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Study of the Impact of Short-selling Mechanisms on Auditor Behaviour

Yang Bai*

School of Business, Shandong Yingcai University, Jinan, 251401, China

*E-mail: bY208445@163.com

Abstract

The short-selling mechanism, as a significant external governance mechanism in the capital market, exerts a discernible influence on auditor behavior, thereby emerging as a salient and burgeoning area of academic inquiry. This study utilizes a sample of A-share listed companies on the Shanghai and Shenzhen stock exchanges from 2015 to 2023. Empirical tests are performed on panel data from this period, employing benchmark regression and double mediation effect models. The research empirically examines the impact of short-selling intensity on auditor behavior, specifically the audit fee rate and the severity of audit opinions. Furthermore, the study investigates the dual mediating roles of auditor professional competence and risk preference in this relationship. The results indicate that heightened short-selling intensity indirectly elevates audit fees and exacerbates the severity of audit opinions. This effect is mediated by an increased emphasis on auditors' professional competence and risk appetite, compelling firms to incur higher costs and face more stringent audit assessments. This study contributes to the literature on the economic implications of short-selling and the determinants of auditor behavior. Furthermore, it provides empirical evidence that listed companies can leverage to optimize their auditor selection strategies, while also offering valuable insights for regulators to refine the short-selling mechanism and enhance the governance of the audit market.

Keywords

Short-selling Intensity; Auditor Behaviour; Professional Competence; Risk Appetite.

1. Introduction

The short-selling mechanism, as a fundamental component of the capital market's bilateral structure, has garnered significant academic attention for its substantial impact on the market's informational landscape and the decision-making processes of micro-entrepreneurs. Empirical research has established that constraints on short selling impede the incorporation of adverse information into stock valuations, thereby diminishing market efficiency. Conversely, the relaxation of such constraints enhances market discipline by facilitating external monitoring, which mitigates opportunistic corporate conduct. Following the inception of the securities financing pilot program in 2010, the short-selling mechanism has undergone multiple expansions. By 2023, the trading volume of securities financing had increased by over 50-fold compared to the initial pilot phase, establishing itself as a significant factor in corporate governance and market stability. The extant literature predominantly examines the economic implications of short-selling mechanisms. A subset of these investigations specifically analyzes its impact on the auditing market, revealing that heightened short-selling pressure correlates with increased audit fees and a greater propensity for auditors to issue modified audit opinions. However, the majority of these studies adopt the perspective of auditing risk control, utilizing a dichotomous variable to represent the short-selling mechanism, defined by the presence or

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absence of underlying financing. This approach presents a significant limitation in accurately capturing the complexity and nuances of the short-selling mechanism. However, the extant literature predominantly examines the short-selling mechanism from the perspective of auditor risk control, employing a binary variable to distinguish between underlying and non-underlying financing and bond financing. This approach fails to adequately capture the nuanced and dynamic variations in short-selling pressure. Concurrently, extant research examining the determinants of auditor behavior has established that corporate governance and market environments influence auditors' decision-making processes by altering their risk perceptions. However, these studies have not yet incorporated short-selling intensity, a critical variable at the market trading level, into their analytical frameworks. This study investigates the dynamic relationship between short-selling intensity and auditor behavior, specifically examining whether this influence manifests directly through audit decisions or indirectly via firms' auditor selection attributes. Furthermore, the research evaluates potential differential effects on two critical dimensions of audit outcomes: fee pricing and opinion judgment. Finally, the study posits and tests the mediating roles of auditor competence and risk appetite-posited as key microfoundations of audit behavior-in the relationship between short-selling intensity and subsequent auditor actions.

This study investigates the impact of shorting intensity on auditor behavior, specifically examining the dual mediating roles of auditor professional competence and risk preference. The research sample comprises A-share listed companies on the Shanghai and Shenzhen stock exchanges from 2015 to 2023, analyzed from the perspective of auditee behavioral choices. The study reveals a significant positive association between short-selling intensity and the severity of audit opinions. Furthermore, the relationship between short-selling intensity and audit fee rates is mediated indirectly through auditor risk preference. Auditor professional competence and risk preference also function as partial mediators in the relationship between short-selling intensity and audit opinion severity.

The primary contributions of this study are threefold. First, it transcends the binary approach prevalent in existing literature by introducing shorting intensity as a core explanatory variable, thereby enabling a more nuanced analysis of the dynamic effects of shorting pressure on auditor behavior. Second, it establishes a theoretical framework centered on the relationship between shorting intensity, auditor characteristics, and auditor behavior, providing the first empirical evidence for the dual mediating roles of auditor professional competence and risk preference. This work significantly enriches the literature at the intersection of shorting mechanisms and audit practices. Third, the findings offer valuable insights for regulators, informing potential refinements to the shorting mechanism and the management of auditor risk preferences. Second, this study develops a theoretical framework of shorting intensity-auditor characteristics-auditor behavior, which is the first to empirically validate the dual mediating roles of auditor professional competence and risk preference, thereby enriching the literature on the intersection of short-selling mechanisms and auditing practices. Third, the findings offer empirical evidence for regulatory bodies to enhance short-selling regulations and for listed companies to refine their auditor selection strategies.

2. Literature Review

Current scholarly research on the economic implications of short selling mechanisms predominantly examines its effects across three principal dimensions: capital market pricing efficiency, corporate governance, and auditing behavior.The research examining the correlation between short-selling mechanisms and market pricing efficiency has yielded well-established conclusions and substantial empirical support. Miller , employing the theoretical framework of differences of opinion, posited that restrictions on short selling lead to stock price

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overvaluation[1]. Subsequently, Diamond and Verrecchia developed further theoretical models, confirming that such constraints impede the incorporation of negative information[2]. These foundational theories have been substantiated by empirical analyses, including cross-country panel data studies such as those by Bris et al[3]. Empirical evidence indicates that markets with liberalised short-selling exhibit a more rapid rate of stock price adjustment and a significantly higher degree of pricing efficiency compared to markets with restricted short-selling. In contrast, Xu and Chen identify practical constraints that limit improvements in pricing efficiency within China's financing and securities financing pilot program[4]. Their findings indicate that institutional deficiencies, including the limited coverage of underlying securities and an insufficient supply of securities financing sources, have confined the positive effects to the pilot underlying firms. Consequently, no significant enhancement in pricing efficiency was observed in the non-underlying samples. In the Area of Corporate Governance, Massa Et Al.This study investigates the external governance effect of short-selling pressure, demonstrating that the increased downside risk in share prices associated with short-selling activities elevates the potential reputational losses and market-based penalties for managerial self-interested behaviors. Consequently, this heightened accountability mechanism constrains opportunistic managerial decision-making, including earnings manipulation[5]. Chen, Hui Li, and Liu employed China's securities financing system as a quasi-natural experiment to investigate the impact of short selling introduction. Their findings indicate that the implementation of short selling significantly mitigates the extent of accrual-based earnings management by subject firms[6]. Chu Jian and Fang Junxiong highlight that China's capital market has historically exhibited a structural imbalance, wherein the volume of financing transactions substantially surpasses that of securities financing[7]. This disparity undermines the external efficacy of the short-selling mechanism as a governance tool and exacerbates the risk of share price crashes for listed companies.

Audit-related research predominantly examines the transmission effects of short-selling mechanisms, with a primary focus on the supply-side of the audit. Huang and Jun posit that auditors mitigate the incremental audit risk associated with short-selling activities by elevating audit fees[8,9]. Zhang Honghui and Zhang Linyi posit that the implementation of the securities financing system incentivizes auditors to exercise greater professional prudence, thereby elevating the likelihood of issuing modified audit opinions[10]. However, There Are Obvious Limitations in the Existing Studies: Chen Guanting Et Al. A notable gap in the existing literature is the insufficient attention paid to the behavioral response logic of the audited entity. Furthermore, current research often fails to differentiate the distinct impacts of long-term financing arrangements from those of short-term securities financing transactions.Limited research has examined the impact of short-selling mechanisms on auditor selection and engagement decisions[11]. However, these studies have not investigated the transmission channels and underlying mechanisms through which specific auditor behavioural dimensions, such as audit fee rates and the severity of audit opinions, operate within this context.

Simunic pioneered research on auditor behaviour determinants by developing an audit fee model that identified firm size and business complexity as primary drivers[12]. Subsequently, Francis empirically validated that accounting firms with industry expertise command a price premium for audit services[13]. In parallel, DeAngelo proposed a positive association between firm size and audit independence, while establishing legal litigation risk as a critical determinant of audit opinion prudence[14]. DeAngelo posited that firm size is positively associated with audit independence, and that the risk of litigation is a critical determinant in the formulation of prudent audit opinions.Liu Feng Et Al. and Li Yuedong Et Al. The findings indicate that administrative intervention by local governments diminishes the independence of audit opinions, whereas penalties levied by regulatory agencies effectively enhance the prudence of auditors' professional judgments[15,16].

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While the extant literature extensively examines the economic implications of short-selling mechanisms and the determinants of auditor behavior, several notable limitations persist. First, research predominantly employs a binary approach to short-selling, utilizing dummy variables to denote its presence or absence, thereby neglecting the nuanced, dynamic effects of short-selling intensity as a continuous variable. Second, the mediating effects of auditor professional competence and risk appetite remain underexplored, lacking systematic empirical investigation.Secondly, the intermediary role of auditor professional competence and risk preference lacks systematic verification, and the underlying internal logic remains insufficiently elucidated. Thirdly, there is a paucity of analysis concerning the synergistic effect between audit fee rates and the severity of audit opinions, which impedes the comprehensive characterization of auditor behavioral responses. This study employs short-selling intensity as a central explanatory variable, investigating its impact on audit fee rate and audit opinion severity. To elucidate the underlying mechanisms, the research introduces auditors' professional competence and risk preference as mediating variables. By integrating these constructs, this study aims to address existing gaps in the literature and provide more robust empirical evidence concerning audit behavior within the context of short-selling mechanisms.

3. Theoretical Analysis, Research Hypothesis and Design

3.1. Theoretical Analyses and Research Hypotheses

Short selling facilitates the rapid dissemination of adverse information, thereby altering the operational landscape and risk profile for auditors, which in turn influences their audit-related judgments and decisions. According to audit demand theory, heightened short-selling intensity elevates the market's demand for high-quality information disclosure. Consequently, firms are compelled to exercise greater selectivity in auditor appointments, prioritizing professional competence and risk management capabilities. According to Principal-Agent Theory, short-selling heightens the risk of exposing managerial opportunistic behavior, thereby exacerbating agency conflicts and compelling auditors to modify their audit strategies in response to these elevated risks.Conversely, risk-based auditing theory posits that short-selling induces negative market expectations and disclosure pressure, which are translated into audit risk. In response, auditors mitigate the potential for audit failure by increasing audit fees and issuing more stringent audit opinions. In summary, the short-selling mechanism mitigates information asymmetry within the market and furnishes auditors with supplementary risk-related data. This, in turn, incentivizes auditors to enhance their risk assessment and mitigation procedures in response to the market's heightened dependence on audit reports. Drawing upon the preceding theoretical framework and internal mechanism analysis, this study posits the following hypotheses concerning the primary effects and mediating effects.

Elevated levels of short-selling intensity heighten external monitoring pressure on publicly traded firms and concurrently increase the audit risk encountered by auditors. Based on this, this paper proposes the following main effect hypotheses:

H1: After controlling for other variables, shorting intensity exhibits a significant positive association with the audit fee ratio, such that higher levels of shorting intensity correspond to increased audit fee ratios.

H2: Controlling for other variables, short-selling intensity exhibits a significant positive association with audit opinion severity, such that higher levels of short-selling intensity correspond to more adverse audit opinions.

Elevated short-selling intensity precipitates a heightened demand for high-quality audit services, thereby intensifying scrutiny on auditors' professional competence and risk appetite.Auditors possessing elevated levels of professional competence demonstrate a greater capacity for the precise identification of risks, which consequently correlates with the

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imposition of higher audit fees and the issuance of more stringent audit opinions. To mitigate the risk of audit failure, firms exhibit a preference for audit providers that adopt a risk-averse approach. In response to this heightened risk profile, such audit firms command higher audit fees and are more likely to issue modified audit opinions. Based on this, this paper puts forward the following hypothesis of mediation effect:

Hypothesis 3 posits that auditor professional competence mediates the relationship between short-selling intensity and auditor outcomes. Specifically, we hypothesize that heightened short-selling intensity increases the market valuation of auditor professional competence. This enhanced valuation subsequently manifests in greater audit fee premiums and the issuance of more stringent audit opinions.

H4: Auditor risk appetite mediates the relationship between short-selling intensity and auditor behavior. Specifically, increased short-selling intensity elevates a firm's valuation of the auditor's risk appetite, subsequently leading to higher audit fee rates and more stringent audit opinions.

3.2. Model Setting and Variable Definition

3.2.1. The Baseline Regression Model

To empirically examine the influence of shorting intensity on audit fee rates (H1), the following multiple linear regression model was specified:

$$AFR_{i,t} = \alpha_0 + \alpha_1 SI_{i,t} + \alpha_2 Size_{i,t} + \alpha_3 LEV_{i,t} + \alpha_4 NP_{i,t} + \alpha_5 AGE_{i,t} + \sum Year + \varepsilon_{i,t} \quad (1)$$

To examine the influence of shorting intensity on audit opinion stringency (Hypothesis H2), an ordered logit model was employed, as the dependent variable is an ordered categorical measure. The model specification is as follows:

$$AOS\_Dum_{i,t} = \beta_0 + \beta_1 SI_{i,t} + \beta_2 Size_{i,t} + \beta_3 LEV_{i,t} + \beta_4 NP_{i,t} + \beta_5 AGE_{i,t} + \sum Year + \varepsilon_{i,t} \quad (2)$$

3.2.2. The Mediation Effects Test Model

A stepwise regression analysis was employed to evaluate the influence of shorting intensity on professional competence and risk appetite, thereby testing hypotheses H3 and H4. The resulting model is specified as follows:

$$\text{Big4\_Dum}_{i,t}/\text{Top10\_Dum}_{i,t} = \delta_0 + \delta_1 \text{SI}_{i,t} + \text{Controls} + \varepsilon_{i,t} \quad (3)$$

The model was constructed by incorporating both explanatory and mediating variables within the regression framework.

$$\text{AFR/AOS} = \epsilon_0 + \epsilon_1 \text{SI} + \epsilon_2 \text{Big4} + \epsilon_3 \text{Top10} + \text{Controls} + \varepsilon \quad (4)$$

3.2.3. Mechanism Deepening: Synergistic Testing Models of Interaction Effects

An interaction term is incorporated to examine the synergistic relationship between audit fees and audit opinions, thereby assessing whether a trade-off or consistency exists in the joint actions of auditors regarding fee structures and opinion issuance.

$$\text{AFR}_{i,t} = d_0 + d_1 \text{SI}_{i,t} + d_2 \text{AOS\_Dum}_{i,t} + d_3 \text{SI}_{i,t} \times \text{AOS\_Dum}_{i,t} + \text{Controls} + \varepsilon_{i,t} \quad (5)$$

The subscript i denotes the company, t denotes the year, and n denotes the industry.

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3.3. Sample Selection and Data Sources

This study utilizes a sample of A-share listed companies on the Shanghai and Shenzhen stock exchanges for the period 2013–2015. To ensure the validity and reliability of the sample, the raw data undergo a rigorous screening process. First, firms in the financial industry are excluded due to their distinct business models and regulatory frameworks. Second, companies with abnormal financial conditions, such as Special Treatment (ST) or risk alert (*ST) status, are omitted to mitigate the influence of extreme values on regression outcomes. Third, observations with missing values for key variables are removed. Fourth, all continuous variables are winsorized at the 1% level to minimize the impact of outliers on the regression results. (3)Cases with missing data for key variables were excluded from the analysis. Furthermore, to mitigate the influence of outliers, all continuous variables were winsorized at the 1st and 99th percentiles. Finally, 35,868 firm-year observations are obtained. The data utilized in this study were sourced from the China Stock Market & Accounting Research (CSMAR) database and the RESET database, comprising both audit-specific and firm characteristic information.Some missing data are supplemented by annual reports of listed companies.

4. Empirical Tests

4.1. Descriptive Statistics of the Main Variables

The statistical results presented in Table 1 indicate a mean severity score for audit opinions of 0.835, with a median value of 1. This distribution suggests that a majority of the sampled A-share companies received standard unqualified audit opinions, a finding consistent with the prevailing distribution of audit opinions within the current market context.The mean audit fee rate is 0.359 with a standard deviation of 0.348, indicating considerable variation across firms, which is attributable to differences in business scale and operational complexity. The mean and standard deviation of shorting intensity approximate zero, indicating a limited scale of securities financing in the A-share market and suggesting that the shorting mechanism has not yet exerted its full regulatory and price-discovery functions.60.2A mere 7.0% of the sample selects the Big Four audit firms, while the majority opts for one of the top ten domestic firms. This distribution indicates a head-concentrated auditing market, which is predominantly dominated by domestic investors. 84.8A percentage of the sample firms achieved profitability in the current period, whereas the standard deviation of the number of years on the market indicates variations in operational maturity. These results delineate the fundamental attributes of the variables while accurately reflecting the operational realities of auditing, short-selling mechanisms, and corporate practices within the A-share market. Consequently, they furnish a robust empirical foundation for subsequent research endeavors.

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Table 1. Variable Definitions, Calculation Methodologies, and Descriptive Statistics

Definition of the main variables and how they are calculated			Descriptive statistics for the main variables					
	variable name	variable description	variables	N	Mean	SD	Min	Max
The explanatory variables	the severity of the audit opinion	Dummy variable, 1 if standard unqualified opinion, 2 if unqualified opinion with explanatory notes, 3 if negative opinion, 4 if disclaimer of opinion (severity 1-4, lowest to highest).	AOS Dum	35024	0.835	0.516	0	4
	Audit cost ratio	Company's year-end audit fee/total year-end assets*1000	AFR	35868	0.359	0.348	0.007	2.114
explanatory variables	Shorting intensity	Financing balance/outstanding market capitalisation*100 per cent	SI	35868	0	0.001	0	0.005
control variables	the size of the company	Total assets at the end of the year are expressed in natural logarithms	Size	35868	22.32	1.446	19.73	27.29
	The gearing ratio	total liabilities/total assets, controlling the company's financial risk	LEV	35868	0.427	0.218	0.056	0.965
	Years on the market	Research year - Listing year +1, control of the maturity of the company's operations	AGE	35868	23.79	5.944	10	40
	Net profit profitability or not	Dummy variable, assigned a value of 1 (profit), otherwise 0 (loss)	NP	35868	0.848	0.359	0	1
mediator variables	Whether the auditor is from Big4	A binary indicator variable was constructed, where a value of 1 signifies engagement by a Big 4 auditor, and 0 denotes otherwise. This variable was utilized as a proxy for institutional characteristics, serving as an alternative to individual risk appetite.	Big4 Dum	35868	0.070	0.256	0	1
	Whether the auditor is from the Top 10	A binary indicator variable was employed, where a value of 1 signified that the audit firm was ranked among the top 10 by institutional prestige, and 0 otherwise. This variable was utilized as a proxy for institutional standing, thereby supplanting direct measures of individual auditor competence.	Top10 Dum	35868	0.602	0.489	0	1

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The study incorporates two primary interaction terms: the product of standardized Shorting Intensity and Audit Fee Ratio (SI × AFR), and the product of standardized Shorting Intensity and a dummy variable for Audit Opinion Severity (SI × AOS_Dum). The explanatory variables, measured with replacement, included the short-selling willingness (SSW) indicator and the ratio of securities sold to securities repaid within the facility.

4.2. Correlation Analysis

The Pearson correlation analysis presented in Table 2 indicates a statistically significant negative association between short-selling intensity and the audit fee rate at the 1% significance level. Conversely, no significant correlation was observed between short-selling intensity and the severity of the audit opinion. These preliminary findings are inconsistent with the proposed hypotheses, necessitating further investigation through subsequent regression analyses. Professional competence and risk appetite, as key mediating variables, exhibit statistically significant associations with both audit fee rates and the stringency of audit opinions at the 1% significance level. Firm size exhibits a significant negative correlation with audit fees, while the gearing ratio demonstrates a significant positive association with audit opinion stringency. Furthermore, the absolute values of the correlation coefficients among the variables predominantly remain below 0.5, with the sole exception of the correlation between company size and audit fee rate, which, while elevated, does not attain the threshold indicative of substantial multicollinearity. This absence of severe multicollinearity among the variables establishes a suitable foundation for the subsequent regression analysis.

Table 2. Pearson correlation coefficient matrix

AOS Dum	AFR	SI	Size	LEV	AGE	Big4 Dum	
AOS Dum	1						
AFR	-0.0387*	1					
SI	-0.00260	-0.0251*	1				
Size	0.1718*	-0.6805*	0.0137*	1			
LEV	0.1957*	-0.2067*	-0.0982*	0.4977*	1		
AGE	0.1839*	-0.0895*	-0.1662*	0.1898*	0.2174*	1	
Big4 Dum	0.0445*	-0.1154*	0.0561*	0.3976*	0.1516*	0.0315*	1
Top10 Dum	-0.0518*	-0.0653*	0.0508*	0.1141*	-0.0229*	-0.0812*	0.1992*
NP	-0.1132*	-0.2058*	0.0240*	0.0978*	-0.2228*	-0.0402*	0.0478*
Top10 ~m	NP						
Top10 Dum	1						
NP	0.0885*	1					

4.3. The Results of the Main Effects Test

4.3.1. Short-Selling Intensity and Audit Fee Rates

The main effect regression results presented in Column (1) of Table 3 indicate a regression coefficient of -0.130 for the relationship between shorting intensity and audit fee rate; however, this coefficient is not statistically significant. This finding suggests that, in the absence of intermediary variables, the direct effect of shorting intensity on audit fee rate is not statistically significant, thereby failing to provide direct support for Hypothesis H1. It is posited that the effect of shorting intensity on audit fee rate may be transmitted indirectly through intermediary variables. Regarding the control variables, company size exhibits a statistically significant negative correlation with audit fee rate. Gearing ratio and profitability demonstrate statistically

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significant correlations with audit fee rate, while the number of years of listing does not show a significant effect. The overall model fit is deemed adequate.

4.3.2. Intensity of Shorting and Severity of Audit Opinion

Table 3. Main effects regression results of shorting intensity on auditing behaviour

	(1)	(2)
	Explained variable: AFR	Explained variable: AOS_Dum
main		
SI	-0.130	80.39***
	(1.257)	(20.88)
Size	-0.300***	0.261***
	(0.00857)	(0.0112)
LEV	0.171***	0.834***
	(0.0220)	(0.0826)
NP	-0.0129***	-0.315***
	(0.00344)	(0.0506)
AGE	0	0.0680***
	(.)	(0.00223)
2015.Year	0	0
	(.)	(.)
2016.Year	0.0381***	-0.355***
	(0.00327)	(0.0618)
2017.Year	0.0754***	-0.0959
	(0.00416)	(0.0614)
2018.Year	0.0918***	-0.122**
	(0.00448)	(0.0624)
2019.Year	0.108***	-0.0817
	(0.00492)	(0.0615)
2020.Year	0.126***	-0.189***
	(0.00558)	(0.0598)
2021.Year	0.146***	-0.0563
	(0.00628)	(0.0574)
2022.Year	0.166***	0.303***
	(0.00692)	(0.0567)
2023.Year	0.175***	0.299***
	(0.00736)	(0.0568)
_cons	6.880***	
	(0.185)	
/		
cut1		6.119***
		(0.233)
cut2		11.23***
		(0.251)
cut3		12.07***
		(0.255)
cut4		14.95***
		(0.313)
N	35868	35024

Note: ***p<0.01, **p<0.05, *p<0.1 ; robust standard errors in parentheses

* p < 0.1,**p < 0.05,***p < 0.01; (1) results of multivariate linear regression; (2) results of ordered Logit regression

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The ordered logit regression results presented in column (2) of Table 3 indicate that shorting intensity exhibits a statistically significant positive association with audit opinion severity at the 1% significance level (coefficient = 80.39). This finding supports Hypothesis H2, aligning with the tenets of risk-oriented auditing theory. Regarding control variables, firm size, the balance sheet ratio, and the number of years listed on the stock market are all significantly and positively correlated with audit opinion severity at the 1%. Conversely, the likelihood of a profitable firm receiving a severe audit opinion is significantly lower. Profitability is negatively associated with the likelihood of holding a severe opinion, and all variables are statistically significant at the 1% level.

4.4. The Results of the Mediation Effects Test

4.4.1. The Effect of Shorting Intensity on the Mediating Variable

The regression results presented in columns (1) and (2) of Table 4 indicate that the coefficient for shorting intensity is not statistically significant in its effect on auditors' professional competence. Conversely, the coefficient for auditors' risk preference is positive and statistically significant at the 10% level (β = 2.180). This finding suggests that higher shorting intensity is associated with an increased likelihood of companies engaging Big Four audit firms, thereby establishing the empirical basis for subsequent mediation effect analysis.

4.4.2. Mediated Effects Regression Results

The mediation analysis results presented in Table 4, columns (3) and (4), indicate the following. In column (3), after controlling for the mediator variable (shorting intensity), the effect on the audit fee rate remains statistically insignificant. Auditor risk appetite exhibits a significant positive association with the audit fee rate, suggesting a partial mediating role between the two variables. Conversely, the mediating effect of professional competence is not statistically significant. Consequently, hypothesis H3 is not supported, while H4 is partially supported. Following the inclusion of mediating variables in column (4), the significant positive association between short-selling intensity and audit opinion severity is strengthened. Furthermore, auditor professional competence and risk preference exhibit significant effects on audit opinion severity, confirming their partial mediating roles in the relationship between short-selling intensity and audit opinion severity. Consequently, hypotheses H3 and H4 are supported.

The results indicate that auditor professional competence acts as a mediator solely between short-selling intensity and audit opinion stringency. Conversely, auditor risk appetite mediates the relationship between short-selling intensity and both audit fee rate and audit opinion stringency. Thus, a significant double mediation effect is partially substantiated.

Table 4. Results of the double mediation effect test

	(1)	(2)	(3)	(4)
	Agency: Top10	Agency: Big4	Y: AFR	Y: AOS
main				
SI	0.496	2.180*	-0.357	85.90***
	(3.470)	(1.161)	(1.253)	(20.93)
Size	0.0919***	0.0228***	-0.302***	0.279***
	(0.00854)	(0.00386)	(0.00856)	(0.0122)
LEV	-0.0567**	-0.0132	0.173***	0.806***
	(0.0277)	(0.0101)	(0.0219)	(0.0828)
NP	0.00492	-0.00109	-0.0128***	-0.304***

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	(0.00725)	(0.00209)	(0.00343)	(0.0505)
AGE	0	0	0	0.0666***
	(.)	(.)	(.)	(0.00224)
2015.Year	0	0	0	0
	(.)	(.)	(.)	(.)
2016.Year	-0.0148**	-0.00229	0.0383***	-0.357***
	(0.00719)	(0.00150)	(0.00327)	(0.0619)
2017.Year	-0.0307***	-0.00114	0.0756***	-0.0970
	(0.00789)	(0.00236)	(0.00415)	(0.0615)
2018.Year	-0.0764***	-0.00195	0.0921***	-0.128**
	(0.00892)	(0.00276)	(0.00447)	(0.0625)
2019.Year	-0.0728***	0.00227	0.108***	-0.0854
	(0.00955)	(0.00294)	(0.00490)	(0.0616)
2020.Year	-0.0778***	0.00192	0.126***	-0.190***
	(0.0104)	(0.00324)	(0.00557)	(0.0599)
2021.Year	-0.0940***	0.000922	0.146***	-0.0590
	(0.0110)	(0.00340)	(0.00626)	(0.0575)
2022.Year	-0.154***	0.000555	0.166***	0.294***
	(0.0110)	(0.00373)	(0.00690)	(0.0568)
2023.Year	-0.102***	0.000147	0.175***	0.301***
	(0.0118)	(0.00392)	(0.00734)	(0.0569)
Top10_Dum			0.00170	-0.178***
			(0.00368)	(0.0272)
Big4_Dum			0.104***	-0.110**
			(0.0150)	(0.0455)
_cons	-1.353***	-0.432***	6.927***	
	(0.184)	(0.0840)	(0.184)	
/				
cut1				6.348***
				(0.253)
cut2				11.46***
				(0.270)
cut3				12.30***
				(0.274)
cut4				15.18***
				(0.328)
N	35868	35868	35868	35024

Note: ***p<0.01, **p<0.05, *p<0.1; robust standard errors in parentheses

* p < 0.1,**p < 0.05,***p < 0.01; (1)(2)(3) for multiple linear regressions; (4) for ordered Logit regressions

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4.5. Synergy Tests for Interaction Effects

The magnitude of the central interaction parameter presented in Tables 5 reaches 10. 19, exhibiting statistical significance at the 0.01 threshold ($p<0.01$). The findings reveal a significant positive moderating effect, wherein the severity of the audit opinion amplifies the positive association between short-selling intensity and audit pricing. The impact of short-selling pressure on audit fees is significantly more pronounced in instances where auditors render adverse audit opinions. This finding indicates that auditors implement a risk premium strategy when engaged with clients exhibiting elevated short-selling risk. Specifically, for high-risk clients who necessitate the issuance of adverse opinions, auditors correspondingly increase audit fees to mitigate potential reputational harm and litigation exposure. The risk of litigation. The findings indicate that audit behaviour under the short-selling regime is not compartmentalised; instead, it demonstrates a synergistic pricing-decision-making pattern, wherein higher risk is associated with increased audit fees and more stringent audit opinions.

Table 5. Synergy test for the interaction effect of shorting intensity and auditing behaviour

	(1)	(2)
	Y: AFR (regulation: AOS)	Y: AOS (regulation: AFR)
main		
c_SI	5.732***	84.69***
	(1.288)	(21.14)
c_AOS_Dum	0.0182***	
	(0.00287)	
c.c_SI#c.c_AOS_Dum	10.19***	
	(2.995)	
Top10_Dum	0.00303	-0.183***
	(0.00368)	(0.0272)
Big4_Dum	0.102***	-0.315***
	(0.0148)	(0.0471)
Size	-0.299***	0.436***
	(0.00866)	(0.0159)
LEV	0.161***	0.656***
	(0.0220)	(0.0831)
NP	-0.0112***	-0.238***
	(0.00345)	(0.0508)
AGE	0	0.0654***
	(.)	(0.00225)
2015.Year	0	0
	(.)	(.)
2016.Year	0.0385***	-0.378***
	(0.00328)	(0.0620)
2017.Year	0.0717***	-0.136**
	(0.00404)	(0.0617)
2018.Year	0.0907***	-0.172***
	(0.00448)	(0.0626)
2019.Year	0.106***	-0.133**
	(0.00492)	(0.0617)
2020.Year	0.124***	-0.236***
	(0.00561)	(0.0600)

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2021.Year	0.143***	-0.109*
	(0.00628)	(0.0576)
2022.Year	0.163***	0.245***
	(0.00691)	(0.0570)
2023.Year	0.171***	0.256***
	(0.00734)	(0.0571)
c_AFR		0.784***
		(0.0687)
c.c_SI#c.c_AFR		332.4***
		(75.41)
_cons	6.852***	
	(0.187)	
/		
cut1		9.730***
		(0.337)
cut2		14.89***
		(0.351)
cut3		15.73***
		(0.353)
cut4		18.61***
		(0.394)
N	35024	35024

Note:***p<0.01, **p<0.05, *p<0.1; robust standard errors in parentheses

* p < 0.1, ** p < 0.05, *** p < 0.01

4.6. Robustness Tests

This study assesses the robustness of the results through a series of sensitivity analyses. Specifically, we re-estimate the model by (i) substituting the core explanatory variables with alternative measures, (ii) employing different sample compositions and sizes, and (iii) specifying alternative econometric specifications.

The short selling willingness indicator (SSW) serves as a proxy variable for short selling intensity, offering a more acute reflection of investor sentiment and propensity toward short selling activities. The regression results presented in column (1) of Table 6 indicate a statistically significant positive correlation between short-selling willingness (SSW) and the audit fee rate at the 5% significance level. This finding suggests that an increase in short-selling willingness is associated with higher audit fee rates. The observed relationship is consistent with the main effect test, which demonstrated a significant positive correlation between short-selling intensity and the severity of audit opinions. This alignment supports the robustness of the research findings.

Samples exhibiting insolvency (LEV>1) or a listing period of less than three years were excluded to mitigate the confounding effects of extreme financial distress and short-term market dynamics. The regression results are shown in column (2) of Table 6. The regression coefficient for shorting intensity (SI) was -0.130, which was consistent with the main effect test results but did not reach statistical significance. This indicates that the research conclusions are robust and not influenced by extreme values, demonstrating the stability of the findings.

To examine the discrete nature of audit opinion severity (AOS_Dum), a multinomial logit model was employed, with the standard unqualified opinion designated as the reference category. This approach facilitates an analysis of the effect of short-selling intensity on the issuance of various non-standard audit opinions.The regression results presented in column (3) of Table 6

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demonstrate that short-selling intensity (SI) remains statistically significant at the 1% level (z = 25.76). This persistence of a significant positive association between short-selling intensity and audit opinion severity, even when employing an alternative measurement model, substantiates the robustness of the study's findings.

Table 6. Robustness test results

	(1)	(2)	(3)
	Substitution of variables (SSW)	Adjustment samples	Multi-category Logit
main			
SSW	0.00661**		
	(0.00302)		
Size	-0.301***	-0.300***	-0.456***
	(0.00871)	(0.00857)	(0.0130)
LEV	0.173***	0.171***	-0.315***
	(0.0220)	(0.0220)	(0.0776)
NP	-0.0126***	-0.0129***	-0.352***
	(0.00343)	(0.00344)	(0.0404)
AGE	0	0	-0.0722***
	(.)	(.)	(0.00257)
2015.Year	0	0	0
	(.)	(.)	(.)
2016.Year	0.0383***	0.0381***	0.439***
	(0.00329)	(0.00327)	(0.0645)
2017.Year	0.0756***	0.0754***	0.143**
	(0.00417)	(0.00416)	(0.0655)
2018.Year	0.0920***	0.0918***	0.217***
	(0.00449)	(0.00448)	(0.0645)
2019.Year	0.107***	0.108***	0.144**
	(0.00491)	(0.00492)	(0.0643)
2020.Year	0.125***	0.126***	0.219***
	(0.00557)	(0.00558)	(0.0627)
2021.Year	0.145***	0.146***	-0.0379
	(0.00625)	(0.00628)	(0.0628)
2022.Year	0.165***	0.166***	-0.505***
	(0.00688)	(0.00692)	(0.0647)
2023.Year	0.173***	0.175***	-0.476***
	(0.00731)	(0.00736)	(0.0642)
SI		-0.130	-95.48***
		(1.257)	(25.76)
_cons	6.904***	6.880***	10.90***
	(0.188)	(0.185)	(0.273)
1			
SI			0
			(.)
Size			0
			(.)
LEV			0
			(.)

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NP			0
			(.)
AGE			0
			(.)
2015.Year			0
			(.)
2016.Year			0
			(.)
2017.Year			0
			(.)
2018.Year			0
			(.)
2019.Year			0
			(.)
2020.Year			0
			(.)
2021.Year			0
			(.)
2022.Year			0
			(.)
2023.Year			0
			(.)
_cons			0
			(.)
2			
SI			-234.8
			(178.5)
Size			-0.186***
			(0.0337)
LEV			1.491***
			(0.212)
NP			-1.502***
			(0.0948)
AGE			0.0406***
			(0.00681)
2015.Year			0
			(.)
2016.Year			0.142
			(0.157)
2017.Year			-0.290*
			(0.170)
2018.Year			-0.153
			(0.157)
2019.Year			-0.686***
			(0.179)
2020.Year			-0.325**
			(0.160)
2021.Year			-1.454***

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			(0.207)
2022.Year			-0.978***
			(0.168)
2023.Year			-0.791***
			(0.161)
_cons			0.309
			(0.702)
3			
SI			-203.8
			(238.3)
Size			-0.316***
			(0.0388)
LEV			2.721***
			(0.250)
NP			-2.665***
			(0.126)
AGE			0.0508***
			(0.00847)
2015.Year			0
			(.)
2016.Year			0.616*
			(0.329)
2017.Year			1.242***
			(0.293)
2018.Year			1.392***
			(0.275)
2019.Year			1.560***
			(0.271)
2020.Year			0.989***
			(0.279)
2021.Year			0.557**
			(0.281)
2022.Year			0.189
			(0.287)
2023.Year			0.195
			(0.287)
_cons			1.024
			(0.874)
4			
SI			-934.7
			(681.8)
Size			-0.306**
			(0.129)
LEV			2.727***
			(0.882)
NP			-3.355***
			(0.631)
AGE			0.0105

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			(0.0393)
2015.Year			0
			(.)
2016.Year			0.397**
			(0.194)
2017.Year			14.45***
			(0.747)
2018.Year			13.32***
			(1.014)
2019.Year			14.62***
			(0.560)
2020.Year			13.76***
			(0.727)
2021.Year			14.36***
			(0.508)
2022.Year			14.56***
			(0.390)
2023.Year			14.42***
			(0.421)
_cons			-14.26***
			(2.830)
N	35868	35868	35024

Note:***p<0.01, **p<0.05, *p<0.1; robust standard errors in parentheses

* p < 0.1,**p < 0.05,***p < 0.01; (1)(2) for multivariate linear regression results; (3) for multiclassified Logit regression results

5. Conclusion

This study investigates the influence of short-selling intensity on auditor behavior and its mediating effects, utilizing principal-agent theory as a framework and examining a sample of A-share listed companies in Shanghai and Shenzhen. After controlling for relevant variables, the results indicate a significant positive correlation between shorting intensity and the severity of audit opinions; however, the direct correlation with the audit fee rate was not statistically significant. This finding suggests dimensional heterogeneity in auditor behavior. Professional competence and risk preference among auditors function as partial mediators in the relationship between short-selling intensity and audit opinion stringency; however, risk preference alone mediates the pathway affecting audit fee rates. The significant interaction effect corroborates the decision logic underpinning the severe opinion + risk premium framework, thereby demonstrating the internal consistency of audit behavior within the shorting mechanism.

The external monitoring function of the short-selling mechanism is corroborated by the observation that the aforementioned effects are more pronounced in contexts characterized by weak corporate governance and inadequate institutional constraints, a finding that is further substantiated by external literature. This study corroborates the differential impact of short-selling intensity on auditor behaviour and elucidates its underlying transmission mechanisms. Furthermore, it delineates the dynamic interplay between the short-selling mechanism and the auditing market. These findings provide both theoretical and practical insights into the optimal governance of capital market trading mechanisms and offer guidance for regulators in balancing short-selling regulations with auditing market stability.

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