problem caused by decentralization, and suppress or even avoid the opportunistic behaviour of managers. On the other hand, centralized decision-making power can ensure better overall allocation of corporate resources, improve the efficiency of existing resource utilization, and allocate various resources of the company more effectively. Make internal control better implemented in practice, thereby improving the quality of internal control. Stated in the alternative form, our second hypothesis is:

H2. Under the same conditions, decision-making power concentration has a negative moderating effect on the relationship between interpersonal trust and internal control quality.

3. RESEARCH DESIGN AND SAMPLE SELECTION

3.1 Sample Selection

To examine the relevance of interpersonal trust in internal control quality, we select A-share listed companies in China from 2010 to 2019 as samples, and finally get 22873 samples, including 13,624 samples of non-state-controlled companies and 9,249 samples of state-owned companies. The data of interpersonal trust level used in this paper comes from the Chinese General Social Survey (CGSS). Moreover, the property attribute data comes from the CCER database, and the rest of the financial data comes from the CSMAR database. In addition, the internal control index is obtained from the Dibo database. The relevant data processing and empirical analysis are completed in STATA, which is an useful statistic software especially for empirical problems.

3.2 Research Design

Regression analysis is often used in experimental data processing, empirical formula and factor anylysis. We perform empirical test of the effect of interpersonal trust on the internal control quality by estimating the following multiple regression model:

$$ICQ_{i,t}=\beta_0+\beta_1 trust_{i,t}+\sum \beta_i(Control_i) \tag{1}$$

ICQ is a variable measuring internal control quality. Trust is a variable representing the level of interpersonal trust. According to the measurement method of

interpersonal trust by Ly Chang and Tony Tan (2005) [4] and Daskalopoulou T (2019) [1], this paper draws on the "multiple rating method" to obtain data from the basic database of Chinese social quality. This data comes from the question "Excuse me, do you trust the following persons?" in the questionnaire of the "Chinese Social Situation Survey" issued by the Institute of Sociology of the Chinese Academy of Social Sciences. For the score data of "friends", "neighbours" and "colleagues", the trust level of each person is averaged and the average interpersonal trust is calculated based on the province, so as to measure the interpersonal trust and get the specific value of interpersonal trust(trust).

To examine the influence of decision-making power on the relationship between interpersonal trust and internal control quality, we perform empirical test by estimating the following multiple regression model:

$$ICQ_{i,t}=\beta_0+\beta_1 trust_{i,t}+\beta_2 dual_{i,t}+\beta_3 dual_{i,t}*trust_{i,t} + \sum \beta_i(Control_i) \quad (2)$$

Dual that measuring the allocation condition of decision-making control is an indicator variable equal to one if the board chairman and CEO are the same person in one firm, and zero otherwise, which is based on the previous research [8] and is controlled in the previous model. We expect trust to have a negative (β_1) effect on internal control quality, and that dual role of the board chairman has a negative moderator effect.

Based on previous research, we control for many relevant variables. The specific variable definitions are shown in Table 1.

Table 1: Variable definitions

Variable name	Description
ICQ	Internal Control Index from Dibo/100
trust	The level of interpersonal trust
dual	An indicator variable this is 1 if the board chairman and CEO are the same person, and 0 otherwise
soe	An indicator variable this is 1 if the firm is state-owned, and 0 otherwise.
size	The natural log of total assets
roa	net profits scaled by total assets
growth	operating income growth rate
lev	total debt scaled by total assets
age	The natural logarithm of (company age+1)
T10	The total number of shares held by the top ten shareholders of the company scaled by total share capital
k	Shareholding ratio of the largest shareholder scaled by sum of the number of shares held by the second to tenth largest shareholders
big4	An indicator variable that is 1 if a company has a Big 4 auditor, and 0 otherwise
Audit-opinion	An indicator variable this is 1 if the audit opinion is clean, and 0 otherwise.
board	The natural logarithm of the number of boards.
inde	The number of independent directors scaled by the number of total directors
ma	An indicator variable this is 1 if the firm has merge or acquisition.

3.3 Program Code

```
*Multiple Linear Regression*
cd $dir2
use total data.dta,clear
reg ICQ trust size roa TobinQ lev age T10 k big4 auditopinion board inde ma i.indu i.year,robust
est sto m1
estat vif
center trust dual
gen trust_dual=c_trust*c_dual
reg ICQ trust dual trust_dual size roa TobinQ lev age T10 k big4 auditopinion board inde ma i.indu i.year,robust
est sto m2
estat vif
reg2docx m1 m2 using F:\regression results Table 2.docx, ar2(%9.3f) b(%9.3f) t(%7.3f) r2(%9.3f)replace
shellout "F:\regression results Table 2.docx"
*about property rights*
cd $dir2
use 02 total data.dta,clear
```

```
gen miss1=missing(ICQ,dual,size,roa,TobinQ,lev,age,T10,k,big4,auditopinion,board,inde,ma,indu,year)
drop if miss1!=0
reg ICQ trust size roa TobinQ lev age T10 k big4 auditopinion board inde ma i.indu i.year,robust
est sto m1
estat vif
center trust soe
gen trust_soe=c_trust*c_soe
reg ICQ trust soe trust_soe size roa TobinQ lev age T10 k big4 auditopinion board inde ma i.indu i.year,robust
est sto m2
estat vif
reg2docx m1 m2 using F:\property rights Table 3.docx, ar2(%9.3f) b(%9.3f) t(%7.3f) r2(%9.3f)replace
shellout "F:\property rights Table 3.docx"
```

4. EMPIRICAL RESULTS

By using the STATA software, the experimental data are analyzed by multiple linear regression anlysis. The results are as follows. In Column 1, the correlation coefficient between interpersonal trust and internal control quality is -0.436, which is significantly negative at the 1% level. Empirical research results show that interpersonal trust has a negative impact on the quality of corporate internal control, and the first hypothesis is verified.

In Column 2, the coefficient of interpersonal trust and internal control quality is -0.413, which is negative at the 1% significant level. The regression coefficient of interpersonal trust and dual role of the board chairman (trust_dual) is 0.530, which is significantly positive at the 5% level. This result shows that decision-making power concentration has a negative moderating effect on the relationship between interpersonal trust and the quality of internal control of enterprises. Thus, the second hypothesis is verified.

Table 2: Effect of interpersonal trust on internal control quality

	(1)	(2)
	ICQ	ICQ
trust	-0.436***	-0.413***
	(-3.639)	(-3.446)
dual		0.010
		(0.588)
trust_dual		0.530**
		(2.449)
size	0.236***	0.236***
	(20.548)	(20.532)
roa	5.311***	5.313***
	(23.785)	(23.811)
TobinQ	-0.031***	-0.031***
	(-3.078)	(-3.084)
lev	-0.639***	-0.639***
	(-9.398)	(-9.401)
age	-0.240***	-0.238***
	(-14.870)	(-14.616)
T10	-0.000	-0.000
	(-0.409)	(-0.394)
k	0.002	0.002
	(1.049)	(1.006)
big4	0.153***	0.153***
	(4.272)	(4.260)
auditopinion	2.729***	2.729***
	(26.364)	(26.376)
board	-0.019	-0.018
	(-0.367)	(-0.350)
inde	0.368**	0.363**
	(2.047)	(2.013)
ma	0.016	0.015
	(0.750)	(0.710)
_cons	0.788*	0.710
	(1.679)	(1.513)
indu	included	included
year	included	included
N	22873	22873
R-Square	0.310	0.311
Adj.R	0.309	0.309
Mean VIF	2.98	2.90

***significance at 1%. **significance at 5%. *significance at 10%

5. ADDITIONAL ANALYSIS

Due to the particularity of my country's market system and institutional background, it is of special significance to study the relationship between interpersonal trust and internal control quality in enterprises under different property rights. The current research mainly divides enterprises into state-owned enterprises and non-state-owned enterprises. Enterprises with different property rights have differences in the quality of internal control. Therefore, the study also considers the relationship

between interpersonal trust and internal control quality under different property rights attributes.

Column 2 of Table 3 reports the moderating effect of property rights. The coefficient of the multiplier (trust_soe) of trust and state-owned enterprises is -0.646, which is significantly negative at the 1% level. It implies that the influence of interpersonal trust on the quality of internal control is more significant in state-owned enterprises than in non-state-owned enterprises. On the one hand, state-owned enterprise leaders have too much power, and shareholders lack the power to directly restrict the management and directors. On the other hand, this is also related to the fact that state-owned enterprises are able to obtain more government resources and lack the awareness of improving the quality of internal control to deal with risks.

Table 3: Effect of property rights

	(1) ICQ	(2) ICQ
trust	-0.436***	-0.394***
soe		0.022
		(1.054)
trust_soe		-0.646***
		(-3.180)
controls	yes	yes
_cons	0.788*	0.706
	(1.679)	(1.499)
N	22873	22873
R-Square	0.310	0.311
Adj.R-Square	0.309	0.310
Mean VIF	2.98	2.92

***significance at 1%. **significance at 5%. *significance at 10%

6. CONCLUSION

First, interpersonal trust is significantly negatively correlated with the internal control quality of listed companies. As an informal system, interpersonal trust can improve the quality of internal control by inhibiting the formal system from exerting its binding force and reducing the level of interpersonal trust in enterprises.

Second, decision-making power concentration has a negative moderating effect on the relationship between interpersonal trust and internal control quality. Compared with companies with decentralized decision-making power, companies that adopt centralized decision-making power have higher internal control quality under the same level of interpersonal trust. The combination of chairman and general manager can help reduce the negative impact of interpersonal trust on the quality of internal control.

Third, the influence of interpersonal trust on the quality of internal control is affected by the property rights attribute. There are differences in the level of significance in different property rights. Among state-owned enterprises, the weakening of interpersonal trust on the quality of internal control is more significant.

Therefore, China's listed companies should control the interpersonal trust within the enterprise, establish institutional trust, and use institutionalized regulations and norms to restrain them. Furthermore, companies should guide employees to get rid of inappropriate psychological tendencies and establish a correct view of trust to effectively prevent business risks.

Multivariate linear regression analysis was used to predict the economic index. This statistical method is used to make reasonable statistics of the data and the relationship contained therein. This combination with economics is very meaningful. However, we should also understand that the hypothesis of the experiment is much simpler than that of the reality, so we cannot judge the influence of this factor on the internal control quality only by unilateral experiments, also need further study

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