

Managerial Ownership and Stock Price Crash Risk: The Mediating Roles of ESG Rating Disagreement, Analyst Coverage and Undervaluation

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Abstract. This study investigates the impact of managerial ownership on stock price crash risk in China, challenging the assumption that such ownership resolves agency problems. Using a sample of 14,106 firm-year observations from 2010 to 2021, we employ panel data analysis and mediation tests. Results indicate that managerial ownership significantly increases stock price crash risk. ESG rating disagreement and company undervaluation negatively mediate this relationship, while analyst coverage positively mediates it. Subgroup analyses reveal that the effect is stronger for firms not audited by Big Four accounting firms, non-heavily polluting firms, and those in regions with high digitalization. These findings contribute to the literature on corporate governance by extending the "rational economic man" theory to managerial behavior and highlighting the limitations of managerial ownership as a solution to agency problems in the Chinese context.

Keywords: agency problem; stock price crash risk; managerial ownership; rational economic man

1. Introduction

Managerial ownership is currently a popular practice for addressing agency problems. From the perspective of agency theory, having management as shareholders can lead them to be more inclined to consider shareholder interests and the future interest of the company when making decisions (Rashid, 2016). But does this approach truly resolve the agency problem? Despite there are regularly general meetings and shareholders having voting rights on significant company matters, the day-to-day operations of the company are still decided by management. Since ordinary shareholders cannot directly manage daily affairs within the business and typically, management does not hold company shares, we argue that shareholder-managers are a special kind of shareholder. These shareholders can directly participate in daily operations. Compared to other shareholders, they have a greater information advantage since their approaches for obtaining information are not limited to attending general meetings and accessing publicly released financial reports. From the perspective of "rational economic man" in economics (Phillips, 2023), we believe that shareholder-managers will use their advantages to seek private benefits. In other words, managerial ownership does not fully resolve the agency problem. Because management with ownership may seek to gain benefits related to the company's stock, they are likely to manipulate stock prices, which could lead to stock price crashes.

We examine whether managerial ownership raises stock price crash risk using a sample from the Shanghai and Shenzhen Stock Exchanges for 2010–2021. After adding control variables, we find that managerial ownership can increase crash risk. We then explore mechanisms and identify factors that mitigate this effect. ESG rating disagreement, analyst coverage, and company undervaluation are investigated as mediating variables. Analyst coverage positively mediates this effect, while ESG rating disagreement and company undervaluation reduce it. We also analyse whether company characteristics influence the main results, finding that managerial ownership increases crash risk more in companies not audited by Big Four firms, those with lower pollution, and those in high-digitalization regions.

This paper makes contributions of expand the theory of "rational economic man" to management research, enrich the research on the negative impacts of managerial ownership and agency problem.

First, the "rational economic man" concept is used in economics to analyse the behaviour of market participants such as firms and households (Lu and Hao, 2022), and to explain microeconomic phenomena like investor and consumer behaviours (Thaler, 2016). Mushinada and Veluri (2019) found that rational investors can boost returns by improving self-attribution and reducing overconfidence. Rational investors, aiming to maximize benefits, may gather excessive information, which can hinder decision-making. This paper applies this concept to managerial ownership, suggesting that while it introduces new incentives for management to influence stock prices, it does not fundamentally change managerial roles or address agency problem.

Second, we enrich the research on the negative impacts of managerial ownership especially in the context of developing countries. Mandacı and Gumus (2010) found that managerial ownership negatively impacts company value in Turkey. Zondi and Sibanda (2015) observed that while managerial ownership aligned interests between management and shareholders in South African retail companies, it did not enhance performance. Saidu and Gidado (2018) reported that managerial ownership could harm financial performance in Nigeria, suggesting it should be avoided. Haghghi and Safari Gerayli (2020) found that managerial ownership increases stock price crash risk in Iran. Since managerial ownership is currently a popular method for addressing agency problems in China, we want to explore whether the drawbacks of managerial ownership observed in other developing countries also exist in China. We found that managerial ownership does not effectively solve agency problems in corporate governance for Chinese companies and can lead to an increased risk of stock price crashes.

Third, this paper advances research on agency problems and agency costs. While managerial ownership was intended to address agency issues (Benson and Davidson, 2009; Mustapha and Che Ahmad, 2011), our study reveals that it not only fails to resolve these problems but also creates new

agency costs due to management's dual role. Subgroup analysis shows that external oversight, such as audits by Big Four firms and investor scrutiny, significantly affects the relationship between managerial ownership and stock price crash risk. This implies that enhancing external supervision, rather than relying solely on managerial ownership, is crucial for addressing agency problems. Therefore, companies should be encouraged to undergo Big Four audits, and investors should actively monitor and support corporate governance.

The structure of the paper is as follows: Section 2 reviews the literature and outlines our hypotheses. Section 3 details the data and key variables utilized. Section 4 discusses the research methodology and primary findings. Section 5 offers results from additional analyses. Finally, Section 6 presents the conclusion.

2. Literature Review and Seven Hypotheses

2.1. Managerial ownership and stock price crash risk

In economics, the "rational economic man" is someone who maximizes utility within resource and information constraints (Phillips, 2023). Managers, seeking to maximize their private interests, may therefore engage in practices like concealing negative information and earnings management (He, 2023; Jaggi and Tsui, 2007; O'Callaghan et al., 2018). Additionally, due to their limited tenure, managers might pursue "short-sighted" policies that enhance short-term profitability at the expense of long-term development (Saidu and Gidado, 2018).

Huang and Ho (2023) and Li et al. (2020) show that stock price crashes often stem from companies hiding negative information over time. When this information emerges, investor confidence wanes, leading to significant stock price fluctuations. Additionally, the loss of long-term growth potential can also cause price crashes, as stock prices reflect investor perceptions of prospects, with fluctuations occurring when prospects are perceived as poor. While studies such as Tejedo-Romero and Araujo (2022) and Sudiyatno et al. (2020) have found positive relationships between managerial ownership and firm profitability, others like Zondi and Sibanda (2015) have found negative or no relationships between managerial ownership and firm value. This contradiction highlights the need for further investigation. Based on this, we propose the hypothesis H1 as follows.

H1. Managerial ownership increases the risk of a company's stock price crash.

2.2. The mechanisms

2.2.1 ESG rating disagreement: According to overinvestment theory, managers may increase investments in social responsibility at the expense of shareholder interests to gain personal benefits. Ongsakul et al. (2021) suggest that managerial ownership can boost a company's social responsibility investments as a buffer against negative events. Firms with strong ESG performance are more likely to disclose their ESG activities, and investing in ESG can genuinely enhance performance and reduce ESG rating disagreements (Kimbrough et al., 2024). Genuine ESG investment supports long-term sustainability and can increase cash flow and profitability while maintaining good supplier and customer relationships (Kotsantonis et al., 2016). Although not financially motivated, such investment improves financial performance over time and reduces stock price crash risk. Therefore, we propose the second hypothesis of this paper:

H2. ESG rating disagreement has negative mediating effect in the process where managerial ownership raises the stock price crash risk.

2.2.2 Analyst coverage: Managerial ownership can increase information asymmetry and mislead investors, particularly when management distorts and withholds accurate company information to hide the company's actual situation (Jaggi and Tsui, 2007). Analysts, who have specialized expertise and access to various information sources, are often relied upon by investors for making investment choices (Huang and Zang, 2008). Although analyst coverage helps reduce information opacity, if analysts uncover and report the negative aspects and risks hidden by management, it can cause investors to panic

and quickly divest their shares, resulting in a noticeable drop in stock prices. This leads to the third hypothesis:

H3. Analyst coverage acts as a positive mediating factor in the process through which managerial ownership increases the stock price crash risk.

2.2.3 Company undervaluation: In this paper, undervaluation is characterized by a high book-to-market ratio, indicating that a company's stock price is below its actual equity value, thus suggesting that the stocks are undervalued. Stocks that are undervalued offer investors a higher margin of safety, as this undervaluation provides a buffer (Donnelly, 2014). Such stocks tend to attract investors with a cautious approach, and even if the company encounters negative news or adverse economic conditions, the price of undervalued stocks is less likely to drop sharply because the market has already priced them lower, offering more protection. This reduced stock price volatility results in a lower likelihood of stock price crashes (Cao et al., 2022). This leads to the hypothesis H4:

H4. Company's market value undervaluation negatively mediates the process of managerial ownership and the stock price crash risk.

2.3. The effects of company characteristics

2.3.1 Non-audited by Big-Four accounting firms: The Big Four accounting firms can provide higher quality audits. Companies with auditors from the Big Four have a lower likelihood of making accounting restatements (Eshleman and Guo, 2014). Through audits of financial reports conducted by the Big Four accounting firms, a company's information asymmetry will decrease. Managerial ownership typically leads to the concealment of negative information and profit manipulation (O'callaghan et al., 2018). Given the higher service quality of the Big Four accounting firms, we believe that companies audited by these firms are less likely to be negatively affected by managerial ownership. In contrast, companies audited by non-Big Four firms, which may be less effective at detecting financial fraud such as earnings management, would experience the greater impact of managerial ownership on stock price volatility. We present the fifth hypothesis:

H5. The effect of managerial ownership on stock price crash risk is stronger in companies non-audited by Big-Four accounting firms.

2.3.2 Non-heavily polluting: Heavily polluting companies attract more scrutiny due to their industry-specific issues (Wu et al., 2022). Investors are concerned that such companies might hide negative information, which could harm their reputation and lead to severe penalties, threatening their operations (Yao et al., 2023). As a result, managerial ownership's ability to manipulate information and profits is limited, so it doesn't significantly affect stock price crashes in these companies. Conversely, in non-heavily polluting companies, less investor attention may allow management to manipulate disclosures and earnings, increasing the risk of stock price crashes. Based on this, we propose the sixth hypothesis:

H6. The effect of managerial ownership on stock price crash risk is more significant in non-heavily polluting companies.

2.3.3 Located in high digitalization region: Managerial ownership may lead management to present more favorable information while hiding negative details to mislead investors (He, 2023). In highly digitalized regions, investors have easier access to company information, making them more susceptible to misleading information from management. Investors might overvalue management's media announcements compared to traditional audited reports, assuming they offer a better informational edge. Since such media-released information is often unverified, it can artificially inflate stock prices and increase volatility. This leads to the seventh hypothesis:

H7. The effect of managerial ownership on stock price crash risk is stronger in companies located in high-digitalization region.

3. Data

3.1. Data sources

Most management holds company stocks for personal gain (Brown et al., 2017), reflecting the behavior of "rational economic man" aiming to maximize their own interests. Macroeconomic fluctuations and policies can impact company performance and stock prices, potentially rendering management incentives ineffective (Chiu et al., 2016). Cai et al. (2022) noted that macroeconomic policy changes can influence internal governance and management's behavior in manipulating stock transactions. Therefore, we exclude data from periods significantly affected by macroeconomic policies to demonstrate that the failure of managerial ownership incentives is due to management's pursuit of personal interests, rather than macroeconomic changes. To address the 2008 financial crisis, recovery policies were implemented in 2009. To avoid the effects of these policies, our dataset starts from 2010. Major macroeconomic policies for the "post-pandemic era" were introduced in 2022 and 2023 (Chen and Zha, 2023), so we end our dataset at 2021. Our dataset spans 12 years from 2010 to 2021, with 14,106 firm-year observations.

The data is sourced from the WIND database and the China Stock Market and Accounting Research (CSMAR) Database. To calculate the mediating variable ESG rating disagreement, we use data from six ESG rating agencies: Bloomberg, Hexun, Huazheng, Wind, Russel, and SynTao Green Finance, following Hu et al. (2023). We collect data for all listed stocks on the Shanghai and Shenzhen Stock Exchanges, excluding financial companies, those designated as Special Treatment, and those with missing values. Constant variables are winsorized at the 1st and 99th percentiles. Data processing and calculations are performed using Stata17.

3.2. Main variables

3.2.1 Dependent variable: We adopted the approach of Cen (2023) to measure stock price crash risk. NCSKEW and DUVOL show a positive correlation with the risk of stock price crashes. NCSKEW signifies a more left-skewed return distribution. DUVOL is less affected by extreme returns (Dang et al., 2022). For the robustness of conclusions, we utilized both NCSKEW and DUVOL in this article.

First, we need to calculate $F_{i,T}$. Its calculation requires the error term from the Equation (1) used to calculate the return of company i in week T .

$$r_{i,T} = c_i + \beta_{1,i}r_{m,T+2} + \beta_{2,i}r_{m,T+1} + \beta_{3,i}r_{m,T} + \beta_{4,i}r_{m,T-1} + \beta_{5,i}r_{m,T-2} + \epsilon_{i,T} \quad (1)$$

$$F_{i,T} = \ln(1 + \hat{\epsilon}_{i,T}) \quad (2)$$

$r_{i,T}$ is the weekly return for company i in week T . $r_{m,T}$ is the weighted market return for company i in week T . $r_{m,T-1}$ and $r_{m,T-2}$ are the weighted market return for company i in last week and the week before last of week T . $r_{m,T+1}$ and $r_{m,T+2}$ are the weighted market return for company i in next week and the week after next of week T . $\epsilon_{i,T}$ is the error term.

Second, we use $F_{i,T}$ to calculate NCSKEW and DUVOL.

$$NCSKEW_{i,T} = \frac{-n(n-1)^{\frac{3}{2}} \sum F^3_{i,T}}{(n-1)(n-2)(\sum F^2_{i,T})^{\frac{3}{2}}} \quad (3) \quad DUVOL_{i,T} = \log\left(\frac{(n_u-1) \sum_{Down} F^2_{i,T}}{(n_d-1) \sum_{Up} F^2_{i,T}}\right) \quad (4)$$

" n " is the total number of trading weeks for company i in one year. " n_u " represents the number of trading weeks when $F_{i,T}$ is larger than annual average return. " n_d " is the number of trading weeks when $F_{i,T}$ is lower than annual average return.

3.2.2 Independent variable— managerial ownership: The independent variable in this article is the percentage of managerial ownership. We multiplied the values of the percentage of managerial ownership by 100 to facilitate subsequent regression analysis.

3.2.3 Mediating variables— ESG rating disagreement: Since different ESG rating agencies have different scoring policy, we standardized all scores from the six rating agencies as the numbers between 1 to 10. In this way, the ESG scores from different agencies could be comparable. Equation (5) and (6)

are for the calculation of ESG rating disagreement following the method of Hu et al. (2023) who also calculate the proxy variable for ESG rating disagreement.

$$ERD_pairwise_{i,t} = \frac{|ESG_score_{i,a,t} - ESG_score_{i,b,t}|}{\sqrt{2}} \quad (5) \quad ERD_{i,t} = \frac{\sum_{n=1}^N ERD_pairwise_{i,t}}{N} \quad (6)$$

In Equation (5), we select any two of the six ESG rating agencies as rating agencies a and b for company i in year t, so we could obtain the values of $ESG_score_{i,a,t}$ and $ESG_score_{i,b,t}$. For company i in year t, up to fifteen $ERD_pairwise_{i,t}$ values can be calculated. Equation (6) represents the arithmetic mean of all $ERD_pairwise_{i,t}$ values for company i in year t.

3.2.4 Mediating variables— Analyst coverage: Our variable for analyst coverage is calculated by taking the natural logarithm of sum of one plus number of analysts covering company following the method of Zhang, feng and Lin (2021). This variable is denoted as $Analysts_{i,t}$.

3.2.5 Mediating variables— Company undervaluation: We use the book-to-market (BM) ratio to measure company undervaluation. A higher BM ratio indicates that the market value of the company is relatively low compared to its book value, which may suggest that the market undervalues the stock. Fama and French (1992) proposed that stocks with high BM ratios have potential for appreciation and tend to outperform those with low BM ratios over the long term. $BM\ ratio_{i,t}$ is calculated by Equation (7).

$$BM\ ratio_{i,t} = \frac{Book\ Value\ of\ Equity_{i,t}}{Market\ Value\ of\ Equity_{i,t}} \quad (7)$$

The *Book Value of Equity*_{*i,t*} represents the difference between the company i's assets and its liabilities of year t. The *Market Value of Equity*_{*i,t*} is calculated by multiplying the current share price by the total number of outstanding shares of company i in year t.

3.3. Control variables

Based on the studies by Chen et al. (2001) and Liu (2023), we have selected the following control variables for the regression model in this paper.

PV is the moving standard deviation of return on assets, indicating earnings instability and high operational risk, which can lead to increased stock price volatility. FC, measures financial constraints and financing ease, reflecting market attitudes toward profitability. Companies with easier financing typically have better financial conditions and lower crash risk. CRT is calculated following the approach of Su (2015). It is the logarithm of the annualized standard deviation of weekly stock returns, showing stock price fluctuation and investor uncertainty. ROS is computed according to the approach outlined by Bei et al. (2011), which represents the annual stock return. Higher ROS boosts investor confidence and reduces market panic. Balance is the ratio of the second to the tenth largest shareholders' holdings divided by the largest shareholder's holding. INST is the institutional investors' shareholding percentage multiplied by 1000. Both reflect ownership structure, affecting decision-making transparency and stock price stability. Dual is a variable indicating if the chairman also serves as manager (1) or not (0). Female is the percentage of women in management. Duality can reduce decision-making participation, increasing risk, while a higher percentage of female managers can improve decision-making and stability. lnCL, lnNOR, and lnNI are the natural logs of current liabilities, net other receivables, and net inventory, respectively. Higher current liabilities indicate debt pressure, high net receivables suggest bad debt risk, and more inventory points to management issues. These factors reflect financial and operational risks affecting stock price volatility.

Definitions of the all variable are presented in Table 1.

Table 1. Definition of variables

Variable	Definition
NCSKEW	The variable which measures the stock price crash risk.
DUVOL	The other variable which measures the stock price crash risk.
Mshare	The percentage of managerial ownership multiplied by 100.
ERD	ESG rating disagreement for the specific firm on that year.
Analysts	The natural logarithm of sum of one plus number of analysts.
BM ratio	The ratio of dividing the book value of equity by the market value of equity.
PV	The moving standard deviation of the company's return on assets.
FC	The financial constraint index.
CRT	Natural logarithm of the annualized weekly return standard deviation of the stock.
ROS	Return of the stock.
Balance	The sum of the percentage ratios of the second to the tenth largest shareholders divided by the shareholding percentage of the largest shareholder.
INST	The ownership percentage of institutional investors among all investors which multiplied by 1000.
Dual	An indicator variable reflects whether chairman and the manager are the same person.
Female	The percentage of women in the management team.
lnCL	Logarithms of the current liabilities.
lnNOR	Logarithms of the net other receivables.
lnNI	Logarithms of the net inventory.

In Table 2, we could observe that the mean of NCSKEW is -0.277 and -0.188 which indicates that on average, companies do not face significant stock price crash risk. The mean of Mshare takes the value of 13.448. The mean of ERD is 2.457, which shows an average company faces an ESG rating score difference of 2.457. The mean of Analysts is 3.691 which indicates that the company faces analyst coverage of 3.691 on average. The mean of BM ratio values at 0.603 which demonstrates that the market value of an average company is higher than its book value.

Table 2. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
NCSKEW	14106	-.277	.728	-5.171	5.038
DUVOL	14106	-.188	.486	-2.561	2.278
Mshare	14106	13.448	19.408	0	89.177
ERD	14106	2.457	.809	0	5.834
Analysts	14106	3.691	1.191	.693	6.748
BM ratio	14106	.603	.257	.01	1.559
PV	14106	.03	.037	.001	.416
FC	14106	.425	.284	0	.989
CRT	14106	-2.817	.383	-4.423	-1.198
ROS	14106	.189	.588	-.822	14.28
Balance	14106	.982	.844	.01	8.056
INST	14106	48.199	25.291	.001	157.098
Dual	14106	.283	.451	0	1
Female	14106	18.669	11.208	0	66.67

lnCL	14106	21.236	1.686	15.302	27.907
lnNOR	14106	17.479	2.018	7.645	26.307
lnNI	14106	20.035	1.926	4.644	27.704

4. Research Design and Regression Results

4.1. Research design

In the main regression of this article, we explore whether managerial ownership would increase the risk of stock price crash. Following the method of Benson et al. (2009), we employ time fixed effects and firm fixed effects. The regression model is shown in Equation (8) and (9).

$$\begin{aligned} \text{NCSKEW}_{i,t} = & \alpha_0 + \alpha_1 \text{Mshare}_{i,t} + \alpha_2 \text{PV}_{i,t} + \alpha_3 \text{FC}_{i,t} + \alpha_4 \text{CRT}_{i,t} + \alpha_5 \text{ROS}_{i,t} + \alpha_6 \text{Balance}_{i,t} \quad (8) \\ & + \alpha_7 \text{INST}_{i,t} + \alpha_8 \text{Dual}_{i,t} + \alpha_9 \text{Female}_{i,t} + \alpha_{10} \ln \text{CL}_{i,t} + \alpha_{11} \ln \text{NOR}_{i,t} + \alpha_{12} \ln \text{NI}_{i,t} \\ & + \text{Firm}_{FE} + \text{Year}_{FE} + \varepsilon_{i,t} \end{aligned}$$

$$\begin{aligned} \text{DUVOL}_{i,t} = & \alpha_0 + \alpha_1 \text{Mshare}_{i,t} + \alpha_2 \text{PV}_{i,t} + \alpha_3 \text{FC}_{i,t} + \alpha_4 \text{CRT}_{i,t} + \alpha_5 \text{ROS}_{i,t} + \alpha_6 \text{Balance}_{i,t} \quad (9) \\ & + \alpha_7 \text{INST}_{i,t} + \alpha_8 \text{Dual}_{i,t} + \alpha_9 \text{Female}_{i,t} + \alpha_{10} \ln \text{CL}_{i,t} + \alpha_{11} \ln \text{NOR}_{i,t} + \alpha_{12} \ln \text{NI}_{i,t} \\ & + \text{Firm}_{FE} + \text{Year}_{FE} + \varepsilon_{i,t} \end{aligned}$$

$\text{NCSKEW}_{i,t}$ and $\text{DUVOL}_{i,t}$ are the dependent variables measuring the stock price crash risk. Mshare is the independent variable representing the managerial ownership. Year_{FE} and Firm_{FE} denote the inclusion of year fixed effects and firm fixed effects in the regression model respectively. $\varepsilon_{i,t}$ is the error term. In order to test hypothesis H1, which states that managerial ownership increases the risk of stock price crash, we focus on the coefficient of $\text{Mshare}_{i,t}$ in this regression. If α_1 is significantly positive, it will support our hypothesis H1.

Next, to explore whether ESG rating disagreement, analyst coverage and company undervaluation can mediate the process, we set up Equation (10), (11) and (12) for testing.

$$\begin{aligned} \text{Mediator}_{i,t} = & \beta_0 + \beta_1 \text{Mshare}_{i,t} + \beta_2 \text{PV}_{i,t} + \beta_3 \text{FC}_{i,t} + \beta_4 \text{CRT}_{i,t} + \beta_5 \text{ROS}_{i,t} + \beta_6 \text{Balance}_{i,t} \quad (10) \\ & + \beta_7 \text{INST}_{i,t} + \beta_8 \text{Dual}_{i,t} + \beta_9 \text{Female}_{i,t} + \beta_{10} \ln \text{CL}_{i,t} + \beta_{11} \ln \text{NOR}_{i,t} + \beta_{12} \ln \text{NI}_{i,t} \\ & + \text{Firm}_{FE} + \text{Year}_{FE} + \varepsilon_{i,t} \end{aligned}$$

$$\begin{aligned} \text{NCSKEW}_{i,t} = & \gamma_0 + \gamma_1 \text{Mshare}_{i,t} + \gamma_2 \text{Mediator}_{i,t} + \gamma_3 \text{PV}_{i,t} + \gamma_4 \text{FC}_{i,t} + \gamma_5 \text{CRT}_{i,t} \quad (11) \\ & + \gamma_6 \text{ROS}_{i,t} + \gamma_7 \text{Balance}_{i,t} + \gamma_8 \text{INST}_{i,t} + \gamma_9 \text{Dual}_{i,t} + \gamma_{10} \text{Female}_{i,t} + \gamma_{11} \ln \text{CL}_{i,t} \\ & + \gamma_{12} \ln \text{NOR}_{i,t} + \gamma_{13} \ln \text{NI}_{i,t} + \text{Firm}_{FE} + \text{Year}_{FE} + \varepsilon_{i,t} \end{aligned}$$

$$\begin{aligned} \text{DUVOL}_{i,t} = & \gamma_0 + \gamma_1 \text{Mshare}_{i,t} + \gamma_2 \text{Mediator}_{i,t} + \gamma_3 \text{PV}_{i,t} + \gamma_4 \text{FC}_{i,t} + \gamma_5 \text{CRT}_{i,t} \quad (12) \\ & + \gamma_6 \text{ROS}_{i,t} + \gamma_7 \text{Balance}_{i,t} + \gamma_8 \text{INST}_{i,t} + \gamma_9 \text{Dual}_{i,t} + \gamma_{10} \text{Female}_{i,t} + \gamma_{11} \ln \text{CL}_{i,t} \\ & + \gamma_{12} \ln \text{NOR}_{i,t} + \gamma_{13} \ln \text{NI}_{i,t} + \text{Firm}_{FE} + \text{Year}_{FE} + \varepsilon_{i,t} \end{aligned}$$

$\text{NCSKEW}_{i,t}$ and $\text{DUVOL}_{i,t}$ remain as the dependent variables. We use $\text{Mediator}_{i,t}$ to represent the three mediating variables. Equation (8) and (9) is the first step in testing the mediating effect, Equation (10) represents the second step and Equation (11) and (12) illustrate the third step. We conduct three separate tests of the mediating effect to examine the effects of ERD, Analysts and BM ratio as mediators individually.

To validate hypothesis H2, which proposes that ESG rating disagreement plays a negative mediating role, we replace $\text{Mediator}_{i,t}$ with $\text{ERD}_{i,t}$. We expect β_1 to be significantly negative, which would indicate that managerial ownership could reduce ESG rating disagreement. At the same time, we expect γ_2 to be significantly positive, indicating that ESG rating disagreement increases the stock price crash risk. If γ_1 is significantly positive, it suggests that the mediating effect is partial. If it is not significant, it suggests that the mediator variable plays a fully mediating role.

We replace $\text{Mediator}_{i,t}$ with $\text{Analysts}_{i,t}$ to explore the positive mediating effect of analyst coverage proposed in hypothesis H3. We expect β_1 is significantly positive, and γ_2 to also be

significantly positive. This would provide that analyst coverage can play the positive mediating role in the relationship. Furthermore, if γ_1 is significantly positive, it suggests that analyst coverage plays a partial mediating role.

When testing hypothesis H4, we use $BM\ ratio_{i,t}$ as the mediating variable. Hypothesis H4 suggests that company undervaluation would play a negative mediating role in the process. We expect both β_1 and γ_2 to be significant, but with opposite signs. Moreover, by examining the significance of γ_1 , we can determine the characteristics of this mediating effect.

4.2. Main results

The main results are presented in Table 3. The regressions account for year and firm fixed effects. Columns (1) and (2) show regressions without control variables, while the other two columns include them. From these regression results, we observe that before including control variables, the coefficient of Mshare is significant at the 5% level (for both NCSKEW and DUVOL), with values of 0.0016 and 0.0013, respectively. After including control variables, managerial ownership (Mshare) was positively associated with stock price crash risk, as measured by both NCSKEW ($\beta= 0.0048$, $p < 0.01$) and DUVOL ($\beta= 0.0037$, $p < 0.01$). This indicates that one standard deviation increase of the percentage of managerial ownership would contribute to 12.7% and 14.57% increase in NCSKEW and DUVOL respectively. This result proves that hypothesis H1 is valid, which shows that managerial ownership could increase the stock price crash risk. This result is similar with the results of Haghighi and Safari Gerayli (2020), which suggests since the management are "rational economic man" and concern about maximizing their own interests, managerial ownership is not an ideal approach to address agency problem for Iranian companies.

Table 3. Main results

	(1) NCSKEW	(2) DUVOL	(3) NCSKEW	(4) DUVOL
Mshare	.0016** (.0008)	.0013** (.0005)	.0048*** (.001)	.0037*** (.0007)
PV			.5817*** (.1945)	.384*** (.1294)
FC			-.0036 (.0566)	.0235 (.0376)
CRT			-.5438*** (.0253)	-.3292*** (.0168)
ROS			-.0883*** (.0126)	-.0829*** (.0084)
Balance			.0372** (.0157)	.0208** (.0105)
INST			.0046*** (.0006)	.0033*** (.0004)
Dual			-.0121 (.0213)	-.006 (.0141)
Female			-.0002 (.001)	-.0003 (.0007)
lnCL			-.0342** (.0167)	-.0218** (.0111)

lnNOR			.0074 (.0071)	.0001 (.0047)
lnNI			.0039 (.0106)	-.0024 (.0071)
_cons	-.2975*** (.0119)	-.2053*** (.0079)	-1.6097*** (.337)	-.8375*** (.2242)
Firm FEs	YES	YES	YES	YES
Year FEs	YES	YES	YES	YES
Observations	14106	14106	14106	14106
R-squared	.2297	.2305	.2823	.2821

Standard errors are in parentheses

*** p<.01, ** p<.05, * p<.1

4.3. Mechanism analyses

4.3.1 Mechanism about ERD: We conduct the following regressions to test whether hypothesis H2 is valid, that is, whether ERD can play a negative mediating role. In column (1) of Table 4, we can see that the coefficient of Mshare is negative and significant at the 5% level. This indicates that a one standard deviation change in the percentage of managerial ownership is associated with a 5.02% decrease in ESG rating disagreement. In columns (2) and (3), the coefficients of ERD are 0.0256 (for NCSKEW, p<0.01) and 0.0164 (for DUVOL, p<0.01). This presents that a one standard deviation increase in ESG rating disagreement is associated with a 2.85% increase in NCSKEW and a 2.72% increase in DUVOL. In the regression results of columns (2) and (3), we can also see that the coefficient of Mshare is significantly positive. We can conclude that hypothesis H2 is valid. ESG rating disagreement can partially mitigate the stock price crash risk associated with managerial ownership, allowing investors to adjust their investment decisions accordingly. Regulators and policymakers can encourage companies to disclose ESG-related information, emphasizing the importance of ESG transparency and accurate reporting.

Table 4. Mechanism about ERD

	(1)	(2)	(3)
	ERD	NCSKEW	DUVOL
Mshare	-.0021** (.001)	.0048*** (.001)	.0037*** (.0007)
ERD		.0256*** (.0089)	.0164*** (.0059)
Control variables	YES	YES	YES
_cons	2.9789*** (.3219)	-1.686*** (.338)	-.8863*** (.2249)
Firm FEs	YES	YES	YES
Year FEs	YES	YES	YES
Obs	14106	14106	14106
R-squared	.4934	.2827	.2825

Standard errors are in parentheses

*** p<.01, ** p<.05, * p<.1

4.3.2 Mechanism about analyst coverage: We conduct the following regressions to exploring the mediating effect of analyst coverage for hypothesis H3. In column (1) of Table 5, it shows that the coefficient of Mshare is 0.0132 ($p < 0.01$) and is significant at the 1% level. This indicates that a one standard deviation increase in the percentage of managerial ownership leads to a 21.44% increase in analyst coverage. The coefficients of Analysts are 0.0644 (for NCSKEW, $p < 0.01$) and 0.0326 (for DUVOL, $p < 0.01$). This indicates that a one standard deviation increase in analyst coverage leads to a 10.54% increase in NCSKEW and a 7.98% increase in DUVOL. Because the coefficient of Mshare is significantly positive, we confirm that hypothesis H3 is valid, which indicates that analyst coverage plays a positive partial mediating role in the process between managerial ownership and stock price crash risk. This suggests that while extensive analyst coverage may reflect a company's profitability and size, it is not necessarily beneficial for the company. Increased analyst coverage speeds up information dissemination. Analysts may quickly identify the negative effects of managerial ownership, which could significantly impact investor confidence and, consequently, increase the risk of a stock price crash.

Table 5. Mechanism about analyst coverage

	(1)	(2)	(3)
	Analysts	NCSKEW	DUVOL
Mshare	.0132*** (.0013)	.0045*** (.0011)	.0038*** (.0007)
Analysts		.0644*** (.0075)	.0326*** (.0051)
Control variables	YES	YES	YES
_cons	-2.0875*** (.4593)	-1.5485*** (.3736)	-.8284*** (.2539)
Firm FEs	YES	YES	YES
Year FEs	YES	YES	YES
Observations	14106	14106	14106
R-squared	.6353	.2909	.292

Standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

4.3.3 Mechanism about degree of undervaluation: In hypothesis H4, we explore whether degree of undervaluation for company value affects the process by which managerial ownership increases the stock price crash risk. The higher Book-to-Market ratio shows that the company is more undervalued. In column (1) of Table 6, we observe that the coefficient of Mshare is 0.0012 and is statistically significant, indicating that a one standard deviation increase in the percentage of managerial ownership leads to an 8.94% increase in the Book-to-Market ratio. In columns (2) and (3), the coefficients of the Book-to-Market ratio are significantly positive ($\beta = -0.3406$, $p < 0.01$ and $\beta = -0.1497$, $p < 0.01$), which means that a one standard deviation change in the Book-to-Market ratio would cause 12.05% and 7.92% decrease in stock price crash risk (for NCSKEW and DUVOL respectively). The coefficients of Mshare are significantly positive ($\beta = 0.0052$, $p < 0.01$ and $\beta = 0.0038$, $p < 0.01$). This indicates that the Book-to-Market ratio plays a negative mediating role in the process. The conclusion validates hypothesis H4. Managerial ownership itself increases stock price volatility, but by raising the Book-to-Market ratio, it can partially mitigate the increase in the crash risk. A higher Book-to-Market ratio indicates that the company's stock is undervalued, which could provide better cushioning against adverse market changes, thereby stock price crash risk would be reduced.

Table 6. Mechanism BM ratio

	(1)	(2)	(3)
	BM ratio	NCSKEW	DUVOL
Mshare	.0012*** (.0002)	.0052*** (.001)	.0038*** (.0007)
BM ratio		-.3406*** (.0518)	-.1497*** (.0345)
Control variables	YES	YES	YES
_cons	-.7892*** (.0552)	- 1.8785*** (.339)	-.9556*** (.2257)
Firm FEs	YES	YES	YES
Year FEs	YES	YES	YES
Observations	14106	14106	14106
R-squared	.8549	.2845	.2831

Standard errors are in parentheses

*** p<.01, ** p<.05, * p<.1

4.4. Robustness test

In this section, we use three methods—changing the time intervals, lagging independent variable and changing the dependent variables—to ensure that our main regression results are robust.

4.4.1 Time interval: Considering that different time intervals would affect the significance of the regression results, we redefine three time periods: year 2013- 2017, 2014- 2019, and 2016- 2021. In Table 7, although changes in the time period led to variations in the coefficient of Mshare, these coefficients remain significant at the 5% level. For the period of year 2013-year 2017, a one standard deviation change in the percentage of managerial ownership contributes to the 12.74% increase in NCSKEW and the 12.21% increase in DUVOL. For the period of year 2014- year 2019, these increases are 11.25% (for NCSKEW) and 15.33% (for DUVOL), respectively. For the period of year 2016- year 2021, one standard deviation increase in percentage of managerial ownership leads to the 13.09% change in NCSKEW and the 14.71% change in DUVOL. This indicates that our regression results remain significant despite changes in the time intervals, demonstrating the robustness of our main conclusions.

Table 7. Time interval

	Year 2013- Year 2017		Year 2014- Year 2019		Year 2016- Year 2021	
	(1) NCSKEW	(2) DUVOL	(3) NCSKEW	(4) DUVOL	(5) NCSKEW	(6) DUVOL
Mshare	.0048*** (.0018)	.0032*** (.0012)	.0044*** (.0016)	.004*** (.0011)	.0052*** (.0019)	.0038*** (.0012)
Control variables	YES	YES	YES	YES	YES	YES
_cons	-.4406 (.6282)	.0366 (.4266)	-2.1686*** (.5441)	-.971*** (.3632)	-2.6671*** (.5817)	-1.5162*** (.381)
Firm FEs	YES	YES	YES	YES	YES	YES
Year FEs	YES	YES	YES	YES	YES	YES
Observations	7107	7107	9373	9373	10085	10085
R-squared	.3936	.4058	.3446	.3435	.3544	.3517

Standard errors are in parentheses

*** p<.01, ** p<.05, * p<.1

4.4.2 Lagging independent variable: Considering that the impact of managerial ownership on the stock price crash risk may require a relatively long response time, we replace Mshare with its one-year and two-year lags of Mshare. If the coefficients of the independent variables remain significantly positive after the replacement, it indicates that the conclusion is robust. Columns (1) and (2) of Table 8 present the regression results with one-year lagged Mshare as the independent variable. We observe that the coefficients of the independent variables (0.0049 and 0.0035) are significant at the 1% level. The other two columns show the regression results with two-year lagged Mshare as the independent variable, with coefficients of 0.0069 and 0.0047, and also significant at the 1% level. This indicates that even when accounting for the delayed effect of managerial ownership on stock price crash risk, our conclusion remains valid.

Table 8. Lagging independent variable

	(1) NCSKEW	(2) DUVOL	(3) NCSKEW	(4) DUVOL
1-year lag of Mshare	.0049*** (.0012)	.0035*** (.0008)		
2-year lag of Mshare			.0069*** (.0013)	.0047*** (.0008)
Control variables	YES	YES	YES	YES
_cons	-2.1521*** (.4346)	-1.157*** (.2913)	-2.2615*** (.4849)	-.9701*** (.3234)
Firm FEs	YES	YES	YES	YES
Year FEs	YES	YES	YES	YES
Observations	12538	12538	10689	10689
R-squared	.2925	.2914	.3093	.3091

Standard errors are in parentheses

*** p<.01, ** p<.05, * p<.1

4.4.3 Changing the dependent variables: Real earnings management can lead to stock price crashes by misleading investors and distorting the stock price from its true value (Abad et al., 2018). Deng and Ong (2018) note that it masks liquidity risks and increased capital costs, heightening uninformed trading and stock price volatility. Additionally, real earnings management can harm long-term value, increase operational risk, and reduce financial transparency, affecting the stock price. We replace stock price crash risk with real earnings management to examine if managerial shareholding has a positive effect on this factor. Following Hou and Jiang (2015) and Cao et al. (2014), we first calculate the company's normal operating cash flow, expenses, and product costs, with the formulas for normal operating cash flow, expenses, and product costs shown in Equations (13), (14), and (15).

$$\frac{CFO_{i,t}}{A_{i,t-1}} = \theta_0 \frac{1}{A_{i,t-1}} + \theta_1 \frac{S_{i,t}}{A_{i,t-1}} + \theta_2 \frac{\Delta S_{i,t}}{A_{i,t-1}} + \theta_3 \frac{S_{i,t-1}}{A_{i,t-1}} + \theta_4 \frac{TC_{i,t}}{A_{i,t-1}} + \theta_5 \frac{EC_{i,t}}{A_{i,t-1}} + \theta_6 \frac{OC_{i,t}}{A_{i,t-1}} + \varepsilon_{i,t} \quad (13)$$

$$\frac{Expense_{i,t}}{A_{i,t-1}} = \mu_0 \frac{1}{A_{i,t-1}} + \mu_1 \frac{S_{i,t}}{A_{i,t-1}} + \varepsilon_{i,t} \quad (14)$$

$$\frac{Product_{i,t}}{A_{i,t-1}} = \theta_0 \frac{1}{A_{i,t-1}} + \theta_1 \frac{S_{i,t}}{A_{i,t-1}} + \theta_2 \frac{\Delta S_{i,t}}{A_{i,t-1}} + \theta_3 \frac{\Delta S_{i,t-1}}{A_{i,t-1}} + \varepsilon_{i,t} \quad (15)$$

$CFO_{i,t}$ represents the net cash flow from operating activities. $Expense_{i,t}$ represents the total of selling and administrative expenses in year t. $Product_{i,t}$ is the total of the cost of goods sold and

changes in inventory for in year t . $A_{i,t-1}$ is the total assets of year $t-1$. $S_{i,t}$ denotes the sales revenue in year t . $\Delta S_{i,t}$ indicates the change in sales revenue from year $t-1$ to year t . $\Delta S_{i,t-1}$ represents the change in sales revenue from year $t-2$ to year $t-1$. $TC_{i,t}$ represents the various tax expenses in year t . $EC_{i,t}$ denotes the cash used on employees in year t . $OC_{i,t}$ represents other cash flows for operating activities in year t . Then, we take the company's actual operating cash flow, expenses, and product costs and subtract the corresponding normal values. Finally, we sum the absolute values of these three differences to obtain the company's real earnings management value (REM).

In Table 9, column (1) presents the regression without control variables, while the second column includes the regression with control variables. As can be seen from the results, regardless of whether control variables are included, managerial ownership has an increasing effect on real earnings management. After adding control variables, the coefficient of Mshare is 0.0004 and is significant at the 1% significance level. This indicates that for everyone standard deviation change in the percentage of managerial ownership, real earnings management changes by 11.71%. This indicates that managerial ownership increases real earnings management, which indirectly confirms that our main conclusion is robust.

Table 9. Changing the dependent variables.

	(1)	(2)
	REM	REM
Mshare	.0001 (.0001)	.0004*** (.0001)
Control variables	YES	YES
_cons	.065*** (.0012)	-.2391*** (.0332)
Firm FEs	YES	YES
Year FEs	YES	YES
Observations	14106	14106
R-squared	.3033	.3194

Standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

Table 10. Robustness and endogeneity test

	(1)	(2)
	NCSKEW	DUVOL
Mshare	.0043*** (.0004)	.0029*** (.0003)
Control variables	YES	YES
_cons	- 1.1507***	-.6588*** (.1113)
Industry FEs	YES	YES
Year FEs	YES	YES
Observations	14106	14106
R-squared	.0982	.1073

Standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

4.5. Endogeneity test

Potential endogeneity issues may increase the standard error of the variable Mshare and reduce the significance of the impact of managerial ownership on stock price crash risk. It may also affect the causal inference of this relationship. To conduct the endogeneity test, we follow the approach of Dong et al. (2024) which includes changing fixed effects model and using Two-Stage Least Squares Regression approach.

4.5.1 Industry fixed effect: Since some omitted variables may vary across industries, we use industry fixed effects instead of firm fixed effects to address potential endogeneity issues. We still account for time fixed effects in the regressions. After including all control variables, the detailed regression results are shown in Table 10. The coefficient of Mshare is significantly positive (0.0043 and 0.0029 respectively). When using industry fixed effects, a one standard deviation change in percentage of managerial ownership contributes to 11.52% increase in NCSKEW and 11.38% increase in DUVOL. Although the impact of managerial ownership on stock price crash risk varies with changes in the fixed effects model, the regression results still support the main finding results.

4.5.2 Two-Stage Least Squares Regression: To further address endogeneity issues, we use the two-stage least squares (2SLS) method. We select the one-year lagged value of Mshare as the instrumental variable. Column (1) in Table 11 represents the first-stage regression, while columns (2) and (3) represent the second-stage regressions. In column (1), we find that in the first-stage regression, the lagged Mshare is significantly positively correlated with the current value of Mshare (the coefficient is 0.6294), which is the endogenous explanatory variable. Columns (2) and (3) present the second-stage regression, analyzing the impact of the instrumented value of MShare from the first-stage regression on NCSKEW and DUVOL. In column (2), with NCSKEW as the dependent variable, the coefficient of Mshare is 0.0086 and significant at the 1% level. In column (3), the coefficient of Mshare is 0.0062 and be significant at the 1% level. These results confirm the conclusion that managerial ownership increases the stock price crash risk.

Table 11. Robustness and endogeneity test

	1 st stage (1) Mshare	2 nd stage (2) NCSKEW	2 nd stage (3) DUVOL
Lagged Mshare	.6294*** (.0071)		
Mshare		.0086*** (.0019)	.0062*** (.0012)
Control variables	YES	YES	YES
_cons	13.8714*** (2.6322)	-.5562 (.3889)	-.1579 (.2606)
Firm FEs	YES	YES	YES
Year FEs	YES	YES	YES
Observations	12538	13055	13055
R-squared	.958	.0344	.0464

Standard errors are in parentheses

*** p<.01, ** p<.05, * p<.1

5. Further Research

According to the approach of Chen et al. (2023), we group the sample to explore how characteristics as being audited by the Big Four accounting firms, being a heavily polluting company, or the level of digitalization in the region where the company is located affect the significance of the main result.

5.1. Audited by the non-Big-Four accounting firms

To test hypothesis H5—whether Big Four audit affects the significance of the link between management shareholding and stock price crash risk—we divide the sample based on whether a company was audited by a Big Four firm. Columns (1) and (2) in Table 12 show the non-Big Four audited group, while Columns (1) and (2) in Table 13 show the Big Four audited group. In Column (1) and (2) of Table 12, we observe that the coefficients of Mshare are 0.0045 and 0.0035 and they are both significant at the 1% significance level. This indicates that for companies audited by non-Big Four accounting firms, a one standard deviation increase in the percentage of managerial ownership leads to 12.26% change in stock price crash risk (for NCSKEW) or a 14.19% change in stock price crash risk (for DUVOL). Although the coefficients of Mshare are still positive in column (1) and (2) in Table 13, they are not statistically significant. This result supports hypothesis H5, indicating that for companies audited by non-Big Four accounting firms, the effect of managerial ownership on stock price crash risk is more

pronounced. Therefore, on one hand, we should encourage companies to be audited by the Big Four accounting firms; on the other hand, investors can reduce risk by investing in companies audited by the Big Four accounting firms.

Table 12. Groups with pronounced results

	Non-audited by Big-Four Accounting Firms		Non-heavily polluting		Located in high digitalization region	
	(1)	(2)	(3)	(4)	(5)	(6)
	NCSKEW	DUVOL	NCSKEW	DUVOL	NCSKEW	DUVOL
Mshare	.0045*** (.001)	.0035*** (.0007)	.0056*** (.0011)	.0042*** (.0008)	.0049*** (.0019)	.0036*** (.0013)
Control variables	YES	YES	YES	YES	YES	YES
_cons	-1.6593*** (.3527)	-.8048*** (.2345)	-1.798*** (.3862)	-.8717*** (.2562)	-1.6264*** (.5829)	-.8756** (.3819)
Firm FEs	YES	YES	YES	YES	YES	YES
Year FEs	YES	YES	YES	YES	YES	YES
R-squared	.2863	.2838	.296	.292	.378	.3765

Standard errors are in parentheses

*** p<.01, ** p<.05, * p<.1

Table 13. Groups with non-pronounced results

	Audited by Big-Four Accounting Firms		Heavily polluting		Located in low digitalization region	
	(1)	(2)	(3)	(4)	(5)	(6)
	NCSKEW	DUVOL	NCSKEW	DUVOL	NCSKEW	DUVOL
Mshare	.0047 (.0066)	.0044 (.0044)	.0017 (.0023)	.0022 (.0015)	.0027 (.0017)	.002* (.0012)
Control variables	YES	YES	YES	YES	YES	YES
_cons	-2.3535 (1.5586)	-1.8916* (1.0343)	-2.2685*** (.7987)	-1.5046*** (.5357)	-1.8744*** (.5801)	-.8384** (.3953)
Firm FEs	YES	YES	YES	YES	YES	YES
Year FEs	YES	YES	YES	YES	YES	YES
R-squared	.3191	.3576	.2747	.2883	.3601	.3654

Standard errors are in parentheses

*** p<.01, ** p<.05, * p<.1

5.2. Industry heterogeneity

Hypothesis H6 posits that heavily polluting companies face more investor scrutiny, making it harder for management to manipulate stock prices, which increases stock price crash risk. Therefore, the regression results will be more pronounced for non-polluting companies. We classified the sample into heavily and non-heavily polluting groups based on Wang and He (2021) and Pan et al. (2019). Columns (3) and (4) in Table 12 represent the non-heavily polluting group, while Columns (3) and (4) in Table 13 represent the heavily polluting group.

In Columns (3) and (4) of Table 12, the coefficients of Mshare (0.0056 and 0.0042) are significant at the 1% significance level. This indicates that for non-heavily polluting companies, one standard deviation increase in the percentage of managerial ownership leads to a 15% and 16.9% change in NCSKEW and DUVOL, respectively. However, in Columns (3) and (4) of Table 13, the coefficients of Mshare (0.0017 and 0.0022) are not significant. Therefore, this supports hypothesis H6, indicating that

non-polluting companies, due to lower external scrutiny, make it easier for management actions to go unmonitored, which could increase stock price crash risk. This suggests that to mitigate the negative impact of managerial ownership, potential and current investors should increase their involvement and oversight in company activities and decisions.

5.3. Location heterogeneity

To validate hypothesis H7, we categorize the sample based on regional digitalization levels. We first calculate the digitalization value, determine its median, and then split the sample into two groups: above and below the median. Digitalization is measured following Liu and Wang (2023), using R-studio to capture terms related to digitization from the Baidu Index, such as “digitization” and “digital economy,” for each province and year. We then count occurrences, divide the totals by 1 million to manage regression scale.

The median value of digitization is 10.6477, so we placed companies with digitization values above 10.6477 into the located in high-digitalization region group. The regression results for this group are shown in Columns (5) and (6) of Table 12. Companies with digitization values below 10.6477 were placed into the located in low-digitalization region group, and the regression results for this group are shown in Columns (5) and (6) of Table 13.

In Columns (5) and (6) of Table 12, the coefficients of Mshare are 0.0049 and 0.0036, both significant at the 1% significance level. This indicates that one unit increase in the standard deviation of percentage of managerial ownership leads to a 12.77% and 13.98% increase in stock price crash risk (for NCSKEW and DUVOL respectively). In Columns (5) and (6) of Table 13, the coefficients of Mshare are 0.0027 and 0.002 but are not statistically significant. These regression results support hypothesis H7, indicating that for companies in regions with higher levels of digitalization, the impact of managerial ownership on stock price crash risk is more pronounced. This suggests that regulators should increase oversight of companies in regions with higher levels of digitalization, as the management's negative actions in these companies can have a more severe impact on the stock market due to the faster dissemination of information.

6. Conclusions

This study challenges the conventional wisdom that managerial ownership effectively resolves agency problems. Our findings demonstrate that in China, managerial ownership increases stock price crash risk, suggesting that managers with ownership stakes may engage in behaviors that prioritize short term stock performance over long-term company value. The mediating roles of ESG rating disagreement, analyst coverage, and company undervaluation provide nuanced insights into the mechanisms through which managerial ownership affects crash risk.

Our results have important implications for corporate governance practices in China and potentially other emerging markets. They suggest that simply aligning manager and shareholder interests through ownership may not be sufficient to mitigate agency problems. Instead, our findings point to the importance of external monitoring mechanisms, such as high-quality auditing and investor scrutiny, in mitigating the potential negative effects of managerial ownership.

This study contributes to the literature by extending the "rational economic man" theory to the realm of corporate governance, demonstrating how managers with ownership stakes may still act in self-interest at the expense of other shareholders. It also highlights the importance of considering contextual factors, such as the level of regional digitalization and industry characteristics, in understanding the relationship between managerial ownership and financial risk.

Future research could explore whether these relationships hold in other industries or countries with different institutional environments. Additionally, longitudinal studies could help establish the causal relationships between managerial ownership and stock price crash risk over time. Finally, investigating

alternative governance mechanisms that could more effectively address agency problems in the Chinese context would be a valuable extension of this work.

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