





The impact of corporate social responsibility on investment efficiency: Exploring the role of analyst forecast accuracy

 Qiuqin Zhao^{1*}

 Salawati Sahari²

 Cheuk Choy Sheung Sharon³

^{1,2,3}Faculty of Economics and Business, Universiti Malaysia Sarawak, 94300, Malaysia.

¹Email: zhaqiqin@fphdss.com

²Email: ssalawati@umimas.my

³Email: ccsharon@umimas.my

¹School of Finance and Economics, Anhui Vocational College of City Management 340100, Anhui, China.



(+ Corresponding author)

ABSTRACT

Article History

Received: 25 April 2024

Revised: 19 September 2024

Accepted: 30 September 2024

Published: 15 October 2024

Keywords

Analyst forecast accuracy

Bootstrap

Corporate social responsibility

Investment efficiency

Mediating effect

PSM.

This research investigates the direct and indirect influence of corporate social responsibility (CSR) on investment efficiency, focusing specifically on the mediating role of analyst forecast accuracy. We analyzed data from Chinese listed companies between 2010 and 2022, including a total of 21947 observations. We employed Ordinary Least Squares (OLS) regression analysis to assess the data. We used Propensity score matching (PSM) to address endogeneity, and the Bootstrap method was applied to verify the mediating effect of analyst forecast accuracy. The four-step approach results demonstrate that corporate social responsibility (CSR) positively impacts firm investment efficiency in both the full sample analysis and the analysis using propensity score matching samples. Further in-depth analysis reveals that analyst forecast accuracy plays an important mediating role in linking two factors. The Bootstrap method applied to both the total samples and PSM samples further confirms that analyst forecast accuracy serves as a partial intermediary in the relationship between the two factors. These findings not only underscore the importance of maintaining high standards of CSR practices but also provide a recommendation for financial analysts to understand better companies' CSR initiatives and disclosure to enhance their forecasting accuracy. Evaluating firm CSR quality, as well as analyst forecast accuracy, is equally useful for those investing in potential opportunities. These factors will help reduce uncertainty in investment decision-making and improve investment efficiency.

Contribution/Originality: While previous studies have focused on the direct impact of CSR on investment efficiency, this study introduces analyst forecast accuracy as a mediating role into this relationship, providing a new perspective on the study of analyst behavior.

1. INTRODUCTION

Corporate investment efficiency refers to the extent of results to inputs achieved through enterprise investments (Zee, Stotsky, & Ley, 2002). This effectiveness is a pointer of strong governance, dependable internal control mechanisms, and high-quality management systems (Cohen, Gaynor, Krishnamoorthy, & Wright, 2007). In an idealized financial domain, where investment choices stand apart from financial conditions, businesses should undertake all projects that have a net present value above zero and avoid investments with a loss-making net present value (Modigliani & Miller, 1958). Organizations may face multifaceted investment obstacles, such as economic policy uncertainty (Drobtetz, El Ghouli, Guedhami, & Janzen, 2018) and volatile stock prices (Dessaint, Foucault, Frésard, &

Matray, 2019). These studies demonstrate the prevalence of information discrepancies and management agency challenges in the stock market.

The concept of CSR involves that companies ought to seek financial benefits while also considering multiple impacts, such as environmental and stakeholder (Carroll & Shabana, 2010). On a global scale, the emphasis on CSR and sustainability is growing significantly. The transparency and actions related to CSR have become critical in evaluating investment opportunities. The participation of stakeholders in CSR is vital for carrying out efficient initiatives (Ansu-Mensah, Marfo, Awuah, & Amoako, 2021). From a business perspective, the revelation of CSR demonstrates the company's unequivocal commitment to environmental stewardship, social equity, and governance best practices while simultaneously functioning as a crucial data point for investors to assess the company's long-term prospects and associated risks (Devie, Liman, Tarigan, & Jie, 2020; Flammer, 2013; Harjoto & Laksmana, 2018; Jenkins & Yakovleva, 2006). Hermalin and Weisbach (2012) on the other hand, find that more CSR disclosure can increase disclosure costs for firms.

A significant body of research indicates that CSR impacts investment efficiency. Many studies have investigated how high-quality CSR can improve investment efficiency by increasing information accessibility and enhancing stakeholder solidarity. Nonetheless, most empirical analyses have primarily focused on direct effects (Benlemlih & Bitar, 2018; Cook, Romi, Sánchez, & Sánchez, 2019; Erawati, Sutrisno, Hariadi, & Saraswati, 2021). These studies examine how high-quality CSR disclosure provides critical non-financial information to investors, influencing investment decisions and the efficiency of capital allocation. However, in the real economy, information does not flow freely among investors and companies (Bakke & Whited, 2010). We have yet to uncover the mechanism that links corporate social responsibility disclosure to investment efficiency.

Analysts are indispensable in shaping the market dynamics. Chen, Danbolt, and Holland (2018) developed a model of analyst information brokerage, illustrating how analysts facilitate information alterations through gathering, interpreting, and broadcasting soft data, thus highlighting their pivotal role as mediators in the flow of market information. Social responsibility activities attract investors and become a key focus for analysts. The literature shows a favorable correlation between analysts' forecasting accuracy and nonfinancial disclosure quality (Dhaliwal, Radhakrishnan, Tsang, & Yang, 2012; Muslu, Mutlu, Radhakrishnan, & Tsang, 2019; Suto & Takehara, 2020). Additionally, studies by (Chen, Xie, & Zhang, 2017; Zadeh, Magnan, Cormier, & Hammami, 2021) link analysts' forecasts to firm investment efficiency. Although previous research has extensively studied the relationships between CSR disclosure, investment efficiency, and analysts' forecasts, these studies have generally been conducted separately. Consequently, the role of analysts as intermediaries in forecasting accuracy regarding CSR and firm investment efficiency has not received extensive examination. A wealth of evidence suggests that CSR positively enhances investment efficiency, but various contingent factors also influence it (Lin, Li, Cheng, & Lam, 2021; Mohd Saleh & Sun, 2022; Rehman et al., 2021).

2. LITERATURE REVIEW

2.1. Corporate Social Responsibility

Along with the influence of the economy, law, and environment, the concept of corporate social responsibility (CSR) has gradually evolved. At the outset, CSR was characterized as a set of actions undertaken by a company to maximize profits while utilizing all resources morally (Friedman, 1970). Thereafter, the definition of CSR has become more prosperous and comprehensive, encompassing economic, legal, moral, and charitable perspectives (Carroll, 1991). Lantos (2001) portrays CSR as an integral part of corporate strategy, suggesting that firms are prone to participate in CSR endeavors if they promise financial gains. (Brammer & Millington, 2008) view a multi-stakeholder orientation and focus on CSR as methods to balance the interests of various stakeholder. Given stakeholders' expectations, this study's CSR scope includes economic and non-economic values for direct and indirect stakeholders, such as employee training and environmental protection (Carroll, 2016). Considering the economic consequences of

CSR, previous research has mainly highlighted the direct impact of CSR on firms' investment efficiency, often neglecting to analyze the pathways through which this influence occurs (Benlemlih & Bitar, 2018; Gupta & Das, 2024).

2.2. Investment Efficiency

Jensens (1986) argued that enterprise investment is defined as the ratio of effective results achieved by enterprise investment to the amount invested. Overinvestment occurs when an enterprise invests in a project with a negative net cash flow. Underinvestment happens when a company abandons a project with a positive net cash flow. Previous literature offers various methods for calculating investment efficiency. Vogt (1994), for example used the investment cash flow sensitivity model to identify wasteful investments in terms of free cash flow. Biddle, Hilary, and Verdi (2009) developed an investment efficiency residual model based on enterprise growth. Many academic articles use the Richardson model because the cash flow model cannot assess the efficiency of wasteful investments, and the Biddle model relies on a single explanatory variable (Teklay, Yu, & Zhu, 2024; Wang & Zhu, 2023; Zhao, Liu, Tang, & Zhang, 2024; Zheng, Xu, & Wenren, 2024). Richardson (2006) performed model regression on multiple variables and calculated residuals to reflect the level of inefficient enterprise investment, determining overstatement and underinvestment based on the sign of the residual.

2.3. Analyst Forecast Accuracy

In the capital market, analysts serve as external supervisors with primary responsibilities including information transmission, risk detection, company performance evaluation, and corporate governance improvement (Bhat, Hope, & Kang, 2006; Coram, Mock, & Monroe, 2011; Kong, Liu, & Liu, 2020; Ren, Zhong, & Wan, 2022). Analysts use their expertise to assess financial and non-financial data and provide more information to investors (Frankel, Kothari, & Weber, 2006). Analyst forecast accuracy and dispersion are the two characteristics often used to describe analyst forecasts in prior literature (Chen et al., 2017). Both internal and external factors influence the accuracy of analyst forecast. For example, analysts cognitive biases, and information processing skills can all affect the analyst forecasts accuracy (Guedj & Bouchaud, 2005; Kott & Perconti, 2018). Analyst forecasts become more difficult due to the market uncertainty and firmness (Amiram, Landsman, Owens, & Stubben, 2018).

3. HYPOTHESIS DEVELOPMENT

3.1. CSR and Investment Efficiency

Samet and Jarboui (2017) identified corporate social responsibility (CSR) as a key factor influencing corporate investment efficiency due to its role in reducing information asymmetry. CSR provides vital information to stakeholders about a company's environmental protections, social contributions, and governance practices. High-quality CSR disclosure enhances organizational transparency, thereby reducing information asymmetry between external stakeholders, particularly investors and analysts, and the company (Hamrouni, Bouattour, Ben Farhat Toumi, & Boussaada, 2022; Martínez-Ferrero, Ruiz-Cano, & García-Sánchez, 2016). CSR disclosure allows market participants to better understand a company's long-term value and operational conditions with greater precision and completeness (Du & Yu, 2021; Reverte, 2016). Prior research has identified the proactive fulfillment of CSR as a key factor in significantly improving the investment efficiency of enterprises. Therefore, the hypothesis is suggested:

H: Corporate social responsibility has a positive impact on corporate investment efficiency.

3.2. Corporate Social Responsibility and Analyst Forecast Accuracy

Numerous researchers, each approaching the subject from a unique viewpoint, have examined the influence of corporate social responsibility (CSR) on analyst forecast accuracy. Dhaliwal et al. (2012) suggest that CSR reports impact analyst forecast accuracy, especially in stakeholder-oriented countries. Similarly, Hu, Liu, Sohn, and Yuen

(2021) analyze the linkage between analyst forecast accuracy and CSR, concluding that high-quality CSR improves analyst forecast accuracy. In the face of economic policy uncertainty, the increased transparency provided by CSR disclosures helps analysts reduce forecasting errors (Chahine, Daher, & Saade, 2021). Based on these prior findings, the following hypothesis was developed:

H₁: Corporate social responsibility has a positive impact on the analyst forecast accuracy.

3.3. Analyst Forecast Accuracy and Corporate Investment Efficiency

Previous research has identified a constructive connection between CSR and firm investment efficiency (Chen et al., 2017). Analysts' intermediary and oversight roles contribute significantly to the development and refinement of this relationship (Zadeh et al., 2021). By conducting thorough research on company financial reports and industry trends, analysts formulate forecasts for key indicators such as future earnings and cash flow (Demmer, Pronobis, & Yohn, 2019; Hugon, Kumar, & Lin, 2016; Wang & Gao, 2020). Accurate forecasts from analysts help investors overcome difficulties posed by unequal access to information (Chen et al., 2017). In the final analysis, the precision of these forecasts serves as a valuable resource for investors, enabling them to formulate informed investment strategies, thereby contributing to the enhancement of enterprises' investment efficiency. Therefore, we propose the following hypothesis:

H₂: Financial analyst forecasts have a positive impact on corporate investment efficiency.

3.4. Mediating Effect of Analyst Forecast

According to mediation theory (Baron & Kenny, 1986; Muller, Judd, & Yzerbyt, 2005) a mediator variable act as an intermediary, challenging the impact of predictor variable towards an outcome variable. Prior scholarly work has evidenced a connection between CSR and analyst forecast accuracy, suggesting that the emergence of CSR narrows information gaps (Chahine et al., 2021). Additionally, studies have shown that analyst forecast accuracy influences firm investment efficiency (Chen et al., 2017). The latest investigation by Zadeh et al. (2021) focuses on the role of analyst forecast accuracy as a mediator. Based on the analysis above, the following hypothesis is proposed:

H₃: Analyst forecast accuracy mediates the relationship between CSR and investment efficiency.

4. THEORETICAL FRAMEWORK

After reviewing the relevant previous literature on the study's dimensions, specifically CSR and its impact on analyst forecast accuracy, this research aims to investigate how financial analyst forecast accuracy mediates the relationship between CSR and investment efficiency. Figure 1 displays the theoretical framework.

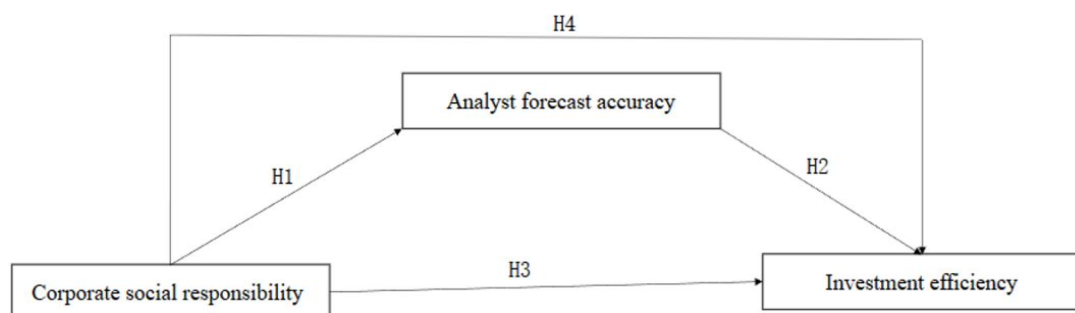


Figure 1. Theoretical framework.

5. METHODOLOGY

5.1. Data and Source

This research utilizes a representative sample of Chinese listed enterprises in Spanning from 2010 to 2022. The dataset originates from the China Stock Market and Accounting Research Database (CSMAR), with an initial

selection of 22,408 companies, excluding those from the financial sector and ST firms. After excluding cases with missing control variable data (461 firms), the final observed sample consists of 21,947 firms.

5.2. Variable Description

5.2.1. Investment Efficiency

Serving as the dependent variable, investment efficiency is primarily evaluated using the investment efficiency model introduced by Richardson (2006) which is assessed by comparing the firm's typical investment level to the absolute deviation from the expected value derived from the model. The A-share market widely recognizes this model for its application in analyzing investment behaviors (Jiang, Li, Shen, & Zhang, 2022; Zhang, Luo, & Ding, 2022). A narrower deviation signifies improved investment efficiency, reflecting a firm's capability to align its investment decisions closely with market and operational expectations.

$$Inv_{i,t} = \alpha_0 + \alpha_1 Cash_{i,t-1} + \alpha_2 Growth_{i,t-1} + \alpha_3 Age_{i,t-1} + \alpha_4 Size_{i,t-1} + \alpha_5 Return_{i,t-1} + \alpha_6 Inv_{i,t-1} + \alpha_7 Lev_{i,t-1} + \sum Industry + \sum Year + \varepsilon_{i,t} \quad (1)$$

In the given model, $Cash_{i,t-1}$ represents the cash assets held as of the conclusion of the previous period, whereas $Growth_{i,t-1}$ represents the revenue growth rate and the firm's potential for future investments during the same timeframe. $Age_{i,t-1}$ signifies the firm's age, defining its historical duration up to the previous period. $Size_{i,t-1}$ refers to the firm's total assets as of the close of the prior period. $Lev_{i,t-1}$ serves as an indicator for assessing the firm's debt burden, representing the financial leverage ratio attained in the preceding period. $Inv_{i,t-1}$ indicates the volume of new investments made during the prior period. Additionally, to approximate the return on stocks, the model includes the increase in total assets (assets plus one) from the previous year. The model incorporates two types of dummy variables, industry and year, to capture industry-specific characteristics and annual time effects, respectively. Ordinary Least Squares (OLS) regression is employed to analyze the data, and the residuals generated from this regression are utilized to assess investment efficiency.

5.2.2. Corporate Social Responsibility

Previous literature suggests that firms fulfill their CSR by addressing the needs of their stakeholders, given the multifaceted nature of socially responsible behavior and the challenges in quantifying this indicator (Fadun, 2014). Hence, evaluating the quality of social responsibility information disclosed by a company primarily depends on whether it reports on fulfilling its social responsibilities towards its stakeholders. China Stock Market Accounting Research (CSMAR) database meticulously records CSR activities across various sub-domains, such as employee welfare, environmental protection, workplace safety, safeguarding suppliers' rights and interests, protecting shareholders' rights and interests, protecting customers' rights and interests, protecting creditors' rights and interests, and developing a CSR system. The CSR index is employed to measure CSR, reflecting its overall levels (Chen et al., 2018; Yuan, Wu, Qin, & Xu, 2022). This database evaluates a company's performance in each sub-domain using a binary scoring system, assigning a score of 1 for satisfactory performance in a particular domain and 0 otherwise. This aggregated CSR score encapsulates the company's overall commitment to social responsibility and its connection with a multitude of stakeholders.

5.2.3. Financial Analyst Forecast Accuracy

Analyst forecast accuracy serves as a tool to assess the precision of financial predictions in this study (Li, Li, Lin, & Xu, 2019). This metric aids in evaluating the alignment between analysts forecasts and actual financial results, thereby indicating the precision of their insights into corporate performance and market conditions.

$$FEEROR_{it} = \frac{|\text{Mean}(\text{FEPS}_{it}) - \text{MEPS}_{it}|}{\text{Price}} \quad (2)$$

The research utilizes the FEEROR model to assess the discrepancy between analysts' forecasts and the actual outcomes within this framework. FEEROR represents analyst forecast accuracy, and FEPS represents the recent forecast for the target company's earnings per share (EPS) by analysts. The mean (FEPS) represents the average of the analyst organization's last forecast for the target company's earnings per share. MEPS stands for the verified EPS value of the target company, whereas Price signifies the stock's price point at the end of the specified period. A lower value of FEEROR signifies higher forecast accuracy.

5.2.4. Control Variables

This study, based on previous literature, employs the following control variables: Size is represented by the logarithm of total assets at the end of the year (Cao, Dong, Lu, & Ma, 2020). Lev is measured by the ratio of total liabilities to total assets at the end of the year (Cao et al., 2020). Growth represents the revenue growth rate, calculated as the increase in revenue divided by the previous year's revenue (Hai, Fang, & Li, 2022). AssetG represents the rate of asset appreciation, calculated as the increase in assets divided by the previous year's assets (Artikis, Diamantopoulou, Papanastasopoulos, & Sorros, 2022). Board denotes the scale of the board of directors, measured by the natural logarithm of the number of members (Ho, Yan, Mao, & An, 2023). SOE indicates state-owned enterprises, coded as 1 for SOE and 0 otherwise (Ullah, Zeb, Khan, & Xiao, 2020), and Top1 represents the proportion of shares held by the largest shareholder (Ho et al., 2023). We select these variables to account for various firm-specific factors that may influence the dependent variable, thereby aiding in isolating the impact of the independent variables on experimental results. All variables are winsorized at 1% and 99%.

5.2.5. Propensity Score Matching Characteristic Variables

Referring to the previous study by Liao, Chen, and Zheng (2019) the PSM method is used to address endogeneity concerns, including the potential for sample selection bias issues. In China, companies that actively undertake CSR are often substantial in size and highly profitable. However, the results in a significant disparity between firms that disclose CSR and those that do not. To ensure the reliability of the result, this method ensures that the two samples are comparable in terms of several key firm characteristics variables, such as return on assets, firm size, asset-liability ratio, industry type, and the age of listing of the firm (Shan, Yang, Zhang, & Chang, 2023). We create this matching process to mimic the environment of a randomized controlled trial, which leads to a more precise evaluation of the treatment effect.

5.3. Research Design

Following the principle of Baron and Kenny (1986) mediating effect and utilising OLS regression with individual clustering and robust standard errors, this study developed a four-step mediating effect model.

$$Inv_{i,t} = \gamma_0 + \gamma_{01}CSR_{i,t} + \gamma_{02}Control_{i,t} + \sum Industry + \sum Year + \mu_{i,t} \quad (3)$$

$$FEEROR_{i,t} = \gamma_1 + \gamma_{11}CSR_{i,t} + \gamma_{12}Control_{i,t} + \sum Industry + \sum Year + \mu_{i,t} \quad (4)$$

$$Inv_{i,t} = \gamma_2 + \gamma_{21}CSR_{i,t} + \gamma_{22}FEEROR_{i,t} + \gamma_{23}Control_{i,t} + \sum Industry + \sum Year + \mu_{i,t} \quad (5)$$

$Inv_{i,t}$ refers to investment efficiency and is denoted by the residuals of the Richardson model. A greater magnitude of residuals indicates increased inefficient investment, consequently reflecting lower efficiency in the firm's investment endeavors. $CSR_{i,t}$, an acronym for CSR, is evaluated through the aggregation of social responsibility scores. $FEEROR_{i,t}$ denotes analyst forecast accuracy, with a higher value indicating a lower level of accuracy in the analyst's forecasts.

Model 3 examines the overall effect of CSR on corporate investment efficiency, represented by γ_{01} . As illustrated in Model 4, the coefficient of the effect of CSR on the accuracy of analysts' forecasts is γ_{11} . In Model 5, the variable γ_{21} reflects the direct impact of CSR on investment efficiency through analyst forecast accuracy, while the variable γ_{22} represents the indirect impact of CSR on investment efficiency through the same mediating factor.

According to the four-step method established by Baron and Kenny (1986) and further elaborated by Muller et al. (2005), the presence of a mediating effect requires that all coefficients be significant and that the direct impact coefficient in Model 5 should be less than the overall effect coefficient in Model 3. This reduction in the direct effect suggests partial mediation by the intervening variable, which in this case is the forecast accuracy. After stepwise regression, following the study of Shrout and Bolger (2002) the indirect effect is measured using the Bootstrap method. We establish the existence of partial mediation when the Bootstrap confidence intervals for the indirect and direct effects exclude 0.

Table 1. Overall description.

Variable	Obs.	Mean	Std. dev.	Min.	Max.
Inv	21947	0.072	0.095	0	1.447
FERROE	21947	0.044	0.066	0	0.433
CSR	21947	4.547	2.667	0	8
Size	21947	22.409	1.287	19.585	26.452
Lev	21947	0.437	0.2	0.027	0.908
Growth	21947	0.176	0.402	-0.658	4.024
AssetG	21947	0.173	0.343	-0.383	5.116
Board	21947	2.132	0.199	1.609	2.708
SOE	21947	0.379	0.485	0	1
TOP1	21947	34.785	14.762	8.02	75.843

6. FINDINGS

6.1. Data Overview

Table 1 summarizes the quantitative characteristics of the main variables employed in our empirical analysis. The mean value of the dependent variable, investment efficiency, is 0.072, with a minimum of 0 and a maximum of 1.477. These values indicate that there is a significant difference in the efficiency of enterprise investment. The independent variable, CSR, has a mean value of 4.547 with a standard deviation of 2.667, showing significant distinctions in the quality of corporate social responsibility. Additionally, the mediator variable, FERROE, has a mean value of 0.044 with a standard deviation of 0.066, indicating a significant deviation in analysts' estimates.

Table 2. Correlation analysis.

Variable	Inv	FERROE	CSR	Size	Lev	Growth	AssetG	Board	SOE	TOP1
Inv	1									
ERROE	-0.044***	1								
CSR	-0.059***	-0.00300	1							
Size	0.020***	0.038***	0.271***	1						
Lev	0.024***	0.180***	0.027***	0.511***	1					
Growth	0.307***	-0.221***	-0.049***	0.027***	0.043***	1				
AssetG	0.429***	-0.212***	-0.053***	0.054***	0.043***	0.565***	1			
Board	0.024***	-0.039***	0.026***	0.246***	0.146***	-0.013*	-0.011*	1		
SOE	0.015**	-0.056***	0.017**	0.358***	0.282***	-0.055***	-0.064***	0.284***	1	
TOP1	0.026***	-0.089***	0.00300	0.221***	0.084***	-0.0200	-0.00300	0.040***	0.240***	1

Note: *Represents the 10% significance level, ** represents the 5% significance level, *** represents the 1% significance level.

6.2. Correlation Analysis

Table 2 displays Pearson correlations below the diagonal. Both corporate investment efficiency and analyst forecast accuracy significantly and negatively correlate with CSR. Furthermore, the analysis reveals no significant issue of multicollinearity among any pair of variables, ensuring that the statistical inferences drawn from this study are robust and reliable.

Table 3. Regression results.

Variables	(1) Inv	(2) FERROR	(3) Inv
CSR	-0.001*** (-3.37)	-0.001*** (-4.14)	-0.001*** (-3.05)
FERROR			0.115*** (11.15)
Size	-0.001 (-1.25)	-0.001 (-1.14)	-0.001 (-1.16)
Lev	0.013*** (2.67)	0.082*** (19.40)	0.004 (0.72)
Growth	0.023*** (6.02)	-0.025*** (-16.48)	0.026*** (6.71)
AssetG	0.103*** (15.08)	-0.023*** (-12.05)	0.106*** (15.37)
Board	-0.000 (-0.03)	-0.011*** (-3.56)	0.001 (0.29)
SOE	0.002 (0.96)	-0.012*** (-8.74)	0.003* (1.69)
TOP1	0.000 (0.63)	-0.000*** (-8.72)	0.000 (1.35)
_cons	0.076*** (4.31)	0.065*** (4.68)	0.069*** (3.89)
N	21947	21947	21947
Industry/Year	Y	Y	Y
r ²	0.224	0.161	0.229

Note: * Represents the 10% significance level, *** represents the 1% significance level.

6.3. Mediation Effect Regression Details

Table 3 presents the regression results, utilizing Baron and Kenny (1986) four-step technique to elucidate the effect. The initial step involves estimating and analyzing the overall effect of social responsibility disclosure on investment efficiency. The first column of Table 3 reflects the regression result supporting H1. Here, the coefficient -0.001 of CSR is highly negatively associated at the 1% significance level, indicating that disclosure of social programs substantially enhances investment efficiency. The study then progresses to develop and estimate two models (Model 4 and Model 5) to explore the potential mediating role of analysts' forecasts in the relationship between social responsibility and investment efficiency. The precision of analyst predictions encompasses the potential intervening factors capable of transmitting or altering CSR's influence on investment effectiveness. Discoveries illustrated in Table 3 unveil that the CSR parameter in the second column demonstrates a statistically noteworthy influence of CSR on the precision of financial analyst predictions, corroborating H2. This illustrates that effectively communicating social responsibility can serve as a measure of managerial excellence and the openness of corporate governance within a company. These positive signals help alleviate information disparities and empower analysts to predict a company's financial outlook accurately (Muslu et al., 2019).

Table 4. Direct and indirect paths computing with Bootstrap.

Path	Type	Coefficient	Std. err.	z	p> z	BC 95% CI	
						Lower	Upper
CSR-FERROR-Inv(Y_{11} * Y_{22})	Indirect	-0.397*10 ⁻⁴	0.137*10 ⁻⁴	-2.91	0.004	-0.665*10 ⁻⁴	-0.130*10 ⁻⁴
CSR-Inv(Y_{21})	Direct	-10.578*10 ⁻⁴	2.080*10 ⁻⁴	-5.09	0.000	-14.655*10 ⁻⁴	-6.501*10 ⁻⁴

In the third column of Table 3, the coefficient of FERROR highlights the beneficial influence of analyst predictions on firm investment efficiency, even after controlling corporate social responsibility (CSR). Meanwhile, the coefficient of CSR is markedly negative, with a smaller magnitude in the third column compared to that of the

first column, validating H3 and H4. This finding underscores that analyst forecast accuracy is crucial in mediating the linkage between CSR and firm investment efficiency.

The current study uses the Bootstrap method, which includes 1000 repetitions of sampling, to examine how analyst forecast precision mediates the link between corporate investment effectiveness and corporate social responsibility. Table 4 shows that neither the direct effect nor the indirect effect confidence intervals include the zero value. This means that the link between CSR and the effectiveness of corporate investment is heavily influenced by how well analysts predict what will happen. These mediation results suggest the significance of precise analyst forecasts in elucidating the influence of CSR on corporate investment strategies.

6.4. Propensity Score Matching Results

Previous research has used the propensity score matching (PSM) method to account for possible changes in the samples and lessen the effect of hidden variables on estimates of the treatment effect (Hoi, Wu, & Zhang, 2013; Liao et al., 2019). This study uses the Probit model and 1:2 nearest neighbor matching to compare firms with above-average social responsibility disclosure and those with below-average disclosure to form a balanced experimental and control group.

With these matched samples, this study investigates how financial analyst forecast accuracy acts as a mediator in the connection between social responsibility disclosure and investment efficiency. The study includes 16,312 samples, and the regression outcomes are detailed in Table 5. This approach allows for an endogeneity test of how enhanced CSR disclosure influences corporate financial outcomes through the lens of analyst forecast accuracy.

Table 5. Balance test.

Variable	Matched	Mean value		%bias	bias	t	p> t	V(C)
		Treated	Control					
Size	U	22.692	22.128	44.9	99.8	33.29	0.000	1.48*
	M	22.679	22.678	0.1		0.05	0.959	0.99
Lev	U	0.443	0.431	6.0	84.6	4.47	0.000	0.90*
	M	0.443	0.445	- 0.9		- 0.68	0.498	0.86*
Assetreturn	U	0.006	0.007	- 8.4	95.5	- 6.21	0.000	0.70*
	M	0.006	0.006	- 0.4		- 0.31	0.754	1.07*
Industry	U	4.384	4.930	-17.0	96.2	-12.60	0.000	0.75*
	M	4.392	4.3709	0.7		-0.53	0.595	1.10*
ListAge	U	2.279	2.2056	11.2	79.6	8.28	0.000	0.90*
	M	2.278	2.2629	2.3		1.70	0.090	0.94*

Note: * Represents the 10% significance level.

Table 5 details the outcomes of the balance tests, which evaluate observable variables at the firm level. Before matching, there was a significant disparity between the means of the control group (firms with lower levels of social responsibility disclosure) and the treatment group (firms with higher levels of disclosure). However, after implementing the propensity score matching, the differences between the group means are no longer statistically notable, illustrating effective matching. Table 5 visually represents the improvement in balance.

Additionally, the matching process significantly reduced the deviations in the control variables, achieving standardized deviations for all variables of less than 10% in absolute value. According to Rosenbaum and Rubin (1983) the standard deviation of the propensity match score should not exceed 20% in absolute value to ensure suitable match quality. This criterion has been successfully met in our study, as shown in Table 5, indicating robust matching that adequately controls for confounding variables and supports reliable estimation of treatment effects.

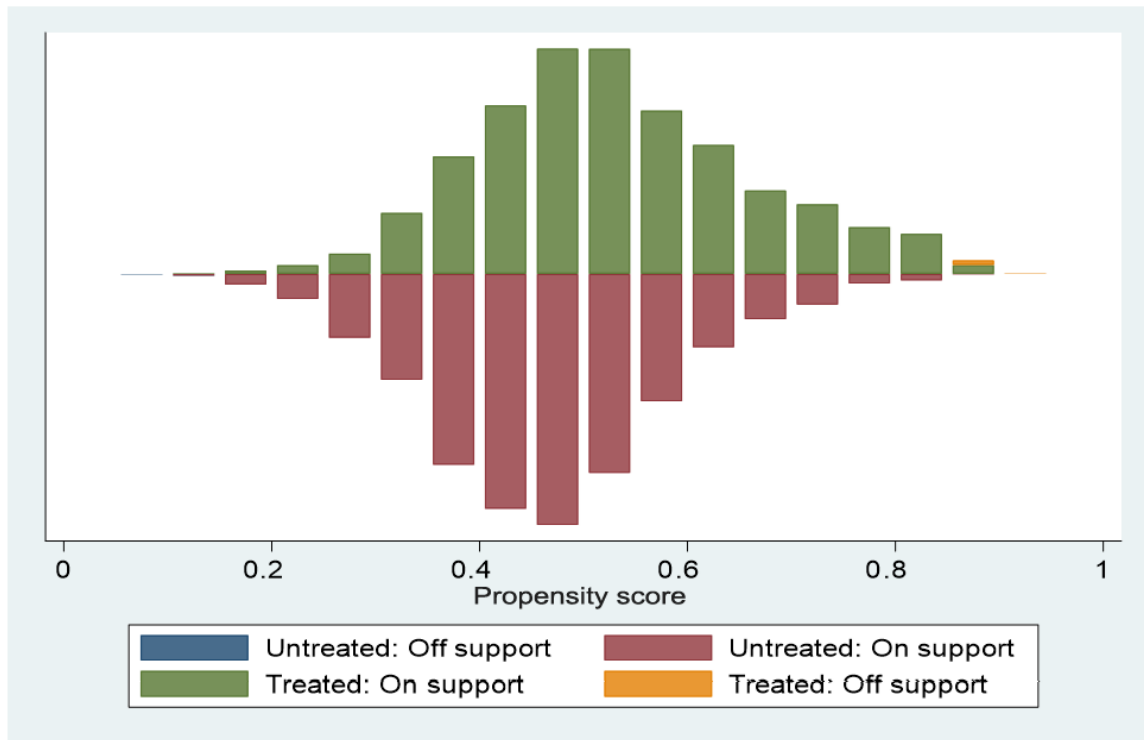


Figure 2. Common range of values for the propensity to match.

As illustrated in Figure 2, most observations fall within the range of shared values, supporting the assumption of common support or overlap. This overlap indicates that the majority of observed values in the propensity matching scores for organizations with and without mandated social responsibility disclosure are within the same range. Specifically, among the 21,947 samples analyzed, 10,888 from the treatment group and 11,010 from the control group fall within the common support domain. Only 49 samples—41 from the treatment group and 8 from the control group—fell outside this domain, resulting in a negligible sample loss rate of only 0.02%. The good matching process makes sure that there is a balance between the treatment group and the people in the control group, propensity scores are similar. This makes the casual insights from the comparative evaluation even more reliable. The significance of this alignment cannot be overstated when it comes to confirming the effect of social responsibility disclosures on the variables being examined.

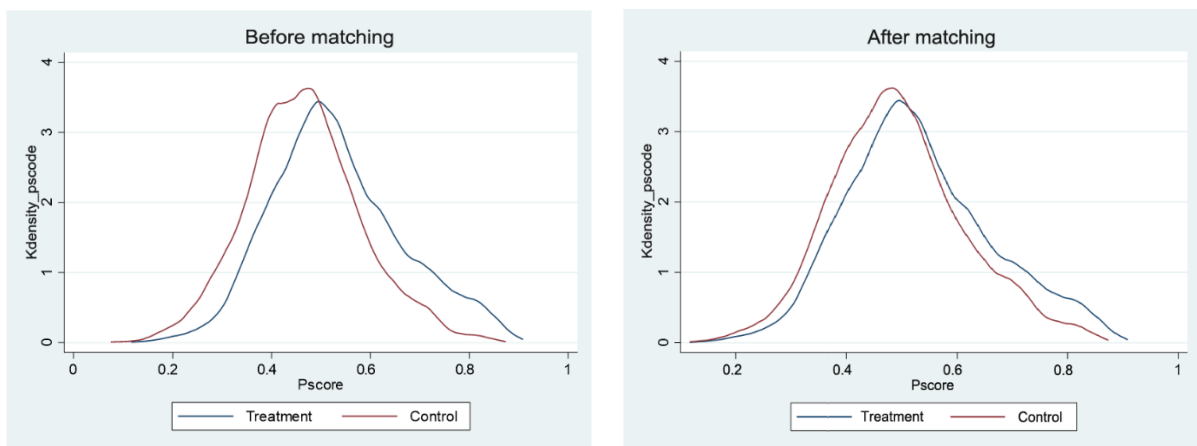


Figure 3. Probability density distribution before and after matching.

As depicted in Figure 3, there is a substantial disparity in the probability distribution of the propensity score values for the experimental and control groups before matching. This considerable difference suggests that directly

comparing these groups would introduce significant bias into the analysis. However, matching significantly reduces the disparity in the probability distributions of the propensity scores between the control group and the experimental group. This improvement effectively minimizes bias in the results, thereby enhancing the reliability of the conclusions drawn from the study. This alignment demonstrates the effectiveness of the propensity score matching technique in creating comparable groups for accurate causal inference.

Table 6. Propensity matching score sample regression results.

Variable	(1) Inv	(2) FERROR	(3) Inv
CSR	-0.001*** (-3.48)	-0.001*** (-4.80)	-0.001*** (-3.12)
FERROR			0.116*** (9.44)
Size	-0.001 (-0.67)	-0.001 (-1.56)	-0.001 (-0.53)
Lev	0.010* (1.76)	0.079*** (16.58)	0.000 (0.08)
Growth	0.023*** (5.33)	-0.025*** (-13.93)	0.025*** (5.94)
AssetG	0.103*** (13.30)	-0.022*** (-10.40)	0.105*** (13.54)
Board	0.000 (0.01)	-0.010*** (-2.92)	0.001 (0.25)
SOE	0.003 (1.49)	-0.011*** (-7.53)	0.004** (2.08)
TOP1	0.000 (0.04)	-0.000*** (-8.31)	0.000 (0.73)
_cons	0.067*** (3.34)	0.069*** (4.45)	0.059*** (2.95)
N	16312	16312	16312
industry/Year	Y	Y	Y
r ²	0.229	0.158	0.234

Note: *Represents the 10% significance level, ** represents the 5% significance level, *** represents the 1% significance level.

Table 6 displays the findings of the empirical analysis, which examines how analyst forecast accuracy mediates the influence of CSR on firm investment efficiency, using a post-sample matched by propensity score matching (PSM). The coefficients in the first column for CSR reflect the overall impact of CSR on firm investment efficiency. The second column outlines the effect of CSR on analyst forecast accuracy, while the third column depicts the combined impact of CSR and analyst forecast accuracy on firm investment efficiency.

Table 7. Bootstrap method indirect and direct paths.

Path	Type	coefficient	Std. err.	z	p> z	BC95% CI	
						Lower	Upper
CSR-FERROR-Inv($\gamma_{11} * \gamma_{22}$)	Indirect	-1.314*10 ⁻⁴	0.202*10 ⁻⁴	-6.50	0.000	-1.710*10 ⁻⁴	-0.918*10 ⁻⁴
CSR-Inv(γ_{21})	Direct	-9.974*10 ⁻⁴	2.706*10 ⁻⁴	-3.69	0.000	-15.278*10 ⁻⁴	-4.671*10 ⁻⁴

The coefficients of CSR in the first two columns shows that it greatly cuts down on wasteful investments and improves the accuracy of analyst predictions, which supports both H1 and H2. Remarkably, the information presented in the third column indicates that the convergence of CSR and analyst forecast precision significantly diminishes ineffective investments, thereby corroborating both H3 and H4. Therefore, analyst forecast accuracy is a mediator in the correlation between CSR and improved investment efficiency among firms. This mediation highlights the crucial importance of precise prediction in enhancing the efficiency of investments propelled by conscientious corporate

conduct. After that, the study uses the Bootstrap method (repeated sampling 1000 times) to look at how analyst predictions might affect the relationship between CSR and how efficiently companies spend their money. Table 7 shows that the confidence intervals for the indirect effects exclude the value 0, while the confidence intervals for the direct effects do not include 0. These results indicate a statistically significant mediating effect of analyst forecasts on the link between CSR and corporate investment efficiency. Analyst forecasts serve as a bridge between CSR and increased investment efficiency in firms.

7. DISCUSSION

The results of the empirical test show that CSR positively impacts corporate investment efficiency with the 21947 total samples and 16312 PSM samples, thus verifying H1. Zamir, Shailer, and Saeed (2022) find a correlation between CSR and the efficiency of corporate investments, and our study reaffirms previous findings regarding the nexus between CSR and investment efficacy. The findings indicate that financial analyst forecast accuracy mediates the impact of CSR on corporate investment efficiency. CSR notably enhances financial forecast accuracy, which in turn positively impacts firm investment efficiency, confirming H2 and H3. These findings are consistent with the results of Muslu et al. (2019). Furthermore, financial analyst forecast accuracy plays a vital role in establishing an indirect positive relationship between CSR and investment efficiency, as indicated in H4. This supports the conclusions of previous research (Zadeh et al., 2021).

8. CONCLUSION

The study uses 21947 full samples to analyze the impact of CSR on corporate investment effectiveness and explore the intricate ways in which CSR affects corporate investment efficiency. The accuracy of financial analyst forecasts has a significant impact on the mechanism linking CSR to corporate investment efficiency. Four research hypotheses are also evaluated using bootstrapping and PSM methods. Different sample results reveal that financial analyst forecast accuracy plays the role of a broker between CSR practices and corporate investment effectiveness. The investigation unveiled favorable correlations linking CSR initiatives, financial analyst precision, and corporate investment efficacy. This research has certain limitations. Firstly, it may depend on data specific to certain countries or regions, which could restrict the generalizability of its conclusions. Variations in CSR practices and capital market dynamics across different countries and cultural contexts could significantly affect the results. Moreover, the Chinese regulatory framework encompasses mandatory and voluntary social responsibility disclosures, yet there is a shortage of empirical studies comparing the effects of these two disclosure approaches. Therefore, our comprehension of how different disclosure strategies influence investor decisions and corporate behavior is limited.

Future research could pursue several paths. Comparative cross-national studies might assess the implementation and efficacy of CSR disclosure in various legal, cultural, and market contexts. Such studies could illuminate how different regulatory frameworks impact the quality of CSR disclosure and investor behavior. Additionally, empirical research could contrast the distinct effects of mandatory versus voluntary disclosures across various industries and company sizes, mainly focusing on their implications for investment efficiency and market confidence. These investigations would further clarify the overall impact of CSR on corporate and market dynamics.

Enterprises should recognize the importance of CSR disclosure because it enhances information transparency, positively affecting corporate investment efficiency. However, relying solely on firms to improve information transparency is insufficient. There is also a need to bolster regulation within the analyst industry to enhance forecast accuracy. As crucial participants in the capital market, the accuracy of analysts' forecasts significantly influences investors' decisions. When making investment decisions, investors should carefully consider the fulfillment of CSR and analysts' forecasts. A responsible enterprise can often earn the trust and support of the market, while accurate and independent analyst forecasts can provide investors with valuable reference information.

Funding: This research is supported by the Scientific Research Project on Higher Education of Anhui Province (Grant number: 2022AH052384).

Institutional Review Board Statement: Not applicable.

Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.

Competing Interests: The authors declare that they have no competing interests.

Authors' Contributions: Writing-original draft, Q.Z.; problem statement supervision, S.S.; statistical method analysis supervision, C.C. and S.S. All authors have read and agreed to the published version of the manuscript.

REFERENCES

- Amiram, D., Landsman, W. R., Owens, E. L., & Stubben, S. R. (2018). How are analysts' forecasts affected by high uncertainty? *Journal of Business Finance & Accounting*, 45(3-4), 295-318. <https://doi.org/10.1111/jbfa.12270>
- Ansu-Mensah, P., Marfo, E. O., Awuah, L. S., & Amoako, K. O. (2021). Corporate social responsibility and stakeholder engagement in Ghana's mining sector: A case study of Newmont Ahafo mines. *International Journal of Corporate Social Responsibility*, 6, 1-22. <https://doi.org/10.1186/s40991-020-00054-2>
- Artikis, P. G., Diamantopoulou, L., Papanastasopoulos, G. A., & Sorros, J. N. (2022). Asset growth and stock returns in European equity markets: Implications of investment and accounting distortions. *Journal of Corporate Finance*, 73, 102193. <https://doi.org/10.1016/j.jcorpfin.2022.102193>
- Bakke, T.-E., & Whited, T. M. (2010). Which firms follow the market? An analysis of corporate investment decisions. *The Review of Financial Studies*, 23(5), 1941-1980. <https://doi.org/10.1093/rfs/hhp115>
- Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51(6), 1173. <https://doi.org/10.1037/0022-3514.51.6.1173>
- Benlemlih, M., & Bitar, M. (2018). Corporate social responsibility and investment efficiency. *Journal of Business Ethics*, 148, 647-671. <https://doi.org/10.1007/s10551-016-3020-2>
- Bhat, G., Hope, O. K., & Kang, T. (2006). Does corporate governance transparency affect the accuracy of analyst forecasts? *Accounting & Finance*, 46(5), 715-732. <https://doi.org/10.1111/j.1467-629X.2006.00191.x>
- Biddle, G. C., Hilary, G., & Verdi, R. S. (2009). How does financial reporting quality relate to investment efficiency? *Journal of Accounting and Economics*, 48(2-3), 112-131. <https://doi.org/10.1016/j.jacceco.2009.09.001>
- Brammer, S., & Millington, A. (2008). Does it pay to be different? An analysis of the relationship between corporate social and financial performance. *Strategic Management Journal*, 29(12), 1325-1343. <https://doi.org/10.1002/smj.714>
- Cao, Y., Dong, Y., Lu, Y., & Ma, D. (2020). Does institutional ownership improve firm investment efficiency? *Emerging Markets Finance and Trade*, 56(12), 2772-2792. <https://doi.org/10.1080/1540496X.2018.1486705>
- Carroll, A. B. (1991). The pyramid of corporate social responsibility: Toward the moral management of organizational stakeholders. *Business Horizons*, 34(4), 39-48. [https://doi.org/10.1016/0007-6813\(91\)90005-g](https://doi.org/10.1016/0007-6813(91)90005-g)
- Carroll, A. B. (2016). Carroll's pyramid of CSR: Taking another look. *International Journal of Corporate Social Responsibility*, 1, 1-8. <https://doi.org/10.1186/s40991-016-0004-6>
- Carroll, A. B., & Shabana, K. M. (2010). The business case for corporate social responsibility: A review of concepts, research and practice. *International Journal of Management Reviews*, 12(1), 85-105. <https://doi.org/10.1111/j.1468-2370.2009.00275.x>
- Chahine, S., Daher, M., & Saade, S. (2021). Doing good in periods of high uncertainty: Economic policy uncertainty, corporate social responsibility, and analyst forecast error. *Journal of Financial Stability*, 56, 100919. <https://doi.org/10.1016/j.jfs.2021.100919>
- Chen, L., Danbolt, J., & Holland, J. (2018). Information about bank intangibles, analyst information intermediation, and the role of knowledge and social forces in the 'market for information'. *Accounting Forum*, 42(3), 261-276. <https://doi.org/10.1016/j.accfor.2018.08.002>
- Chen, T., Xie, L., & Zhang, Y. (2017). How does analysts' forecast quality relate to corporate investment efficiency? *Journal of Corporate Finance*, 43, 217-240. <https://doi.org/10.1016/j.jcorpfin.2016.12.010>
- Cohen, J., Gaynor, L. M., Krishnamoorthy, G., & Wright, A. M. (2007). Auditor communications with the audit committee and the

- board of directors: Policy recommendations and opportunities for future research. *Accounting Horizons*, 21(2), 165-187. <https://doi.org/10.2308/acch.2007.21.2.165>
- Cook, K. A., Romi, A. M., Sánchez, D., & Sánchez, J. M. (2019). The influence of corporate social responsibility on investment efficiency and innovation. *Journal of Business Finance & Accounting*, 46(3-4), 494-537. <https://doi.org/10.1111/jbfa.12360>
- Coram, P. J., Mock, T. J., & Monroe, G. S. (2011). Financial analysts' evaluation of enhanced disclosure of non-financial performance indicators. *The British Accounting Review*, 43(2), 87-101. <https://doi.org/10.1016/j.bar.2011.02.001>
- Demmer, M., Pronobis, P., & Yohn, T. L. (2019). Mandatory IFRS adoption and analyst forecast accuracy: The role of financial statement-based forecasts and analyst characteristics. *Review of Accounting Studies*, 24, 1022-1065. <https://doi.org/10.1007/s11142-019-9481-7>
- Dessaint, O., Foucault, T., Frésard, L., & Matray, A. (2019). Noisy stock prices and corporate investment. *The Review of Financial Studies*, 32(7), 2625-2672. <https://doi.org/10.1093/rfs/hhy115>
- Devie, D., Liman, L. P., Tarigan, J., & Jie, F. (2020). Corporate social responsibility, financial performance and risk in Indonesian natural resources industry. *Social Responsibility Journal*, 16(1), 73-90. <https://doi.org/10.1108/SRJ-06-2018-0155>
- Dhaliwal, D. S., Radhakrishnan, S., Tsang, A., & Yang, Y. G. (2012). Nonfinancial disclosure and analyst forecast accuracy: International evidence on corporate social responsibility disclosure. *The Accounting Review*, 87(3), 723-759. <https://doi.org/https://doi.org/10.2308/accr-10218>
- Drobotz, W., El Ghouli, S., Guedhami, O., & Janzen, M. (2018). Policy uncertainty, investment, and the cost of capital. *Journal of Financial Stability*, 39, 28-45. <https://doi.org/10.1016/j.jfs.2018.08.005>
- Du, S., & Yu, K. (2021). Do corporate social responsibility reports convey value relevant information? Evidence from report readability and tone. *Journal of Business Ethics*, 172, 253-274. <https://doi.org/10.1007/s10551-020-04496-3>
- Erawati, N. M. A., Sutrisno, T., Hariadi, B., & Saraswati. (2021). The role of corporate social responsibility in the investment efficiency: Is it important? *The Journal of Asian Finance, Economics and Business*, 8(1), 169-178. <https://doi.org/10.13106/jafeb.2021.vol8.no1.169>
- Fadun, S. O. (2014). Corporate social responsibility (CSR) practices and stakeholders expectations: The Nigerian perspectives. *Research in Business and Management*, 1(2), 13-31. <https://doi.org/10.5296/rbm.v1i2.5500>
- Flammer, C. (2013). Corporate social responsibility and shareholder reaction: The environmental awareness of investors. *Academy of Management Journal*, 56(3), 758-781. <https://doi.org/10.5465/amj.2011.0744>
- Frankel, R., Kothari, S., & Weber, J. (2006). Determinants of the informativeness of analyst research. *Journal of Accounting and Economics*, 41(1-2), 29-54. <https://doi.org/10.1016/j.jacceco.2005.10.004>
- Friedman, M. (1970). A friedman doctrine: The social responsibility of business is to increase its profits. *New York Times Magazine*, 126, 32-33.
- Guedj, O., & Bouchaud, J.-P. (2005). Experts'earning forecasts: Bias, herding and gossamer information. *International Journal of Theoretical and Applied Finance*, 8(7), 933-946. <https://doi.org/10.1142/S0219024905003281>
- Gupta, J., & Das, N. (2024). Too little or too much? The curvilinear relationship between corporate social responsibility disclosure and investment efficiency in BRICS economies. *Corporate Social Responsibility and Environmental Management*. <https://doi.org/10.1002/csr.2705>
- Hai, M., Fang, Z., & Li, Z. (2022). Does business group's conscious of social responsibility enhance its investment efficiency? Evidence from ESG disclosure of China's listed companies. *Sustainability*, 14(8), 4817. <https://doi.org/10.3390/su14084817>
- Hamrouni, A., Bouattour, M., Ben Farhat Toumi, N., & Boussaada, R. (2022). Corporate social responsibility disclosure and information asymmetry: Does boardroom attributes matter? *Journal of Applied Accounting Research*, 23(5), 897-920. <https://doi.org/10.1108/JAAR-03-2021-0056>
- Harjoto, M., & Laksmana, I. (2018). The impact of corporate social responsibility on risk taking and firm value. *Journal of Business Ethics*, 151, 353-373. <https://doi.org/10.1007/s10551-016-3202-y>
- Hermalin, B. E., & Weisbach, M. S. (2012). Information disclosure and corporate governance. *The Journal of Finance*, 67(1), 195-

233. <https://doi.org/10.1111/j.1540-6261.2011.01710.x>
- Ho, K.-C., Yan, C., Mao, Z., & An, J. (2023). Corporate sustainability policies and corporate investment efficiency: Evidence from the quasi-natural experiment in China. *Energy Economics*, 127, 107050. <https://doi.org/10.1016/j.eneco.2023.107050>
- Hoi, C. K., Wu, Q., & Zhang, H. (2013). Is corporate social responsibility (CSR) associated with tax avoidance? Evidence from irresponsible CSR activities. *The Accounting Review*, 88(6), 2025-2059. <https://doi.org/10.2308/accr-50544>
- Hu, S., Liu, M., Sohn, B. C., & Yuen, D. C. (2021). The impact of disclosure quality on analyst forecasts in China. *Accounting Forum*, 45(4), 411-434. <https://doi.org/10.1080/01559982.2021.1936394>
- Hugon, A., Kumar, A., & Lin, A.-P. (2016). Analysts, macroeconomic news, and the benefit of active in-house economists. *The Accounting Review*, 91(2), 513-534. <https://doi.org/10.2308/accr-51151>
- Jenkins, H., & Yakovleva, N. (2006). Corporate social responsibility in the mining industry: Exploring trends in social and environmental disclosure. *Journal of Cleaner Production*, 14(3-4), 271-284. <https://doi.org/10.1016/j.jclepro.2004.10.004>
- Jensens, M. C. (1986). Agency costs of free cash flow, corporate finance and takeovers. *American Economic Review*, 76(3), 323-329. <https://doi.org/stable/1818789>
- Jiang, D., Li, W., Shen, Y., & Zhang, Y. (2022). Does air quality affect firms' investment efficiency? Evidence from China. *International Review of Economics & Finance*, 79, 1-17. <https://doi.org/10.1016/j.iref.2022.01.001>
- Kong, D., Liu, L., & Liu, S. (2020). Market information traveling on high-speed rails: The case of analyst forecasts. *Pacific-Basin Finance Journal*, 61, 101320. <https://doi.org/10.1016/j.pacfin.2020.101320>
- Kott, A., & Perconti, P. (2018). Long-term forecasts of military technologies for a 20-30 year horizon: An empirical assessment of accuracy. *Technological Forecasting and Social Change*, 137, 272-279. <https://doi.org/10.1016/j.techfore.2018.08.001>
- Lantos, G. P. (2001). The boundaries of strategic corporate social responsibility. *Journal of Consumer Marketing*, 18(7), 595-632. <https://doi.org/10.1108/07363760110410281>
- Li, H., Li, Z., Lin, B., & Xu, X. (2019). The effect of short sale constraints on analyst forecast quality: Evidence from a natural experiment in China. *Economic Modelling*, 81, 338-347. <https://doi.org/10.1016/j.econmod.2019.06.001>
- Liao, L., Chen, G., & Zheng, D. (2019). Corporate social responsibility and financial fraud: Evidence from China. *Accounting & Finance*, 59(5), 3133-3169. <https://doi.org/10.1111/acfi.12572>
- Lin, Y.-E., Li, Y.-W., Cheng, T. Y., & Lam, K. (2021). Corporate social responsibility and investment efficiency: Does business strategy matter? *International Review of Financial Analysis*, 73, 101585. <https://doi.org/10.1016/j.irfa.2020.101585>
- Martínez-Ferrero, J., Ruiz-Cano, D., & García-Sánchez, I. M. (2016). The causal link between sustainable disclosure and information asymmetry: The moderating role of the stakeholder protection context. *Corporate Social Responsibility and Environmental Management*, 23(5), 319-332. <https://doi.org/10.1002/csr.1379>
- Modigliani, F., & Miller, M. H. (1958). The cost of capital, corporation finance and the theory of investment. *The American Economic Review*, 48(3), 261-297. <https://doi.org/stable/1809766>
- Mohd Saleh, N., & Sun, X. W. (2022). The influence of female directors proportion on investment efficiency: The mediating role of caution. *Gender in Management: An International Journal*, 37(3), 289-304. <https://doi.org/10.1108/GM-09-2020-0295>
- Muller, D., Judd, C. M., & Yzerbyt, V. Y. (2005). When moderation is mediated and mediation is moderated. *Journal of Personality and Social Psychology*, 89(6), 852-863. <https://doi.org/10.1037/0022-3514.89.6.852>
- Muslu, V., Mutlu, S., Radhakrishnan, S., & Tsang, A. (2019). Corporate social responsibility report narratives and analyst forecast accuracy. *Journal of Business Ethics*, 154, 1119-1142. <https://doi.org/10.1007/s10551-016-3429-7>
- Rehman, I. U., Shahzad, F., Latif, K. F., Nawab, N., Rashid, A., & Hyder, S. (2021). Does corporate social responsibility mediate the influence of national culture on investment inefficiency? Firm-level evidence from Asia Pacific. *International Journal of Finance & Economics*, 26(3), 3484-3503. <https://doi.org/10.1002/ijfe.1972>
- Ren, L., Zhong, X., & Wan, L. (2022). Missing analyst forecasts and corporate fraud: Evidence from China. *Journal of Business Ethics*, 18(1), 171-194. <https://doi.org/10.1007/s10551-021-04837-w>
- Reverte, C. (2016). Corporate social responsibility disclosure and market valuation: Evidence from Spanish listed firms. *Review of Managerial Science*, 10, 411-435. <https://doi.org/10.1007/s11846-014-0151-7>

- Richardson, S. (2006). Over-investment of free cash flow. *Review of Accounting Studies*, 11, 159-189. <https://doi.org/10.1007/s11142-006-9012-1>
- Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, 70(1), 41-55. <https://doi.org/10.1093/biomet/70.1.41>
- Samet, M., & Jarbouli, A. (2017). How does corporate social responsibility contribute to investment efficiency? *Journal of Multinational Financial Management*, 40, 33-46. <https://doi.org/10.1016/j.mulfin.2017.05.007>
- Shan, Y. G., Yang, J. W., Zhang, J., & Chang, M. (2023). Analyst forecast quality and corporate social responsibility: The mediation effect of corporate governance. *Meditari Accountancy Research*, 31(3), 675-705. <https://doi.org/10.1108/MEDAR-02-2021-1200>
- Shrout, P. E., & Bolger, N. (2002). Mediation in experimental and nonexperimental studies: New procedures and recommendations. *Psychological Methods*, 7(4), 422-445. <https://doi.org/10.1037/1082-989X.7.4.422>
- Suto, M., & Takehara, H. (2020). Corporate social responsibility intensity, management earnings forecast accuracy, and investor trust: Evidence from Japan. *Corporate Social Responsibility and Environmental Management*, 27(6), 3047-3059. <https://doi.org/10.1002/csr.2022>
- Teklay, B., Yu, W., & Zhu, K. (2024). The effect of superstitious beliefs on corporate investment efficiency: Evidence from China. *International Review of Economics & Finance*, 92, 1434-1447. <https://doi.org/10.1016/j.iref.2024.02.017>
- Ullah, I., Zeb, A., Khan, M. A., & Xiao, W. (2020). Board diversity and investment efficiency: Evidence from China. *Corporate Governance: The International Journal of Business in Society*, 20(6), 1105-1134. <https://doi.org/10.1108/CG-01-2020-0001>
- Vogt, S. C. (1994). The role of internal financial sources in firm financing and investment decisions. *Review of Financial Economics*, 4(1), 1-24. [https://doi.org/10.1016/1058-3300\(94\)90002-7](https://doi.org/10.1016/1058-3300(94)90002-7)
- Wang, H., & Gao, X. (2020). Oil price dynamics and airline earnings predictability. *Journal of Air Transport Management*, 87, 101854. <https://doi.org/10.1016/j.jairtraman.2020.101854>
- Wang, X., & Zhu, L. (2023). How does export VAT rebates policy affect corporate investment efficiency? Evidence from corporate tax stickiness. *Pacific-Basin Finance Journal*, 82, 102130. <https://doi.org/10.1016/j.pacfin.2023.102130>
- Yuan, T., Wu, J. G., Qin, N., & Xu, J. (2022). Being nice to stakeholders: The effect of economic policy uncertainty on corporate social responsibility. *Economic Modelling*, 108, 105737. <https://doi.org/10.1016/j.econmod.2021.105737>
- Zadeh, M. H., Magnan, M., Cormier, D., & Hammami, A. (2021). Environmental and social transparency and investment efficiency: The mediating effect of analysts' monitoring. *Journal of Cleaner Production*, 322, 128991. <https://doi.org/10.1016/j.jclepro.2021.128991>
- Zamir, F., Shailer, G., & Saeed, A. (2022). Do corporate social responsibility disclosures influence investment efficiency in the emerging markets of Asia? *International Journal of Managerial Finance*, 18(1), 28-48. <https://doi.org/10.1108/IJMF-02-2020-0084>
- Zee, H. H., Stotsky, J. G., & Ley, E. (2002). Tax incentives for business investment: A primer for policy makers in developing countries. *World Development*, 30(9), 1497-1516. [https://doi.org/10.1016/S0305-750X\(02\)00050-5](https://doi.org/10.1016/S0305-750X(02)00050-5)
- Zhang, J., Luo, Y., & Ding, X. (2022). Can green credit policy improve the overseas investment efficiency of enterprises in China? *Journal of Cleaner Production*, 340, 130785. <https://doi.org/10.1016/j.jclepro.2022.130785>
- Zhao, L., Liu, X., Tang, Y., & Zhang, W. (2024). Functional subsidies, selective subsidies and corporate investment efficiency: Evidence from China. *Emerging Markets Review*, 61, 101162. <https://doi.org/10.1016/j.ememar.2024.101162>
- Zheng, D., Xu, Y., & Wenren, Y. (2024). Compliance management and investment efficiency in state-owned enterprises: Evidence from China. *China Journal of Accounting Research*, 17(2), 100358. <https://doi.org/10.1016/j.cjar.2024.100358>

Views and opinions expressed in this article are the views and opinions of the author(s), International Journal of Management and Sustainability shall not be responsible or answerable for any loss, damage or liability etc. caused in relation to/arising out of the use of the content.