Treatise on the Relationship between Business ESG Performance and Efficiency of Investment

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Abstract: This essay examines the relationship between corporate environmental, social, and corporate governance (ESG) and corporate investment efficiency using data from Chinese A-share listed businesses from 2010 to 2020. The empirical findings indicate that solid environmental, social, and governance practices may help businesses improve their non-investment efficiency. The empirical findings of this research, on the other hand, indicate that ESG may help to minimize non-investment efficiency by reducing the agency problem. By employing corporations from developing markets as research samples, this study contributes to the theoretical literature on environmental, social, and corporate governance (ESG). At the same time, the findings of this study have illuminating implications for the company's ESG management, which is to say, for the management of stakeholders. At the same time, it supplies policymakers with valuable information on resource allocation and other problems.

1 INTRODUCTION

With increasing public awareness of climate change and societal challenges, environmental, social, and governance (ESG) investment has progressively become a popular subject. Against the backdrop of the pandemic, ESG investment has been expanding throughout the world unlike anything we've seen before. ESG is a term that refers to an investing strategy that takes into account three dimensions: Environment, Social Responsibility, and corporate governance. The ESG investment approach, as opposed to the standard investment strategy, places a greater emphasis on the overall enhancement of company social value. Since the 1980s, the divergences between firm owners and managers have become more pronounced, and unfavorable events such as financial fraud have been more prevalent, resulting in increased interest in corporate governance in both the business and academic communities (Shleifer, Vishny 1997, Bebchuk, et al., 2009, Bai, et al., 2005, Milosevic, et al., 2015) Because of the fast expansion of China's economy and culture, financial fraud events such as the Kangmei and the kangdexin scandals have occurred one after another, highlighting the need for deeper study into corporate governance. Against a backdrop of the steady expansion of the China's capital market frameworks, the 2018 corporate governance benchmarks for newly listed companies made it clear that they need to actively learn from international experience, encourage institutional investors to participate in corporate governance, strengthen the role played by the board of directors' audit committee, and set up the fundamental framework of environmental, social responsibility, and corporate governance (ESG). In this context, the link between ESG and firm investment efficiency, as well as the particular effect mechanism, is investigated in this research.

Enterprises' investment choices, as one of the three primary decisions they make, are critical to their long-term strategy and growth, and the index of investment efficiency is the focus of both academics and business communities. Increasing the effectiveness of investment has emerged as a crucial subject of concern for businesses and investors in recent years, as a result of China's economic growth and transition. The relationship between enterprise ESG performance and investment efficiency is currently dominated by two theories: on the one hand, it is believed that better ESG performance can enhance enterprise financing constraints and agency costs, thereby improving enterprise investment efficiency(Lambert, et al., 2007, Zhong, Gao, 2017,

Anwar, Malik, 2020); On the other hand, it is claimed that firms' attention to ESG would result in the waste of company resources and the conduct of managers pursuing their personal interests, resulting in a reduction in the investment efficiency of enterprises (Bé nabou, Tirole, 2010, Krüger, 2015).

According to previous researches, the current relevant research is primarily based on international data, whereas domestic research on enterprise ESG performance and enterprise investment efficiency is still in its infancy, and relevant research on China's market environment is insufficient. This paper, in contrast to previous research, is more concerned with China's specific situation and makes use of the relatively mature ESG rating data of SynTao Green Finance to evaluate the ESG performance of A-share listed companies; Simultaneously, this paper investigates the internal influence mechanism of ESG performance on enterprise investment efficiency, thus provide useful advice and ideas to Chinese businesses on how to enhance their ESG strategy and investment efficiency, so increasing their value and promoting economic growth.

2 MATERIALS AND METHODS

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2.1 Model Design and Variable Definition

For the purpose of testing the aforementioned hypotheses, this paper refers to Benlemlih and Bitar(2018) in constructing the following basic regression model：

$$Misinvest_{i,t} = \alpha_0 + \alpha_1 * ESG_{i,t} + \sum \alpha_j Controls_{i,t} + \mu_t + \eta_{ind} + \varepsilon_{i,t} \qquad (1)$$

2.1.1 Explained Variable

$$Invest_t = \beta_0 + \beta_1 TobinQ_{t-1} + \beta_2 Lev_{t-1} + \beta_3 Cash_{t-1} + \beta_4 Age_{t-1} + \beta_5 Size_{t-1} + \beta_6 Returns_{t-1} + \beta_7 Invest_{t-1} + \varepsilon \qquad (2)$$

Invest stands for newly investments, the amount invested equals the product of (capital expenditure + M&A expenditure - income from selling long-term assets - depreciation) / total assets, where capital expenditure is defined as "expenditure on purchasing fixed assets, intangible assets, and other long-term assets" in the cash flow statement (direct method); Investment in mergers and acquisitions (M&A) is in the cash flow statement (direct method) that represents "net cash spent for acquiring subsidiaries and other businesses." Specifically, income from the sale of long-term assets is represented by "net cash retrieved from the disposition of fixed assets, intangible assets, and other long-term assets" in the cash flow statement (direct method), and depreciation is represented by "current depreciation expense" in the cash flow statement (indirect method). When a company's market value is divided by its book value, the resulting ratio is called TobinQ. Total liabilities divided by total assets is the asset liability ratio of the corporation, which is abbreviated as Lev. Cash is the sum of money and money equivalents divided by the sum of all assets. Age stands for the natural logarithm of the number of years it has been listed on the stock exchange. Size is defined as the natural logarithm of its total assets. A company's annual Return is calculated by averaging the yearly return of individual shares, taking into account the reinvestment of cash dividends; Furthermore, the yearly effect and the industry impact are also included by model (1). To determine the investment efficiency of a corporation, the absolute value (AbsXinvest) of the Xinvest, as determined by model (1), is used as an index. With increasing value, the degree of inefficient investment increases, while the degree of investment efficiency decreases.

2.1.2 Explaining Variables

As a result of the creation and promotion of the idea of ESG, a plethora of environmental, social, and governance (ESG) grading systems have evolved both domestically and internationally, each with its own set of assessment criteria, reference indicators, and coverage. The Huazheng ESG rating index is used to assess the environmental, social, and governance (ESG) performance of businesses in this study. Similar to Huazheng ESG rating, other ESG assessment methods have shortcomings, such as

limited coverage and infrequent updates. For example, CASVI rating and SynTao Green Finance rating only cover a part of the constituent stocks and are updated once every six months and once every twelve months, respectively; Jiashi ESG is updated more frequently than Huazheng ESG, but it has not yet been launched in the WIND, CSMAR, or other databases; Huazheng ESG system draws on the mainstream ESG evaluation framework from abroad and incorporates the realities of China's capital market as well as the characteristics of various listed companies, finally establishes 26 key indicators and employs the industry weighted mean method for ESG evaluation. It is updated quarterly and includes all publicly traded companies. Huazheng ESG rating is split into nine classes, ranging from low to high: C, CC, CCC, B, BB, BBB, A, AA, and AAA. ESG is built in accordance with the aforementioned rating by using the assignment technique, in which the nine grades from C to AAA are sequentially allocated as 1~9, that is to say, when the ratings are C, ESG = 1; when the ratings are CC, ESG = 2; when the ratings are CCC, ESG = 3, and so on.

2.1.3 Controlled Variables

According to Li Yanxi et al. (Li, et al, 2015), Lu Xin et al. (Lu, 2017), and Cao Yue et al. (Cao, et al, 2020), this paper primarily restricts other variables that may impact the level of enterprise investment efficiency from two aspects of the company's financial status and internal governance level: organization (Size), company debt ratio (Lev), profitability (ROA), and growth (TobinQ). Internal governance variables such as (INED), (Share Concentration), SOE, and Duality are all important considerations. Additionally, in order to better manage the unobservable characteristics that do not vary with industry or time, the time fixed effect (μt) and the industry fixed effect (ηind) are included into the model.

Table 1 shows the specific definitions of variables. TobinQ is the ratio of a company's market value to its book value, with the formula being [(total share capital - domestic listed foreign shares B shares) × Current closing price of a shares + domestic listed foreign shares B shares × Current closing price of B shares (Shanghai Stock Exchange×CNY_ USD, Shenzhen Stock Exchange / HKD_ CNY, converted into RMB) + total liabilities at the end of the current period] / total net worth

Table 1: Variable definition table.

Variable type	Variable name	Variable symbol	Variable measurement
Explained variable	Investment efficiency	Misinvest	Model-estimated (1) absolute value of residual
	Over investment	Overinv	Model 1: Regression-derived absolute value of residual larger than zero
	Insufficient investment	Undinv	Model 1: Regression-derived absolute value of residual less than zero
Explanatory variable control variable	ESG rating	ESG	Huazheng's ESG rating ranges from 1 to 9
	Enterprise scale	Size	Total assets natural logarithm
	Profit level	ROA	Net profit to total assets ratio
	Growth	TobinQ	The ratio of a company's market value to its book value.
	Ownership concentration	Share_Concentration	The greatest shareholder's shareholding ratio
	Auditor	BIG4	Dummy variable, 1 for the big 4 auditors, otherwise 0
	Nature of equity	SOE	Dummy variable, state-owned enterprise is 1, otherwise 0
	Proportion of independent directors	INED	Ratio of independent director to board of directors
	Duality	Duality	Dummy variable, the chairman and general manager are the same person, 1, otherwise 0
	Corporate debt ratio	Lev	Ratio of total liabilities to total assets

2.2 Data Sources and Sample Selections

The study sample for this article is data from China's A-share listed businesses from 2010 to 2020; the ESG rating data is based from Huazheng ESG rating, and other financial and governance data is sourced from the CSMAR Guotai'an database. As a result, this article (1) eliminates financial sector samples (2) excludes ST company samples (3) excludes missing values of regression variables. Furthermore, this

study winsorizes the variables to lessen the influence of outliers on empirical analysis outcomes.

2.3 Descriptive Statistics

The descriptive statistical findings of all variables in this research are shown in Table 2. Table 2 indicates that the average ESG score for the firms in the sample is 6.492, with a standard deviation of 1.070, indicating that ESG performance in the sample ranges from 5 to 7.49. The mean value of investment efficiency is 0.159, and the standard deviation is 0.157, indicating that there are significant variances in investment efficiency across the enterprises in the sample. Table 3 shows the firms' industry dispersion. As can be seen, the sample includes listed organizations from 18 different sectors. Manufacturing enterprises made up a major chunk of them, accounting for 65.44 percent. Companies in other industries make up less than 10% of the total.

Table 2: Descriptive Statistics.

Variables	Sample size	Mean values	SD	Minimum value	Median	Maximum value
Misinvest	9806	0.159	0.157	0.002	0.121	1.039
Overinv	4965	0.145	0.117	0.002	0.118	0.584
Undinv	4841	0.173	0.191	0.002	0.125	1.199
ESG	28247	6.492	1.070	4	6	9
Size	28681	22.125	1.300	19.764	21.936	26.157
ROA	28681	0.040	0.060	-0.251	0.039	0.195
TobinQ	28681	2.043	1.334	0.866	1.608	8.871
Share_Concentration	28681	34.802	14.903	8.773	32.810	74.824
BIG4	28681	0.058	0.234	0.000	0.000	1.000
SOE	28169	0.371	0.483	0.000	0.000	1.000
INED	28651	0.272	0.027	0.250	0.263	0.364
Duality	28315	0.281	0.449	0.000	0.000	1.000
Lev	28681	0.419	0.211	0.049	0.410	0.908

Table 3: Sample distribution statistics.

Industries	Sample sizes	Percentage points
Agriculture, forestry, animal husbandry, and fisheries	369	1.29
Mining	674	2.35
Manufacturing	18,769	65.44
Electricity, heat, gas, and water and distribution	935	3.26
Construction	761	2.65
Wholesale and retail	1,438	5.01
Transportation, storage, and mail services	872	3.04
Lodging and Catering	88	0.31
Information transmission, software, and information technology services	1,887	6.58
Real estate	1,179	4.11
Leasing and commercial services	325	1.13
Scientific research and technology services	300	1.05
Water conservation, environmental protection, and public utilities management	334	1.16
Home, repair and other services	22	0.08
Education	28	0.1
Health, and social work	63	0.22
Culture, sports, and entertainment	388	1.35
Total	249	0.87

3 RESULTS & DISCUSSION

3.1 Basic Regression Results

Table 4 summarizes the main findings of this study's basic regression analysis. First, the basic regression without control variables is represented by the first column, and the basic regression with control variables added on the basis of the first column is represented by the second column. The regression coefficient indicates that environmental, social, and governance factors have an inhibitory influence on the company's non-investment efficiency (β = −0.00866, p<0.01). Therefore, every one unit rise in

environmental, social, and governance (ESG) boosts by 0.00866 the non-investment efficiency level of the organization. The third and fourth columns look at the influence of ESG factors on corporate over-investment. After controlling for other factors, the regression coefficient of environmental, social, and governance (ESG) is -0.00473, and the p value is less than 0.05, indicating that ESG discourages excessive investment by the corporation. The final two columns of Table IV detail the consequences of ESG's under-investment in the firm. The findings demonstrate that environmental, social, and governance (ESG) may hinder the company's under-investment (β = 0.00951, p<0.01), which means that improving ESG can mitigate the company's under-investment issue.

Table 4: Basic regression results.

Variable	(1) Mis invest	(2) Mis invest	(3) Overinv	(4) Overinv	(5) Undinv	(6) Undinv
ESG	-0.00941***	-0.00866***	0.00281	-0.00473**	-0.0181***	-0.00951***
	(0.00153)	(0.00158)	(0.00185)	(0.00189)	(0.00207)	(0.00180)
Controlled variable	No	Yes	No	Yes	No	Yes
Time effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes
Observed value	9,806	9,521	4,965	4,805	4,841	4,716
R2	0.684	0.684	0.684	0.684	0.684	0.684

Note: standard error in brackets

The significance level: *** p<0.01, ** p<0.05, * p<0.1

The controlled variables are: Sizes, ROA, TobinQ, Share Concentration, Auditors (BIG4), SOE, INED, Duality, Lev

3.2 Robustness Test

This research used quantile regression to reassess ESG in order to analyze the investment efficiency of businesses at multiple quantile fractiles, in order to further assess the reliability of the findings. Quantile regression may be used to provide a more thorough understanding of the relationship between independent and dependent variables. Instead of using an OLS linear model to estimate the model with average effect, quantile regression creates various effects at different points along the distribution (quantile fractiles) of dependent variables. The

dependent variable is continuous, meaning that it does not include any zeros or too many duplicates. And the model is estimated once again in this research, and the results of the quantile regression are shown in Table 5. Table 5 contains the regression findings for various quantiles, which are shown in columns 1 through 5. The findings indicate that environmental, social, and governance (ESG) factors have an inhibitory effect on different quantiles of a company's investment efficiency, that improving ESG will decrease the company's non-investment efficiency, which is consistent with the findings of the basic regression in Table 4. As a consequence, the findings of this paper are consistent and trustworthy.

Table 5: Robustness test (quantile regression).

Variables	(1) Misinvest 10quantile	(2) Misinvest 25quantile	(3) Misinvest 50quantile	(4) Misinvest 75quantile	(5) Misinvest 90quantile
ESG	-0.00189**	-0.00293**	-0.00599***	-0.0104***	-0.0156***
	(0.000747)	(0.00117)	(0.00154)	(0.00223)	(0.00337)
Controlled variable	Yes	Yes	Yes	Yes	Yes

Time effect	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes
R2	0.0579	0.0699	0.0944	0.1361	0.2111
Observed value	9,521	9,521	9,521	9,521	9,521

Note: standard error in brackets

The significance level: *** p<0.01, ** p<0.05, * p<0.1

The controlled variables are: Company Sizes, ROA, TobinQ, Share Concentration, Auditors (BIG4), SOE, INED, Duality, Lev

3.3 Impact Mechanism Analysis

This research also builds a model to evaluate whether environmental, social, and governance (ESG) factors may increase the investment efficiency of firms by easing the agency issue in order to better understand the mechanism of ESG's investment efficiency. In accordance with previous research, the free cash flow (FCF) of the firm is used as the measuring indicator for agency cost in this study. Because when a firm generates greater free cash flow, the management of the organization is more driven to make investments that will benefit the company. Whereupon, this investment method that ultimately benefit the management itself is frequently not in accordance with the interests of the majority of shareholders in the company, which impedes the development of the enterprise, results in inefficient investment, and ultimately results in agency problems in the organization. According to Wen Zhonglin (2006), the following is the model of mechanism analysis:

$$Median_{it} = \beta_0 + \beta_1 * ESG_{it} + \sum \beta_j X_{it} + \mu_t + \eta_{ind} + \varepsilon_{it}$$

$$Misinvest_{it} = \alpha_0 + \alpha_1 * ESG_{it} + \alpha_2 * Median_{it} + \sum \alpha_j X_{it} + \mu_t + \eta_{ind} + \varepsilon_{it}$$

$$(3)$$

In which the median is the intermediate variable, that is, the FCF. X_{it} represents the control variable, μ_t is the time-effect, η_{ind}, the industry effect, while ε_{it} is the residual.

The findings of the study, which used enterprise free cash flow as the mediator, are shown in Table 6. The first column summarizes the influence of ESG on company investment efficiency (Misinvest). The second column provides the influence of ESG on the mediator and enterprise free cash flow (FCF). The data demonstrates that the regression coefficient of ESG is -0.0141 *, passes the Statistical significance test. This demonstrates that ESG may successfully cut corporate agency expenditures while also alleviating relevant difficulties. The last column contains the regression findings obtained by combining (ESG) factors with business free cash flow

(FCF). This analysis reveals that the regression coefficient of enterprise free cash flow is positive and significant at the 1% level of Statistical significance ($\beta = 0.00827$, p<0.01), which indicates that the greater a company's free cash flow, the higher its non-investment efficiency. The regression coefficient of ESG ($\beta = -0.00643$, p<0.01) was statistically negative and less than the regression coefficient of ESG in the first column ($\beta = -0.00866$, p<0.01) This demonstrates that the agency cost serves as an intermediate. In other words, ESG may help to ease the agency issue, minimize non-efficient investment, and ultimately enhance the investment efficiency of businesses.

Table 6: Mechanism analysis.

Variable	(1) Misinvest	(2) Fcf	(3) Misinvest
ESG	-0.00866***	-0.0141*	-0.00643***
	(0.00158)	(0.00824)	(0.00167)
Fcf			0.00827***
			(0.00136)
Controlled variable	Yes	Yes	Yes
Time effect	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes
Observed value	9,521	18,360	6,628
R2	0.329	0.329	0.329

Note: standard error in brackets

The significance level: *** p<0.01, ** p<0.05, * p<0.1

The controlled variables are: Size, ROA, TobinQ, Share Concentration, Auditors (BIG4), SOE, INED, Duality, Lev, the natural logarithm of the company's free cash flow serves as the intermediate variable (FCF)

4 CONCLUSIONS

With the rising attention being paid by all sectors of society to the social responsibility of the environment and other issues, businesses have begun to pay more attention to their own ESG management practices. This essay investigates the relationship between environmental, social, and governance (ESG) and

company investment efficiency using data from Chinese publicly traded firms from 2010 to 2020. The empirical findings indicate that environmental, social, and governance (ESG) factors may reduce a company's non-investment efficiency, which is to say that a strong ESG can increase an enterprise's investment efficiency. ESG has the potential to increase non-investment efficiency in both under-investment and over-investment situations. The empirical findings of the mechanism analysis reveal that environmental, social, and governance (ESG) factors have an influence on company investment efficiency by easing the agency issue.

The following is the theoretical contribution made by this research: First and foremost, this research employs ESG as a measure of company performance in areas such as the environment, social responsibility, corporate governance, and so on. Existing research on corporate social responsibility tend to be narrowly focused on a single facet of the issue. The ESG therefore more accurately portrays the corporate social responsibility associated with firms and their stakeholders. Second, the samples included in this research represent a total of 18 sectors of publicly traded businesses. As a result, the findings of this research are more thorough and representative than previous findings. Third, the research samples for this study are publicly traded Chinese enterprises. As a result, the findings of this research contribute to the research on developing market economies. Enterprise managers will also benefit from the findings of this research. First and foremost, the findings of this research demonstrate that effective environmental, social, and governance (ESG) practices may lower the non-investment efficiency of businesses. As a result, business management should develop proper ESG strategies that are tailored to their specific scenario in order for the organization to reap the benefits of sound ESG practices and policies. Environmental management, environmental protection, employee training, community social responsibility and other practices should be considered by businesses in order to enhance the company's ESG performance and, ultimately, to increase the company's investment efficiency. Moreover, analysts should be involved in monitoring and overseeing the ESG behavior of businesses. For investors, the information disclosure of companies is a key indicator of their performance. Thus, the analyst's oversight function and their opinions are critical in the operation of businesses.

REFERENCES

Anwar R, Malik J A. When does corporate social responsibility disclosure affect investment efficiency? a new answer to an old question[J]. SAGE Open, 2020, 10 (2).

Bai C, Liu Q, Lu Z, Song M, Zhang J. An empirical study on the governance structure of Listed Companies in China [J] Economic research, 2005, (2): 81-91

Bebchuk L, Cohen A, Ferrell A. What matters in corporate governance? [J]. Review of Financial Studies, 2009, 22(2): 783-827.

Bénabou R, Tirole J. Individual and corporate social responsibility[J]. Economica, 2010, 77(305): 1-19.

Benlemlih M, Bitar M. Corporate social responsibility and investment efficiency[J]. Journal of Business Ethics, 2018, 148(3): 647-671.

Cao Y, Xin H, Zhang Z. The impact of the implementation of the new environmental protection law on the investment efficiency of heavy pollution industries [J] China soft science, 2020, (8): 164-173

Chen R, Zheng M, Liu W. Intermediary effect analysis: principle, procedure, bootstrap method and its application [J], Journal of marketing science, 2017,9 (4): 120-135

Krüger P. Corporate goodness and shareholder wealth[J]. Journal of Financial Economics, 2015, 115(2): 304-329.

Lambert R, Leuz C, Verrecchia R E. Accounting information, disclosure, and the cost of capital[J]. Journal of Accounting Research, 2007, 45(2): 385-420.

Li Y, Zeng W, Ma Z, Chen K. External governance environment, property right nature and investment efficiency of Listed Companies [J] Nankai management review, 2015, (1): 25-36

Lu X, Zhang L, Li H, Ding Y. Background characteristics of executive team and investment efficiency -- A Study on the regulatory effect of executive incentive [J] Audit and economic research, 2017, (2): 66-77

Milosevic D, Andrei S, Vishny R W. A survey of corporate governance[J]. Journal of Finance, 2015, 52: 737-783.

Richardson S. Over-investment of free cash flflow[J]. Review of Accounting Studies, 2006, 11(2-3): 159-189.

Shleifer A, Vishny R W. A survey of corporate governance[J]. Journal of Finance, 1997, 52(2): 737-783.

Wen Z, Zhang L, Hou J. Moderating variables with mediation and moderating mediating variables [J] Journal of psychology, 2006, (3): 448-452

Zhong M, Gao L. Does corporate social responsibility disclosure improve firm investment efficiency? [J]. Review of Accounting and Finance, 2017.