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## Research on Effectiveness of Internal Control in China-based on Panel Data from the Listed Manufacturing Companies in China

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**Abstract:** The purpose of internal control is to ensure the safety and integrity of corporate' assets, to comply with accounting standards and ultimately to realize the maximization of corporate' value. To achieve these goals, internal control is effective. In order to judge the effectiveness of internal controls of Listed Manufacturing Companies in China and find out the deficiencies in internal control of the companies, then improvements can be made in these areas. In this article listed manufacturing companies in China are researched as samples and mutation empirical analysis is made. Then by building a model to verify the the effectiveness of evaluation results. The Innovation of this study is to discover that independent director is not independent; the internal audit department has been given a limited mandate which affects the effectiveness of internal control of Listed Manufacturing Companies in China. Therefore, to achieve the objectives of internal control, some measures must be made.

**Key words:** Internal control, effectiveness, listed manufacturing companies

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### INTRODUCTION

With the rapid development of economy, the importance of internal control in modern economic life is increasingly outstanding and it has become the focus. However, malignant management fraud often can bring enterprise the serious economic loss and cause the bad social influence because of the internal control failure which caused the serious crisis of confidence and to a large extent it had influenced the global economic recovery and development. At present the research on the effectiveness of internal control mainly concentrated in the three aspects: The study on internal control effectiveness evaluation theory, on internal control effectiveness of empirical model, on the summary of best practices to the enterprise research and evaluation of staff behavior rules. Because the starting point of research on internal control activities is different, the measuring and evaluating the effectiveness of internal control differ in thousands ways. The COSO (Committee of Sponsoring Organizations) report (1992) argues that if the board of directors and management reasonably ensure economic entity management goal achievable, financial reporting reliable, the laws and regulations abide, internal control system is effective. "Effective internal control" in COCO is defined as: Companies can reliably realize the reasonable goal depends on the extent to ensure the

realization of enterprise goal. INTOSAI believes that effective internal controls should meet three criteria, namely, timely appropriate standards, cost and efficiency criteria and the standards of consistency in unction design. Vandeputte *et al.* (2002) in "internal control: A practical guide" emphasizes the effectiveness of internal control includes two aspects: Design and executive efficiency. And to ensure the internal control effectiveness, continuous monitoring process is required. Ashbaugh-Skaife *et al.* (2007) believed that the effective internal control process was essentially to manage large amounts of information to support the enterprise manager's decision making process, protect the corporate assets and reasonably assure the achievement the goal of enterprise. Gullkvist and Jokipil (2013) believes the effectiveness of the internal control is defined as the management of enterprise. Srivastava and Kogan (2010) in their model "the reliability of the internal control theory" put forward the views about three features: The reliability of the output information and input the original information of internal control system, control activities and the number of internal control. Gierga *et al.* (2005) used such as the Time of Detection (TD), the time that the damage under caused by the event is fixed (TF), the time limit after which time units (TW) to measure the validity of the internal control model and put forward that cost and effectiveness principle of the internal control can be used

to measure internal control effectiveness. Boritz *et al.* (2013) put forward the model to evaluate the effectiveness of internal control by using the horizontal axis to show solid internal control important goal, the vertical axis to represent the reliability of the internal control in five two-dimensional methods. In addition, Feng *et al.* (2009) proposed the relationship between internal control effectiveness and executive's payment. Bierstaker Thibodaux experiment the actions of the auditor to internal control evaluation. Leary and Iselin also used laboratory research method to research on the internal control evaluation behavior of certified public accountants. Gupta surveyed how listed Corporation management use COSO to report to assess the effectiveness of internal control through a questionnaire.

**MATERIALS AND METHODS**

**Sample selection and the evaluation indices:** To evaluate the effectiveness of the internal control of enterprise, 30 listed Manufacturing Corporation are selected as samples randomly from the perspective of control target level.

To evaluate the effectiveness of internal control, the first thing is to determine the target of internal control. There are two levels: One is the highest goal which is strategic target; the other is the basis target enterprise internal departments and posts should have, including operation objectives, asset security objectives, reporting and compliance objectives.

However, because the target expression is so abstract, it is difficult to evaluate the level of realization the target of internal control directly. So these abstract goals were disposed into a series of evaluation index that can be directly measured. These indicators not only can be directly affected through various internal control procedures and methods but also the calculation of the index data can be acquired through open channels.

According to the requirement of catastrophe evaluation method, evaluation index system of effectiveness of internal control can be seen in Table 1.

**The collection and processing of data:** The original data are from the RESSTE financial research database and the huge influx of information database. According to the catastrophe progression method, all related data are manual sorted using Excel statistical software, to Positive index, according to  $X'_i = (X_i - X_{min}) / (X_{max} - X_{min})$ , the original data are normalized, to reverse index, according to  $X'_i = (X_{min} - X_i) / (X_{min} - X_{max})$ , the original data are normalized, this will change the nature of the different variables and make these data be compared, that is the raw data can be changed between 0-1.

**Mutation empirical analysis:** After the original data are normalized, the catastrophe theory and fuzzy mathematics combined to produce catastrophe fuzzy model  $f(x)$ , after  $f'(x) = 0$  operation after the normalization formula of  $x_i = \sqrt{a}$ ,  $x_i = \sqrt[3]{b}$ ,  $x_i = \sqrt[4]{c}$ ,  $x_i = \sqrt[5]{d}$ , system is comprehensive quantitative calculated from the bottom of the index to the top in turn, until the highest total indicators and finally to get a one parameter, the calculated total membership function and thus the evaluation results about the effectiveness of internal control in listed manufacturing company can be gotten. The result can be seen in Table 2.

**Empirical test:** The effectiveness of internal control is evaluated through mutation progression method for 30 listed manufacturing companies and the evaluation result is given. However, whether the evaluation results are valid, whether it can represent the enterprise's internal control effectiveness, it needs further inspection. The most direct way is to compare evaluation results with the true level of internal control. If the evaluation results can accurately distinguish or predict the actual internal

Table 1: Index system of effectiveness of internal control evaluation

First class index	Third level index	Forth level index	Index note	
Effectiveness of internal control	Strategic target A <sub>1</sub>	Growth rate of Operating income A <sub>11</sub>	Positive index	
		Growth rate of net profit A <sub>12</sub>	Positive index	
Operation objectives B <sub>1</sub>	Operating profit ratioB <sub>14</sub>	Asset-liability ratioB <sub>11</sub>	Reverse index	
		Accounting receivable turnover ratioB <sub>12</sub>	Positive index	
		Rate of return on net assetsB <sub>13</sub>	Positive index	
		Impairment loss of assets B <sub>21</sub>	Reverse index	
	Asset security objectives B <sub>2</sub> Reporting objectives B <sub>3</sub>	Audit opinion of financial statement B <sub>31</sub>		Standard unqualified opinion: 3 Nonstandard unqualified opinion: 2 Qualified opinion: 1
Disclaime : 0	Compliance objectives B <sub>4</sub>	Significant accounting errors B <sub>32</sub>	Yes: 0, no: 1	
		Illegal behavior B <sub>41</sub>	Yes: 0, no: 1	

**Table 2: Evaluation on effectiveness of the internal control results**

Comprehensive evaluation	Rank	Comprehensive evaluation	Rank
0.9233860	23	0.9506254	12
0.8994338	28	0.9466410	15
0.9267894	20	0.9455404	17
0.9633590	4	0.9222742	24
0.8936365	30	0.9139156	26
0.9501250	14	0.9546844	10
0.9724229	2	0.9532854	11
0.9562813	9	0.8899123	29
0.9583303	8	0.9217887	25
0.9505805	13	0.9335228	18
0.9591489	6	0.9090551	27
0.9255303	21	0.9739226	1
0.9242473	22	0.9670505	3
0.9311892	19	0.9616119	5
0.9465258	16	0.9587897	7

control level between different companies, then it shows that the evaluation is effective. But it is very difficult to get real internal control level information of the companies, the real effectiveness of a company’s internal control can be indirectly determined only according to the level of internal control disclosure. Therefore, this article will use internal control information disclosure level as variables to inspect the effectiveness of the real level of internal control.

**Building a model:** A company’s internal control information disclosure level is affected not only by the true effectiveness of the internal control but also by other various factors, such as the firm characteristics and external environment, So, the real connection between the level of internal control disclosure and its evaluation score can be revealed by controlling other related factors that affect the disclosure level of the enterprise internal control, so the effectiveness of evaluation results can be verified. To evaluate the prediction and discriminator ability of the scores to the disclosure levels of internal control and the real effectiveness of company’s internal control by referencing the following orderly classification variables regression model.

$$ICDI = a_0 + a_1 \text{Score} + a_2 \text{Profit} + a_3 \text{Outdir} + a_4 \text{Audit} + a_5 \text{Lnassets} + a_6 \text{Salesgro} + \epsilon$$

Where:

**ICDI:** Orderly classification variables, represents the company’s internal control information disclosure level, If the company disclosed the “internal control audit report”, then ICDI = 5; if “self assessment”, ICDI = 4; 3 for the “details”, ICDI = 5; 2 to “general statement”, 1 to “simple disclosure”

- Score:** The score of internal control effectiveness evaluation
- Profit:** Company’s operating margins
- Outdir:** The proportion of the number of independent director to the total director board number of the company
- Audit:** Dummy variable. If the company set up the audit committee, the figure is 1, otherwise the figure is 0
- Lnassets:** Natural logarithm of total assets of the company
- Salesgro:** The Company’s operating income growth rate

## RESULTS AND DISCUSSION

Ordered legit regression is made based on the above model, we can get the models fitting information (Table 3) and the parameter estimates (Table 4).

The likelihood ratio test of final model and the model contains intercept only term (coefficient of other parameters to zero) is give in Table 4 (the model fitting information), significance level P is less than 0.01 by Chi-square test which shows that the model was set up significantly. According to the coefficient estimates of the variables in the Table 4, Coefficient estimates of score is 293.945, the significance level of Wald test is less than 0.01, it is Highly significant. It shows that the internal control evaluation score is higher, the higher the level of internal control information disclosure of the company. This result not only proves the signal transmission theory is scientific, also suggests that the evaluation results well represent the actual circumstances of the enterprise internal control effectiveness which shows that the evaluation system has good prediction and discriminator ability, effectiveness has been further confirmed. In addition, the coefficient estimates of assets and

Table 3: Model fitting information

Model	-2 Logarithmic likelihood values	Chi-square	Df	Significant
Intercept Only	88.142			
Final	24.351	63.791	6	0.000

Join function : Log

Table 4: Parameter estimates

Parameters	Estimates	Standard error	Wald	Df	Significant	95% confidence interval		
						Lower limit	Upper limit	
Threshold	[ICDI = 1]	284.476	93.784	9.201	1	0.002	100.663	468.289
	[ICDI = 2]	299.082	98.325	9.252	1	0.002	106.368	491.797
	[ICDI = 3]	304.884	100.019	9.292	1	0.002	108.851	500.918
	[ICDI = 4]	310.181	101.143	9.405	1	0.002	111.945	508.417
Position	Score	293.945	86.960	11.426	1	0.001	123.506	464.384
	Profit	-0.114	0.114	1.006	1	0.316	-0.337	0.109
	Outdir	-18.739	8.775	4.560	1	0.033	-35.938	-1.540
	Audit	-26.705	0.000	.	1	0.000	-26.705	-26.705
	Lnassets	2.600	1.097	5.613	1	0.018	0.449	4.751
	Salesgro	0.146	0.073	3.963	1	0.046	0.002	0.290

Join function: Logit

Salesgro is positive and significant is clear at 5% level, It shows the larger the scale of assets and development prospect of the company and the higher level of its internal control information disclosure. the coefficient estimates of Profit and Audit is negative and it is not significant statistically, it means that the company’s profit level, the establishment of audit committee did not play there proper role; coefficient estimate of outdir is 18.739 but it is significance in the 5% level, this also illustrates the establishment of the independent director system of listed companies in China didn’t play role on the improvement of internal control information disclosure to some extent.

**CONCLUSION**

Based on the evaluation and analysis on the effectiveness of 30 listed manufacturing companies which are selected randomly, there are a few problems about internal control in the listed manufacturing company: The governance structure of corporate is imperfect; the supervision of the company is weak. Therefore, the listed Manufacturing company need to take measures in the above two aspects to increase the effectiveness of internal control.

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**REFERENCES**

Ashbaugh-Skaife, H., D.W. Collins and W.R. Kinney Jr., 2007. The discovery and reporting of internal control deficiencies prior to SOX-mandated audits. *J. Accounting Econ.*, 44: 166-192.

Boritz, J.E., L. Hayes and J.H. Lim, 2013. A content analysis of auditors’ reports on IT internal control weaknesses: The comparative advantages of an automated approach to control weakness identification. *Int. J. Account. Inform. Syst.* J., 14: 138-163.

Feng, M., C. Li and S. McVay, 2009. Internal control and management guidance. *J. Account. Econ.*, 48: 190-209.

Gierga, D.P., J. Brewer, G.C. Sharp, M. Betke, C.G. Willett and G.T. Chen, 2005. The correlation between internal and external markers for abdominal tumors: Implications for respiratory gating. *Int. J. Radiat. Oncol. Biol. Phys. J.*, 61: 1551-1558.

Gullkvist, B. and A. Jokipil, 2013. Perceived importance of red flags across fraud types. *Critical Perspect. Account.*, 24: 44-61.

Srivastava, R.P. and A. Kogan, 2010. Response to discussions on assurance on XBRL instance document: A conceptual framework of assertions. *Int. J. Account. Inform. Syst.*, 11: 282-284.

Vandeputte, M., E. Peignon, D. Vallod, P. Haffray, J. Komen and B. Chevassus, 2002. Comparison of growth performances of three French strains of common carp (*Cyprinus carpio*) using hemi-isogenic scaly carp as internal control. *Aquaculture*, 205: 19-36.