

The Influence of Internal Control Quality on Corporate Financial Performance: An Empirical Analysis Based on Panel Quantile Regression Model

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Article Info

Article History

Received : November 02nd, 2023

Revised : December 27th, 2023

Accepted : December 31st, 2023

Published : December 31st, 2023

Article DOI:

10.14421/EkBis.2023.7.2.2118

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Published by:

FEBI UIN SunanKalijaga Yogyakarta

ABSTRACT

This study delves into the relationship between internal control quality and the financial performance of Chinese-listed corporations. Employing a distinctive research approach featuring panel quantile regression, this study meticulously examines data spanning the period from 2011 to 2020, encompassing 953 Chinese-listed entities. The analysis, in comparison to conventional methods such as ordinary least squares (OLS) regression and fixed-effects models, consistently reveals a robust and statistically significant positive correlation between internal control quality and corporate financial performance. Notably, the findings of the panel quantile regression bring to the forefront a nuanced perspective, elucidating an enhancing effect of internal control quality on Return on Assets. Nevertheless, this effect diminishes as one ascends the quantile distribution, elucidating varying degrees of influence contingent upon the internal control quality spectrum. These findings underscore the pivotal role of effective internal control systems in augmenting financial performance, with implications for corporate governance. Furthermore, this research underscores the evolving nature of internal control frameworks, particularly in the context of digitalization, thus delineating an imperative area for prospective scholarly exploration.

Keywords: Internal Control Quality; Financial Performance; Chinese-Listed Companies; Panel Quantile Regression; Digitalization

JEL Classification: G32, M41, M42, O16

How to cite: Xu, M., & Loang, O.K. (2023). The Influence of Internal Control Quality on Corporate Financial Performance: An Empirical Analysis Based on Panel Quantile Regression Model. *EkBis: Jurnal Ekonomi dan Bisnis*, 7(2), pp. 140-154.

<https://doi.org/10.14421/EkBis.2023.7.2.2118>

INTRODUCTION

Effective internal control systems have long been recognised as crucial corporate governance

mechanisms that aim to prevent the recurrence of unethical behaviour, including earnings

management, fraud, and reporting misconduct (Ji et al., 2017). A robust internal control system can enhance inadequate monitoring and mitigate potential investment risks (Chen et al., 2017). A high-quality internal control system guarantees high-quality financial and non-financial information reporting and a transparent environment (Ji et al., 2017). As a result, internal controls can potentially maintain the balance and continuity of the relationship between the enterprise and external participants, thereby alleviating information asymmetry. Compared with companies with high internal control quality, those with defects in internal control display elevated idiosyncratic risks and systems (β) risk and equity costs (Ashbaugh-Skaife et al., 2009). Therefore, effective internal control can prevent financial risks, safeguard organisational assets and other critical resources, and assist entities in delivering reliable financial information (Alfartosi & Jusoh, 2021). Doing so enhances business efficiency, and the expected results are achieved.

However, developing efficient internal control systems requires the allocation of company resources. For instance, organisations must establish independent and professional internal audit departments to implement appropriate internal control systems effectively (Chang et al., 2019). Depending on whether the investment originates internally or externally within the enterprise, the cost of executing internal controls can be categorised into initial costs and subsequent monitoring expenses. The initial costs mainly constitute the internal control expenses invested by the management to disclose internal control information accurately. Conversely, subsequent monitoring expenses are external audit fees (Foster et al. 2007). Some studies have also categorised the cost of executing internal controls into three components: internal employee expenses, external consulting and technical

expenses, and auditor fees (Krishnan et al., 2008). Therefore, like the cost of a corporate governance structure, creating and executing internal control systems within a company is also a constituent of agency costs (Agyei Mensah, 2016). This makes it an ongoing area of interest in research regarding whether enhancing the quality of internal controls can promote improvements in a company's financial performance.

Both the "Internal Control Overall Framework" in the United States and the "Basic Standards for Enterprise Internal Control" in China emphasise the crucial goal of internal control in enhancing operational efficiency and effectiveness. The COSO Committee presented its report on the Internal Control-Overall Framework" in September 1992, which was subsequently supplemented in 1994 to become the COSO Internal Control Framework. The proposal of this framework marked a significant new era in the development of internal control theory, allowing enterprises to enhance their risk prevention and optimise internal controls to improve their overall operations (Harasheh & Provasi, 2023). Although other internal control frameworks are available, the COSO Internal Control Framework is widely regarded as the standard for building and improving internal control systems. Furthermore, it is the only framework recommended by the US Securities and Exchange Commission with the "Final Rules" of Article 404 of the Sarbanes-Oxley Act, recognising it as a standard for evaluating internal control within enterprises. In 2017, COSO released the Enterprise Risk Management Framework, calling for integrating environmental, social, and corporate governance issues to strengthen internal control systems and improve quality (Harasheh & Provasi, 2023).

China has become one of the world's largest economies with significant global trade and investment. In order to promote and guide the

establishment and improvement of internal control systems for listed companies, improve the level of risk management, improve the efficiency and efficiency of company operations, and protect the legitimate rights and interests of investors, the Shenzhen Stock Exchange and Shanghai Stock Exchange of China issued their respective "Guidelines for Internal Control of Listed Companies" in 2006, clearly requiring listed companies to disclose the development and implementation of internal control systems by the requirements of the "Guidelines for Internal Control." In June 2008, the Chinese Ministry of Finance and five other ministries issued the "Basic Standards for Internal Control of Enterprises", which is considered the "SOX of China" (Li et al., 2020). Subsequently, listed companies in China forcibly began to disclose their internal control information. Internal control information and disclosure systems have received regulatory attention. Significant changes in the regulatory environment determine the disclosure of internal control information, thereby determining the availability of reliable information for research in this field (Chalmers et al., 2019).

China has become a major global economy with significant international trade and investment participants. To promote and guide the establishment and enhancement of internal control systems for listed companies, enhance risk management levels, improve operational efficiency, and safeguard the legitimate rights and interests of investors, The Shenzhen Stock Exchange and Shanghai Stock Exchange in China issued their respective "Guidelines for Internal Control of Listed Companies" in 2006, mandating listed companies to disclose their development and implementation of internal control systems as per the "Guidelines for Internal Control." In June 2008, the Chinese Ministry of Finance and four other Ministries issued the "Basic Standards for Internal

Control of Enterprises", regarded as the "SOX of China" (Li et al., 2020). Consequently, listed companies in China have started disclosing internal control information on a mandatory basis. Therefore, internal control information and disclosure systems have garnered regulatory attention. The notable changes in the regulatory landscape dictate the disclosure of internal control information, thereby determining the availability of reliable information for research in this domain (Chalmers, Hay, & Khlif, 2019). Research has explored the correlation between internal controls and financial performance in businesses, and certain gaps exist that require further investigation. Specifically, earlier studies primarily employed fixed effects models, intermediary effects models, and other approaches to analyse the relationship between internal control and financial performance (Zhou et al., 2016; Musah et al., 2022). However, these studies seldom examined the dispersion of this correlation using quantile regression models. This is a noteworthy research gap, as variances in internal control systems among listed companies can affect financial performance. Consequently, quantile regression models can scrutinise the heterogeneous association between internal control quality and financial performance at various enterprise levels.

The primary objective of this research is to explore the heterogeneous correlation between the quality of internal controls and financial performance within the context of China. Specifically, this study assesses the influence of variations in internal control quality on a company's return on assets. The findings of this investigation can serve as an impetus for managers to prioritise internal controls within their enterprises. By enhancing the quality of internal controls, businesses can maintain sustainable

competitive advantages amidst market competition.

LITERATURE REVIEW

The influence of internal controls on corporate financial performance is a matter of intense debate in both the academic and business spheres. As recognition of the significance of internal control systems and the availability of extensive data continue to grow, research findings are becoming increasingly important. It is widely believed in existing studies that there is a significant correlation between internal controls and corporate financial performance. Previous research has focused on preventing financial risk through internal controls and how they may affect external financing costs.

Internal Control Helps to Suppress Potential Financial Risks

Avoiding risk is crucial for maintaining a company's financial performance at an optimal level. [Ogneva et al. \(2007\)](#) argue that internal control deficiencies caused by systemic issues may lead to excessive risk-taking by management, resulting in additional risks that increase the volatility of future cash flows and increase the likelihood of business failure. [Hogan et al. \(2008\)](#) find that companies with internal control deficiencies have higher inherent and information risks than the industry average. [Whisenant et al. \(2003\)](#) found that a lower level of internal control can increase the general manager's self-interest motivation, who may seek personal welfare at the expense of the company's interests, to achieve an increase in personal wealth, leading to a decrease in the financial performance of the enterprise. [Weili Ge and Sarah Mcvay \(2005\)](#) used a sample of 261 companies with certain degrees of internal control deficiencies to establish a model and conduct empirical research. They pointed out that different

degrees of internal control deficiencies can negatively impact companies, increase potential risks in their business processes, and significantly reduce their financial performance ([Loang, 2023](#)). Therefore, improving a company's internal control system can promote continuous improvement in its financial performance. [Donelson et al. \(2017\)](#) explored whether and how weak internal controls increase the risk of financial reporting fraud by senior management. This is because senior management can override control, and there is a close connection between significant deficiencies and future fraud disclosures, which may be attributed to inadequate control ([Fu et al., 2023](#)): a) providing managers with more opportunities to engage in fraud or b) indicating that management's characteristics do not emphasise reporting quality and completeness. Weak internal controls allow managers to implement fraud through organisational rather than procedural controls. This supports the claim of the Public Company Accounting Oversight Board (PCAOB) in the United States that organisational-level controls reduce the risk of fraud and the risk of management overriding controls.

The Quality of Internal Control Affects the Quality of Financial Information

Companies with deficiencies in their internal controls may encounter varying issues regarding the reliability and robustness of their accounting information. Restating operating income is more likely ([Bizarro et al., 2011](#)). Prior to the enactment of the SOX Act, regulatory authorities had already recognised the impact of internal controls on the quality of accounting information. In 1985, to curb increasingly rampant corporate accounting fraud, five authoritative institutions in relevant fields in the United States jointly established the US Anti-Financial Fraud Committee, which served as the predecessor of the well-known COSO. In 1992, the

COSO Committee released the Internal Control Integration Framework, which holds significant guiding significance for current theories and practices of internal control. Researchers have found a positive correlation between a weak internal control environment and the frequency of financial reporting fraud (Bell & Carcello, 2000), which increases the likelihood of financial misstatements. Strong internal controls can limit the management's manipulation of earnings and enhance the reliability of accounting information. After the promulgation of the SOX Act, public companies were required to mandatorily disclose internal control information mandatorily, making it convenient for researchers to explore the impact of internal control on the quality of accounting information.

Most researchers believe that implementing the SOX Act negatively affects the quality of accounting information through internal control deficiencies. Doyle et al. (2007) selected 705 listed companies that disclosed significant internal control deficiencies from August 2002 to November 2005 as samples. They constructed a multivariate cross-sectional data analysis model and used five types of accrued quality variables to verify the relationship between accrued quality and internal control deficiencies. This study found a significant negative correlation between internal control deficiencies and accrued quality. Companies that disclose internal control deficiencies under SOX302 (ICD companies) exhibit lower accrual quality. However, this difference exists only at the company level and not at the account level. There is no significant difference in accrual quality between companies that disclose internal control deficiencies in SOX404 and the control companies. However, when internal control deficiencies are divided into company and account levels, a significant difference in accrual quality is observed

between ICD companies and control companies at the company level.

Cohen et al. (2008) found that earnings management based on accruals steadily increased from 1987 to the passage of the Sarbanes Oxley Act (SOX) in 2002. However, after the SOX Act was enacted, the level of earnings management for accruals decreased significantly, while the level of earnings management for real activities increased significantly. This finding indicates that companies' earnings management methods shifted from accruals to real activities after the SOX Act. Ashbaugh-Skaife et al. (2008) find that internal control deficiencies are more likely to reduce accrual quality by causing unintentional errors. They discuss the impact of cross-period correction of internal control deficiencies on the quality of financial reporting information in listed companies. The results show that companies that corrected internal control deficiencies significantly improved their accrual quality. Singer and You (2010) found that implementing the SOX Act improved the reliability and relevance of profits in companies' financial reports. Companies that comply with SOX404 have smaller manipulative accruals, and reported profits have a more robust predictive ability for future earnings and cash flows. Furthermore, improved earnings quality restores investors' confidence and increases their response to unexpected news.

Considering that the Securities and Exchange Commission postponed the SOX404 compliance date for small companies (unauthorised filers), Nagy (2010) divided the sample companies (with a market value of \$25 million to \$125 million) into SOX404 compliant and non-SOX404-compliant groups based on the SOX404 compliance threshold (market value of \$75 million). The empirical results show that companies in the compliance group were less likely to issue financial reporting misstatements. There was a significant negative

correlation between SOX404 compliance and the release of significant misstatements in financial statements, indicating that SOX404 regulations have achieved the goal of improving the quality of financial reporting.

Several studies have explored the impact of internal controls on accounting information from a robustness perspective. Using data before the SOX Act, Goh and Li (2011) find that companies with internal control deficiencies have lower accounting robustness. They also explore the impact of correcting internal control deficiencies on the robustness of accounting information and find that companies that correct internal control deficiencies have stronger accounting information robustness. Mitra et al. (2013), by examining publicly available data after the implementation of the SOX Act, found that companies with internal control deficiencies have higher accounting robustness, particularly those with company-level internal control deficiencies. This is because, after the implementation of the SOX Act, companies with internal control deficiencies face regulatory pressure, increasing their demand for accounting conservatism. However, they find that companies with internal control deficiencies do not experience significant changes in accounting conservatism after correcting for deficiencies. These findings highlight the different conclusions reached by researchers using data from different periods, which can be attributed to regulatory pressure and further explain the effectiveness of regulation from an alternative perspective.

The Quality of Internal Control Affects the Cost of Obtaining Funds for the Company

The cost of acquiring funds significantly affects a company's financial performance. Theoretical analysis demonstrates that higher- (lower-) quality disclosure of accounting information can decrease (increase) the cost of

equity (Lambert et al., 2007). The quality of internal controls is a crucial factor that influences the quality of accounting information disclosure. Under SOX404, companies reporting deficiencies in internal controls send a clear signal to market participants that the reliability of their accounting disclosures is lower than expected. This signal may cause investors to discount a company's expected cash flows at a higher risk premium. In other words, investors may demand higher expected returns from companies reporting internal control deficiencies than those that do not report such deficiencies (Gordon & Wilford, 2012), resulting in higher financing costs. Ogneva et al. (2007) argue that companies with internal control deficiencies may face higher equity costs due to the elevated information risks associated with these companies. Furthermore, these deficiencies could reflect poor management controls, which may increase business risk and equity costs. However, when controlling for the deviation between a company's original characteristics and analyst predictions, the direct link between equity costs and internal control deficiencies disappears. Similar conclusions regarding the relationship between information risk and internal control deficiencies are drawn. Based on a sample of 330 companies that disclosed weaknesses under section 302 of SOX and 383 companies that disclosed weaknesses under section 404 of SOX, Beneish et al. (2008) inferred that companies experienced significant negative abnormal returns when making unaudited disclosures under section 302. However, no market response was observed for disclosures under section 404, indicating that the cost of capital does not increase when weaknesses are disclosed under section 404. These findings align with the inference made by Doyle et al. (2007) that the disclosure in section 404 may reflect a lower threshold of disclosure importance.

According to the framework proposed by Lambert et al. (2007), Ashbaugh-Skaife et al. (2009) argue that the Sarbanes-Oxley (SOX) Act can reduce equity capital costs by mitigating information risk. When a company's internal controls are ineffective, the cost of equity capital increases significantly because of higher information risk. Conversely, when a company's internal controls are effective (including the improvement of previously disclosed internal control deficiencies), and after accounting for other risk factors, the cost of equity capital significantly decreases. After controlling for other factors, Kim et al. (2011) found that companies required to disclose internal control deficiencies under SOX 404 had, on average, 28% higher debt financing costs than the control companies. Furthermore, a detailed comparison revealed that companies with significant and company-level internal control deficiencies faced higher debt financing costs than those with less severe internal control and accounting-level internal control deficiencies. Companies with internal control deficiencies face higher direct financing costs, encounter more non-price-financing restrictions, and are less likely to secure bank debt financing. Moreover, banks impose higher loan interest rates on companies that have disclosed internal control deficiencies but reduce the rates once deficiencies are corrected. Hammersley et al. (2012) also suggest that failure to improve significant internal control deficiencies results in lower credit ratings and higher company debt capital costs. Costello et al. (2011) use internal control reports mandated by the SOX Act as an alternative indicator of financial reporting quality. They examined the impact of financial reporting quality on the trade-offs made by lenders when employing supervisory mechanisms. The findings revealed that when a company disclosed significant deficiencies in internal controls, lenders adjusted relevant financial and pricing terms based on

financial ratios and utilised alternative pricing and security terms, such as those based on credit ratings. Additionally, variations exist in how internal control deficiencies and financial report restatements affect the terms of a company's debt contracts.

Previous studies have identified a correlation between internal controls and corporate financial performance and investigated the potential mechanisms through which this relationship operates. Nevertheless, several research directions require further investigation. First, substantial variations exist in internal control quality across firms. With ongoing advancements in and widespread adoption of techniques for evaluating internal control quality, utilising internal control quality rather than internal control can yield more valuable insights. Second, employing non-linear models can facilitate an examination of the heterogeneous impact of internal control quality on financial performance.

The main objective of this study is to empirically examine changes in financial performance among companies at different percentiles using panel quantile regression models. This examination focuses on when Chinese regulatory authorities have implemented requirements for listed companies to disclose internal control information. The findings enhance the construction of internal control systems and promote the quality of internal corporate controls.

METHODOLOGY

Population and Sample

This research takes listed companies in the Chinese Mainland as the research object, adopts technical methods in quantitative research, and establishes an econometric analysis model to test the research hypothesis based on theoretical analysis empirically.

According to the research questions, the sample selected in this study comprises companies listed on the Shanghai Stock Exchange and Shenzhen Stock Exchange in China. For some particular types of firms, data were appropriately processed based on previous research (Cao et al., 2023; Li et al., 2020). Specifically, the following processing was carried out: excluding the sample of financial industry companies, Excluding Special Treatment companies with abnormal financial conditions, high operational risks, and non-standard information disclosure issues, and excluding severe companies with missing key data.

This study uses a panel quantile model to examine the direct heterogeneity between internal control quality and financial performance at different quantiles.

Data

According to this study's research scope and sample, empirical research data were collected from listed companies on the Shanghai Stock Exchange and Shenzhen Stock Exchange in China from 2011 to 2020. The data mainly includes financial indicators, internal control disclosure reports, etc.

The listed companies' financial performance and other relevant financial data are from the China Securities Market (CSMAR) database. CSMAR is a research-oriented precision database developed by Shenzhen Xishima Data Technology Co., Ltd. based on authoritative database professional standards, such as CRSP, COMPUSTAT, TAQ, and THOMSON, and combined with China's actual national conditions in the economic and financial fields. Many studies have used data from this database to research Chinese-listed companies (Shen et al., 2021; Lennox & Wu, 2022).

The data on the internal control quality of listed companies are sourced from the DIB internal control information disclosure index database. This

database was established by Shenzhen Dibo Enterprise Risk Management Technology Co., Ltd. and is designed to serve as an indicator system for internal control information disclosure. The indicator system comprises five primary and 65 secondary indicators and calculates listed companies' annual internal control information disclosure index. This database has been extensively utilised in research on internal control practices of Chinese companies (Chan et al., 2021).

Variables and Measurements

Financial performance. In previous studies, financial performance has typically been assessed using various indicators. Among them, Return on Total Assets (ROA) and Return on Equity (ROE) are commonly used. ROA, which measures operating profit, is considered a superior metric because it is not influenced by factors such as leverage, special projects, or discretionary projects (Kyere and Ausloos, 2021). Hence, this study adopts ROA as the primary measure of financial performance and conducts additional robustness tests using ROE.

$$ROA = \frac{Net\ Income}{Total\ Assets}$$

$$ROE = \frac{Net\ Income}{Stockholder's\ Equity}$$

Internal Control Quality (ICQ). Internal control quality cannot be directly observed, and information on the quality of internal control systems is not widely available (Krishnan, 2005). Therefore, using the internal control information disclosed in the annual reports of listed companies directly for quantitative research is difficult. Previous studies have used two approaches to measure the quality of internal controls. One approach categorises internal control quality into two groups: with and without defects. If a company's auditors report significant defects in internal control for the year, they are considered to

have low internal control quality. Conversely, if no significant defects exist, they have high internal control quality (Ashbaugh-Skaife, 2009; De Simone et al., 2015; Lisic et al., 2016; Loang & Ahmad, 2023). The other approach involves evaluating the quality of internal controls in listed companies by establishing an evaluation index system based on internal control elements. The higher the score, the higher the internal control quality (Hwang et al., 2004; Khlif & Samaha, 2014). Additionally, some studies have combined these two methods (Shu et al., 2018; Shen et al., 2021).

Based on the approach used in the relevant literature (Chan et al., 2021), this study adopts the internal control index of Chinese listed companies provided by Shenzhen Dibo Enterprise Risk Management Technology Co., Ltd. to assess the quality of internal controls in listed companies. These data are based on the five elements of internal control and are designed to create an index system for internal control information disclosure. It comprises five primary indicators: the internal environment, risk assessment, control activities, information and communication, and monitoring. It also considers factors such as whether the

accounting firm issues an evaluation report and whether independent directors and the board of supervisors provide opinions, thus providing a comprehensive depiction of the internal control level of companies. These data have been continuously published annually since 2011, making them well-suited for panel data research.

This study incorporates several control variables to account for potential influencing factors. These variables include capital structure, company size, nature of property rights, and CEO duality. The natural logarithm of total assets measures the company size (SIZE). Capital structure (LEV) is the ratio of total liabilities to total assets at the period's end, reflecting the company's equity nature. Property rights nature (SOE) indicates whether the actual controller is a government or state-owned enterprise, with a value of one if true and zero otherwise. CEO Duality (DUAL) represents whether the chairman also serves as the CEO. If the chairman also serves as a CEO, the value is one; otherwise, the value is 0.

Table 1 presents the descriptive statistics for all variables.

Table 1
Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	6019	.042	.058	-.76	.482
ICQ	6019	6.515	.142	5.819	6.827
LEV	6019	.488	.199	.008	1.698
SIZE	6019	23.186	1.449	20.437	27.146
SOE	6019	.629	.483	0	1
DUAL	6019	.18	.384	0	1

Table 2 displays the results of the variable correlation analysis, presenting the correlation coefficients and corresponding p-values for the variables. The table reveals that the correlation coefficient between ROA and internal control

quality is 0.326, indicating a preliminary correlation between these factors. The significance level, with a p-value of less than 1%, further confirms the statistical significance of this relationship.

Table 2
Pairwise Correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) ROA	1.000					
(2) ICQ	0.326 (0.000)	1.000				
(3) LEV	-0.370 (0.000)	0.064 (0.000)	1.000			
(4) SIZE	-0.048 (0.000)	0.264 (0.000)	0.534 (0.000)	1.000		
(5) SOE	-0.119 (0.000)	0.095 (0.000)	0.235 (0.000)	0.316 (0.000)	1.000	
(6) DUAL	0.036 (0.005)	-0.041 (0.002)	-0.099 (0.000)	-0.098 (0.000)	-0.263 (0.000)	1.000

Model Specifications

Based on a theoretical analysis, this study employs a two-step approach to examine the relationship between internal control quality and the financial performance of enterprises. First, ordinary least squares (OLS) and panel fixed effects analyses were conducted on the sample. Subsequently, a panel quantile regression model was established to investigate this relationship further. The panel quantile regression model provides separate estimates for various conditional quantiles of the dependent variable distribution, offering a more robust estimation structure than traditional regression approaches (Ramdani and Wittelostuijn, 2010). By presenting multiple regression curves, this model allows for a more straightforward interpretation of the relationship between the dependent variable and the distribution, thereby extracting richer information. Notably, the panel quantile regression model addresses a fundamental issue encountered in quantile estimation with fixed effects: the potential bias in interpreting the estimated coefficients for treated variables when individual fixed effects are included. The dependent variable in this study is the financial performance of enterprises, and the primary explanatory variable of interest is the

quality of internal controls within these enterprises. Additionally, control variables were selected based on relevant literature. The OLS model representing the relationship between internal control quality and the financial performance of firms is as follows:

$$ROA_{i,t} = \alpha_0 + \alpha_1 ICQ_{i,t} + \alpha_2 LEV_{i,t} + \alpha_3 SIZE_{i,t} + \alpha_4 SOE_{i,t} + \alpha_5 DUAL_{i,t} + \varepsilon_{i,t} \quad (1)$$

where α_0 is a constant term, α_1 - α_5 is the regression coefficient of the corresponding indicator, and $\varepsilon_{i,t}$ is the residual variable.

The regression fixed-effect model is:

$$ROA_{i,t} = \alpha_0 + \alpha_1 ICQ_{i,t} + \alpha_2 LEV_{i,t} + \alpha_3 SIZE_{i,t} + \alpha_4 SOE_{i,t} + \alpha_5 DUAL_{i,t} + \lambda_i + \mu_t + \varepsilon_{i,t} \quad (2)$$

where λ_i is an individual fixed effect that does not change over time and μ_t is a fixed-time effect.

The panel quantile regression model, which has no constant terms, was used for the regression analysis. Therefore, the quantile model for this study was obtained by combining the previous analysis with the quantile regression model.

$$Q_\tau ROA_{i,t} = \alpha_1(\tau) ICQ_{i,t} + \alpha_2(\tau) LEV_{i,t} + \alpha_3(\tau) SIZE_{i,t} + \alpha_4(\tau) SOE_{i,t} + \alpha_5(\tau) DUAL_{i,t} + \varepsilon_{i,t} \quad (3)$$

Where $Q_\tau ROA_{i,t}$ represents a company's financial performance at a given percentile value τ . By contrast, $\alpha(\tau)$ represents the estimated value of the corresponding variable at different τ percentiles (we use five values: 0.1, 0.25, 0.5, 0.75, and 0.9).

RESULT AND DISCUSSION

Analysis of Quantile Regression Results

When examining the influence of internal control quality on firms' financial performance, this study employs a panel quantile regression model, examining five quantiles: 0.1, 0.25, 0.5, 0.75, and 0.9. The findings for various quantiles of ROA are presented in Table 3. Based on the panel quantile regression results reported in Table 3, the coefficient for internal control quality is positive across all quantiles, although it exhibits a declining trend as the quantile increases. Specifically, the coefficient is 0.153 at the 10th and decreases to 0.066 at the 90th quantile. Furthermore, the 10th through 75th percentile coefficients demonstrated statistical significance at the 1% level, except for the 90th percentile, which failed to achieve statistical significance. These outcomes suggest

that the quality of internal control within enterprises positively influences ROA, which aligns with theoretical expectations. Further analysis reveals that the impact of internal control quality on ROA is more pronounced at lower quantiles, whereas it diminishes at higher quantiles, thus confirming significant variations in the effects of internal control quality on ROA.

Compared to the regression results of the OLS and fixed-effects models, the coefficient for internal control quality is 0.133 in OLS and 0.100 in the fixed-effects model. It means that the regression result of OLS is significantly larger than that of the fixed-effects model. Furthermore, these coefficients lie between the internal control quality regression coefficients at the 50th and 10th percentiles in quantile regression models. They were also much larger than the 75th and 90th percentiles coefficients.

Table 3
OLS, Fixed effect and Quantile regression for panel data results

	OLS	Fixed effect	Quantiles				
			10	25	50	75	90
ICQ	0.133*** (0.008)	0.100*** (0.010)	0.153*** (0.018)	0.105*** (0.012)	0.095*** (0.011)	0.067*** (0.008)	0.066 (0.042)
LEV	-0.131*** (0.007)	-0.155*** (0.025)	-0.088*** (0.015)	-0.076*** (0.011)	-0.091*** (0.014)	-0.067*** (0.017)	-0.152*** (0.022)
SIZE	0.005*** (0.001)	-0.003 (0.003)	-0.005** (0.002)	-0.008*** (0.002)	-0.016*** (0.003)	-0.019*** (0.004)	0.001 (0.028)
SOE	-0.010*** (0.001)	0.007*** (0.003)	0.016* (0.009)	0.001 (0.006)	0.010 (0.009)	0.007 (0.007)	0.006 (0.017)
DUAL	0.001 (0.002)	0.004*** (0.001)	0.001 (0.005)	0.003 (0.003)	0.006* (0.003)	0.002 (0.005)	0.011* (0.007)
CONS	-0.874*** (0.050)	-0.483*** (0.068)					
<i>N</i>	5815	5815	5815	5815	5815	5815	5815

Notes: Standard errors clustered by country are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Robustness Testing

To assess the robustness of the panel quantile regression model, a robustness test was conducted using the generalised quantile model, which is a

particular case of generalised quantile estimation. Additionally, to account for variations in measuring a company's financial performance, the dependent

variable was replaced with ROE in some studies for robustness testing.

Table 4 presents the regression results obtained using the generalised quantile model. The coefficient for internal control quality passes the

significance test at the 1% level for all quantiles. Furthermore, the coefficient values gradually decreased as the quantiles increased, which is consistent with the trend observed in the panel quantile model

Table 4
Generalised quantile regression results

	(1)	(2)	(3)	(4)	(5)
	roa	roa	roa	roa	roa
ICQ	0.158*** (0.008)	0.114*** (0.007)	0.099*** (0.005)	0.098*** (0.005)	0.088*** (0.005)
LEV	-0.070*** (0.004)	-0.075*** (0.004)	-0.099*** (0.003)	-0.142*** (0.004)	-0.188*** (0.006)
SIZE	0.002*** (0.001)	0.002*** (0.000)	0.002*** (0.000)	0.002*** (0.001)	0.002*** (0.001)
SOE	-0.007*** (0.002)	-0.006*** (0.001)	-0.008*** (0.001)	-0.011*** (0.001)	-0.012*** (0.002)
DUAL	-0.001 (0.002)	0.001 (0.002)	0.003** (0.001)	0.004** (0.002)	0.007*** (0.003)
CONS	-1.033*** (0.047)	-0.734*** (0.041)	-0.602*** (0.032)	-0.558*** (0.033)	-0.433*** (0.035)
<i>N</i>	5815	5815	5815	5815	5815

Notes: Standard errors clustered by country are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 5 presents the regression results obtained after replacing the dependent variable with ROE. The coefficient for internal control quality also passes the significance test at the 1% level across all quantiles. Notably, the coefficient gradually decreases as the quantiles increase until the 75th quantile. However, an increase is observed

in the 90th quantile. This unexpected finding could be attributed to the limitations of ROE indicators in capturing the influence of debt leverage on net profits. High-ranking enterprises with significant debt leverage may contribute to an increase in net profits, which may explain the observed trend.

Table 5
Quantile Regression for Panel Data Results

	(1)	(2)	(3)	(4)	(5)
	ROE	ROE	ROE	ROE	ROE
ICQ	42.368*** (3.016)	16.803*** (3.146)	14.345*** (2.976)	13.292*** (1.498)	15.037*** (4.775)
LEV	-16.449*** (2.508)	-6.785*** (2.200)	-4.445 (5.639)	-3.180 (3.015)	-1.397 (16.907)
SIZE	-1.122* (0.591)	-1.033 (0.740)	-0.619 (4.382)	-1.213 (1.629)	-3.030 (7.023)
SOE	1.352 (1.513)	3.313* (1.823)	0.166 (2.685)	-0.617 (1.401)	1.717 (14.439)
DUAL	-0.185 (0.979)	0.657 (0.635)	0.851 (0.683)	0.618 (0.756)	0.752 (2.061)
<i>N</i>	5800	5800	5800	5800	5800

Notes: Standard errors clustered by country are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

CONCLUSION AND RECOMMENDATION

In contrast to conventional research methods, this study utilises an alternative approach to investigate the influence of internal control quality on the financial performance of Chinese listed companies. Specifically, this study employed the quantile regression method to analyse the heterogeneous effects of internal control quality on the financial performance of 953 Chinese-listed companies from 2011 to 2020. The findings were compared with those obtained from OLS regression and fixed-effects models. Regardless of the regression analysis method employed, there was a notable and statistically significant positive correlation between internal control quality and firm financial performance.

The results of the panel quantile regression also indicate an enhancing effect of internal control quality on ROA, which is consistent with theoretical expectations. However, the coefficient of internal control quality decreases as the quantile increases,

indicating a diminishing effect. Further analysis revealed that the lower the quantile, the more significant the impact of internal control quality on ROA, while the higher the quantile, the smaller the impact, thus confirming significant differences in the effect of internal control quality on ROA due to variations in internal control quality among companies.

Internal control quality affects various aspects of a company, such as financing costs, the information environment, and fraudulent behaviour, which can impact the company's financial performance. However, companies' internal control environments have undergone significant changes with the development of new-generation information technologies, such as artificial intelligence, big data, and blockchain. This implies that the digitalisation process may influence the quality of internal control. Due to data availability limitations, this factor was not considered in the current study. This is an important topic that warrants further research.

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