“ESG ratings and stock performance in the internet industry”

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ESG RATINGS AND STOCK PERFORMANCE IN THE INTERNET INDUSTRY

Abstract

Amidst the escalating emphasis on sustainable development, numerous corporations and organizations have intensified their environmental, social, and governance (ESG) efforts. The internet sector, intrinsically linked to the ESG domain, has consequently garnered amplified scrutiny. This study delves into the correlation between ESG ratings and the stock performance of publicly listed Chinese companies in the internet sector from 2016 to 2020. The findings reveal that initiatives in the ESG sphere significantly and negatively influence stock performance in these firms, assessed through raw stock returns, stock excess returns relative to the market index, Jensen's one-factor alpha, and the Fama-French three-factor alpha. This inverse correlation between ESG ratings and stock performance is nonlinear and convex, indicating a lessening negative impact at elevated ESG levels. Moreover, this adverse effect is more pronounced in value stocks compared to growth stocks. Predominantly manifesting before 2018, this negative trend diminishes amidst the COVID-19 period. The reverse causality analysis employing lagged ESG ratings suggests that higher ESG ratings precipitate reduced stock performance, as opposed to vice versa. This study bridges a gap in the existing literature concerning ESG and stock performance specific to the Chinese internet industry and proposes recommendations for its sustainable evolution.

Keywords ESG ratings, stock performance, alpha, Fama-French, internet industry, COVID-19, China

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INTRODUCTION

Amid escalating environmental and ecological challenges, the imperative for sustainable economic and social advancement has intensified. In this context, numerous nations and global entities have persistently focused on sustainable development. The concept of environmental, social, and governance (ESG) emerged in 2005, notably in the seminal "Who Cares Wins" conference, which scrutinized ESG's role in shaping asset management and financial research practices (International Finance Corporation, 2005). Presently, ESG constitutes a pivotal criterion for gauging sustainable progress. In corporate management, particularly within publicly traded firms, ESG mandates a holistic approach, incorporating environmental, societal, and governance considerations alongside traditional financial metrics to assess a company's capability for sustainable growth. In the Chinese context, the progression towards objectives like carbon neutrality and a green economy has elevated the significance of ESG metrics for listed companies, marking them as crucial determinants of sustainable development trajectories.

The internet industry exhibits a profound connection with ESG considerations. As the internet economy evolves, various online platforms have become integral for information dissemination and exchange,

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thereby elevating the social relevance of the internet industry, which has garnered considerable attention. The operational demands of internet firms, encompassing extensive electricity usage, access to substantial customer data, influence on societal norms, and robust corporate governance, align with crucial ESG facets. Thus, the internet industry's progress is inextricably linked to ESG adherence, with sustained ESG commitments pivotal for its enhanced growth. Moreover, the ESG performance among internet companies is markedly heterogeneous. Not all entities within this sector have integrated ESG protocols, and those that have exhibit varied ESG ratings. To date, Chinese internet firms have not extensively engaged in ESG initiatives despite China hosting the world's most extensive internet user base, which markedly eclipses other nations. These insights underscore the imperative to examine the interplay between ESG practices and corporate performance within China's internet industry, a venture both necessary and advantageous.

1. LITERATURE REVIEW AND HYPOTHESES

ESG considerations have increasingly garnered the focus of policymakers and stimulated robust academic inquiry. The discourse on ESG's role in corporate spheres has significantly intensified. Historically, academia has hypothesized that ESG might adversely impact corporate performance, attributing this to constraints in investment. For instance, Hong and Kacperczyk (2019) demonstrated that sin stocks (companies engaged in alcohol, tobacco, and gaming production) with low ESG ratings exhibit higher expected returns than similar stocks. Likewise, Pyles (2020) disclosed that portfolios containing stocks with higher ESG ratings frequently yield reduced abnormal returns. In contrast, recent studies advocate ESG's potential to bolster long-term corporate investments. For instance, Deng and Cheng (2019) demonstrated a favorable link between ESG ratings and stock performance among China's A-share listed corporations. This paper aims to reconcile these divergent viewpoints by examining the influence of ESG adherence on stock performance, particularly in the internet industry.

Many studies on ESG practices have consistently underscored the beneficial impact these practices have on corporate performance and stock return. Chandra and Tourani-Rad (2021) provided compelling evidence that stock portfolios constructed based on high environmental pillar scores significantly outperform those based on lower scores. This outcome underlines the increasing relevance of environmental stewardship in investment management. Similarly, Deng and Cheng (2019) established that companies with higher ESG indices exhibit superior stock performance, indicating a direct link between ESG adherence and financial success. Chouaibi and Chouaibi (2021) identified a positive association between ESG practices and the creation of stock market value, as well as between the ESG index and stock performance. During times of crisis, such as the COVID-19 pandemic, Broadstock et al. (2021) discovered that ESG ratings emerged as a reliable predictor of future stock performance, suggesting that ESG practices could be integral to corporate resilience. Engelhardt et al. (2021) found that firms engaging in ESG practices not only enjoy higher abnormal stock returns but also benefit from reduced volatility in stock returns. Extending this line of inquiry, Chiu et al. (2020) reported that companies that consistently disclose ESG-related information will likely achieve higher mid-term and long-term abnormal returns than their peers. Kang et al. (2021) also highlighted that consistent ESG efforts significantly boost investor demand, enhancing long-term stock performance. This comprehensive body of research underscores the critical role of ESG practices in enhancing stock performance, offering a compelling case for integrating ESG considerations into investment strategies.

The broader impact of ESG practices extends beyond stock performance, influencing various aspects of corporate operations and market perception. The capital market, as noted by Miralles-Quiros et al. (2018) and Consolandi et al. (2022), has shown an escalating focus on the environmental dimensions of companies, irrespective of their industry. This heightened scrutiny reflects a paradigm shift towards sustainability and corporate responsibility. ESG disclosure, as highlighted by Yen-Yen (2019) and Chiu et al. (2020), plays a piv-

otal role in enhancing transparency and resolving information asymmetries between corporate managers and stakeholders. Ng and Rezaee (2020) further confirmed that high ESG disclosure strongly correlates with stock price informativeness, indicating that transparent ESG practices enhance investor perception and confidence. Wu et al. (2022) argued that this improvement in transparency directly contributes to more efficient stock pricing mechanisms. Additionally, ESG disclosures are a buffer against the risk of stock price crashes, a finding supported by Dumitrescu and Zakriya (2021) and Murata and Hamori (2021). In risk management, ESG ratings have emerged as crucial indicators, as Fan and Michalski (2020) emphasized. The integration of ESG criteria in operations, reputation building, and financial risk control is not just a matter of compliance; it is increasingly seen as a strategic imperative, as evidenced by the research of Liu and Hamori (2020), Vinodkumar and Alarifi (2022), and Reber et al. (2022). This comprehensive overview illustrates that ESG practices are instrumental in mitigating information asymmetry, improving market transparency, and fostering sustainable corporate growth.

Corporate adoption of ESG practices can also bring adverse impacts and restrictions. Research into corporate financing decisions suggests that elevated ESG ratings may negatively impact stock performance, as noted by Hong and Kacperczyk (2009). In line with this, La Torre et al. (2020) found that an increased ESG index correlates with lower excess stock returns and greater volatility. Capelle-Blancard and Petit (2019) also highlighted the asymmetric impact of ESG news on stock performance, noting that positive ESG news does not significantly affect a company's stock performance, whereas negative ESG news can severely damage it. Do and Kim (2020) argued that not all ESG management strategies result in positive corporate performance outcomes and may exacerbate issues of information asymmetry and conflicts of interest. They further found that companies heavily influenced by ESG factors might lose growth opportunities and suffer long-term declines in stock performance. The empirical research of Buallay et al. (2020) in the banking sector also confirmed a negative correlation between ESG performance and profitability. The implementation of ESG practices can lead to overinvestment and increased costs. A meta-analysis by Tasnia et al. (2021) of 37 U.S. banks indicated that adopting ESG practices incurs additional costs, leading bank managers to avoid these practices. Surroca et al. (2010) suggested that ESG practices might incentivize managers to seek private benefits, such as enhanced personal reputation, leading to overinvestment. Thus, implementing ESG practices is associated with additional costs and over-investment, negatively affecting stock performance.

Despite numerous studies arguing that implementing ESG practices affects a company's stock performance, other research indicates that adopting ESG practices might not significantly affect stock performance. Fiskerstrand et al. (2020) explored the Norwegian stock market from 2009 to 2018 and found no substantial correlation between the level of the ESG index and stock returns. Similarly, Mitsuyama and Shimizutani (2015) examined how the stock market reacted to companies implementing ESG practices and concluded that there was no significant response. Takahashi and Yamada (2021) also noted that companies with high ESG ratings do not necessarily experience high abnormal returns. Moreover, Mănescu (2011) investigated the effects of seven ESG components (environment, human rights, diversity, community relations, employee relations, product safety, and corporate governance) and observed that most components do not have a persistently significant relationship with stock returns. Demers et al. (2021) also noted that ESG factors were insignificant in fully specified returns regressions for the entire COVID-19 pandemic year of 2020. The uncertainty in ESG ratings adds another layer of complexity, as Dimson et al. (2020) highlighted that companies with a high ESG score from one rater often receive a moderate or low score from another, suggesting that ESG ratings, when used in isolation, might not materially contribute to portfolio returns. This leads to the conclusion that ESG factors may not significantly impact stock performance.

In summary, academic research presents divergent findings regarding the correlation between ESG ratings and stock performance. ESG ratings could enhance stock performance through sustainable growth, impede it due to investment constraints, or exert no impact. This paper introduces

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the following three alternative hypotheses to address these possibilities.

H1: ESG ratings positively affect stock performance in the Chinese internet industry.

H2: ESG ratings negatively affect stock performance in the Chinese internet industry.

H3: ESG ratings do not affect stock performance in the Chinese internet industry.

2. METHODOLOGY

The principal data source is the China Stock Market and Accounting Research (CSMAR) database. This analysis confines its scope to companies publicly traded in the internet industry within mainland China. Given the nascent adoption of ESG practices by a limited subset of Chinese firms, this study delineates a temporal frame from 2016 to 2020. Several smaller-size internet firms have been omitted from the sample. The final sample encompasses 60 publicly listed Chinese corporations in the internet sector.

From the CSMAR, the study acquired annual stock returns as the dependent variable and several control variables, encompassing market value, price-to-book ratio, total assets, return on equity, and financial leverage. A logarithmic transformation was employed for both market value and total assets to mitigate the influence of outliers. Notably, these variables are extracted at an annual frequency, aligning with the frequency of ESG ratings.

For robustness, three alternative performance measures were employed as dependent variables: stock excess return, *Alpha1* calculated based on Jensen's (1968) one-factor model, and *Alpha3* computed according to the Fama-French (1993) three-factor model. The market and Fama-French factors are retrieved from the Central University of Finance and Economics website[1]. Subsequently, annual *Alpha1* and *Alpha3* values were computed using daily data for each specific year[2].

ESG rating data from 2016 to 2020 were meticulously gathered from the Morgan Stanley Capital International (MSCI) website[3]. The ESG rating, the pivotal independent variable, comprises seven distinct categories: AAA, AA, A, BBB, BB, B, and CCC. These seven rating categories are systematically translated into numerical values between one and seven. Notably, the highest rating (AAA) corresponds to the numerical value of seven, while the lowest rating (CCC) is denoted as one. In cases where ESG practices were initiated by companies in subsequent years, a value of zero is ascribed to their earlier ESG ratings, presuming prior neglect of ESG practices.

The investigation utilized the fixed-effects regression model to examine the association between ESG ratings and stock performance, as outlined below:

$$\begin{aligned} Perf_{i,t} &= \beta_0 + \beta_1 ESG_{i,t} + \beta_2 LMV_{i,t} + \\ &+ \beta_3 PB_{i,t} + \beta_4 LTA_{i,t} + \beta_5 ROE_{i,t} + \\ &+ \beta_6 Lev_{i,t} + U_i + V_t + \varepsilon_{i,t}, \end{aligned} \quad (1)$$

where the subscript i pertains to firm i, and subscript t pertains to year t. The dependent variable, *Perf*, signifies stock performance, encompassing stock return (*Ret*), stock excess return relative to market return (*exRet*), Jensen's one-factor alpha (*Alpha1*), and Fama-French three-factor alpha (*Alpha3*). The principal explanatory variable, *ESG*, denotes the ESG rating from zero to seven. The control variables consist of the logarithm of market value (*LMV*), price-to-book ratio (*PB*), the logarithm of total assets (*LTA*), return on equity (*ROE*), and financial leverage (*Lev*). U_i symbolizes the firm fixed effects, V_t symbolizes the year fixed effects, and ε is the residual term.

Beyond employing raw stock returns (*Ret*) to gauge companies' stock performance, this study also computed three risk-adjusted performance metrics. The initial metric is the stock excess returns over market returns (*exRet*). The secondary metric is *Alpha1*, derived from Jensen's (1968) one-factor alpha:

1 The market and Fama-French factors are retrieved on July 30, 2022 from http://sf.cufe.edu.cn/kydt/kyjg/zgzcglyjzx/xzzq.htm.

2 In the calculation of *Alpha1* and *Alpha3*, it is imperative that the daily data encompass at least half of the observations within a given year. As a robustness verification, the findings remain consistent even when this constraint is omitted.

3 The MSCI ESG ratings are retrieved on July 30, 2022 from https://www.msci.com/our-solutions/esg-investing/esg-ratings.

$$R_{i,t} - R_{f,t} = \alpha_{1i} + \beta_i \left(R_{m,t} - R_{f,t} \right) + \varepsilon_{i,t}, \quad (2)$$

where $R_{i,t}$ signifies the daily stock returns for firm i and day t within each specific year. $R_{f,t}$ denotes the risk-free rate, and $R_{m,t}$ represents the market return. The intercept term, α_1, represents the risk-adjusted stock performance measure, *Alpha1*. Additionally, the research utilized the Fama-French (1993) three-factor model to compute *Alpha3* using the subsequent formula:

$$R_{i,t} - R_{f,t} = \alpha_{3i} + \beta_{1i} \left(R_{m,t} - R_{f,t} \right) + \\ + \beta_{2i} SMB_t + \beta_{3i} HML_t + \varepsilon_{i,t}, \quad (3)$$

where two supplementary factors are incorporated, *SMB* represents the return difference between small and large capitalization stock portfolios, and *HML* denotes the return difference between high and low book-to-market stock portfolios. The intercept term, α_3, signifies the risk-adjusted stock performance measure, *Alpha3*.

To investigate the nonlinear quadratic relationship between ESG ratings and stock performance, we incorporate the squared term of the ESG rating (ESG^2) into the fixed-effects regression model:

$$Perf_{i,t} = \beta_0 + \beta_1 ESG_{i,t} + \beta_2 ESG_{i,t}^2 + \\ + \beta_3 LMV_{i,t} + \beta_4 PB_{i,t} + \beta_5 LTA_{i,t} + \\ + \beta_6 ROE_{i,t} + \beta_7 Lev_{i,t} + U_i + V_t + \varepsilon_{i,t}. \quad (4)$$

To examine the moderating effects of a series of control variables, the interaction term (*ESG*×*Control*) is included in the fixed-effects regression model:

$$Ret_{i,t} = \beta_0 + \beta_1 ESG_{i,t} + \\ + \beta_2 ESG_{i,t} \times Control_{i,t} + \beta_3 LMV_{i,t} + \\ + \beta_4 PB_{i,t} + \beta_5 LTA_{i,t} + \beta_6 ROE_{i,t} + \\ + \beta_7 Lev_{i,t} + U_i + V_t + \varepsilon_{i,t}, \quad (5)$$

where *Control* denotes *LMV*, *PB*, *LTA*, *ROE*, and *Lev*, respectively.

Finally, the reverse causality test is conducted employing lagged dependent and independent variables:

$$Ret_{i,t} = \beta_0 + \beta_1 ESG_{i,t-1} + \beta_2 LMV_{i,t} + \\ + \beta_3 PB_{i,t} + \beta_4 LTA_{i,t} + \beta_5 ROE_{i,t} + \\ + \beta_6 Lev_{i,t} + U_i + V_t + \varepsilon_{i,t}, \quad (6)$$

$$ESG_{i,t} = \beta_0 + \beta_1 Ret_{i,t-1} + \beta_2 LMV_{i,t} + \\ + \beta_3 PB_{i,t} + \beta_4 LTA_{i,t} + \beta_5 ROE_{i,t} + \\ + \beta_6 Lev_{i,t} + U_i + V_t + \varepsilon_{i,t}, \quad (7)$$

where either the independent variable (*ESG*) is lagged by one year or the dependent variable (*Ret*) is lagged by one year and alternates the role with *ESG*, functioning as the explanatory variable.

3. RESULTS

Table 1 displays the statistics of the sample variables. The average annual stock raw return is 8.81%, significantly lower than its standard deviation of 55.12%, indicating broad variations. The mean ESG rating falls below one, implying that most companies have only recently adopted ESG practices. The highest ESG rating reaches six, revealing that no companies have attained a rating as elevated as AAA. The average logarithm of market value stands at 7.45, the typical price-to-book ratio at 6.74, the average logarithm of total assets at 13.45, the mean return on equity at 8.03%, and the average leverage ratio is modest at 1.34%.

Table 2 displays the correlations among all variables. While the correlation between stock raw returns and ESG ratings is positive and statistically significant, its magnitude is comparatively modest, at 0.27. The correlation coefficients between ESG ratings and other control variables are below 0.5, suggesting multicollinearity is not a concern in this context.

First, Equation (1) is utilized to conduct multivariate fixed-effects regressions. The findings in Table 3 reveal that, after accounting for various control variables, the ESG rating exerts a significantly negative influence on the stock performance across four different metrics. The regression coefficient for *ESG* stands at −0.0639. An increase of one standard deviation in the ESG rating (1.3292) results in an approximate 8.49% decrease in annual return (=0.0639×1.3292), highlighting the substantial economic impact of ESG ratings on raw stock return. However, the economic effect on risk-adjusted stock performance measures is comparatively minimal. A one standard deviation rise in the ESG rating (1.3292) reduces alphas

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Table 1. Descriptive statistics

Variable	Obs.	Mean	Std.Dev.	Min	Max	Skewness	Kurtosis
Ret	265	0.0881	0.5512	–0.5775	2.4286	1.5581	5.5103
ESG	265	0.6717	1.3292	0.0000	6.0000	1.9937	6.2978
LMV	265	7.4532	1.0149	4.9628	10.1924	–0.0715	2.6260
PB	265	6.7402	11.5776	0.8237	174.2573	11.6749	167.0078
LTA	265	13.4486	1.0172	11.0372	16.9804	0.2827	4.2158
ROE	265	0.0803	0.1503	–0.8194	0.5157	–2.9950	18.0523
Lev	265	1.3434	6.2850	–25.4831	99.4696	14.1490	227.1836

Note: This table presents descriptive statistics of the annual sample spanning 2016 to 2020. *Ret* signifies a company's stock raw return, *ESG* denotes the ESG rating score varying from zero to seven, *LMV* is the logarithm of market value, *PB* represents the price-to-book ratio, *LTA* is the logarithm of total assets, *ROE* indicates the return on equity, and *Lev* pertains to financial leverage.

Table 2. Pairwise correlations between variables

	Ret	***ESG***	***LMV***	***PB***	***LTA***	***ROE***	***Lev***
Ret	1.0000						
ESG	0.2745***	1.0000					
	(0.0000)						
LMV	0.4013***	0.5071***	1.0000				
	(0.0000)	(0.0000)					
PB	0.2063***	0.0514	0.3005***	1.0000			
	(0.0007)	(0.4047)	(0.0000)				
LTA	0.1193*	0.4443***	0.7449***	0.0047	1.0000		
	(0.0523)	(0.0000)	(0.0000)	(0.9399)			
ROE	0.1804***	0.1167*	0.3976***	0.1618***	0.2082***	1.0000	
	(0.0032)	(0.0577)	(0.0000)	(0.0083)	(0.0006)		
Lev	–0.0271	0.2372***	0.1008	–0.0285	0.2305***	–0.0725	1.0000
	(0.6603)	(0.0001)	(0.1015)	(0.6440)	(0.0002)	(0.2398)	

Note: This table presents the pairwise correlations among the variables. The *p*-values are reported in parentheses below the correlation coefficients. *, **, and *** represent the levels of statistical significance at 10%, 5%, and 1%, respectively.

by about four basis points (=0.0003×1.3292). The coefficients on the control variables are subsequently scrutinized. As anticipated, financial leverage positively affects stock performance, while the total asset shows a significantly negative influence. The price-to-book ratio and return on equity demonstrate no notable correlation with stock performance. Overall, the baseline regression results presented in Table 3 corroborate Hypothesis 2 and refute Hypotheses 1 and 3.

To assess the existence of a nonlinear relationship between stock performance and ESG ratings, Equation (4) is employed to conduct fixed-effects regressions. The results in Table 4 indicate that the regression coefficients on *ESG* consistently manifest negative and statistically significant values. The coefficients on ESG^2 are positive and demonstrate weak significance, implying that the link between ESG ratings and stock performance is nonlinear and follows a convex pattern. This means that stock performance declines at a decreasing rate as ESG ratings increase. The higher a company's ESG ratings, the less pronounced the negative influence of ESG ratings on stock performance.

Furthermore, the interaction terms between the independent variable *ESG* and each control variable were incorporated to assess their marginal impacts. The findings in Table 5 reveal that most interaction terms' regression coefficients are insignificant. An exception is observed with the coefficient on the interaction between ESG ratings and the price-to-book ratio, which is positively quantified at 0.0058 and holds statistical significance at the 5% level. This indicates that the price-to-book ratio influences the negative effect of ESG ratings on stock returns. A lower price-to-book ratio intensifies the negative impact of ESG ratings on stock returns. In essence, the adverse effect of ESG rating on stock performance is more pronounced in value stocks compared to growth stocks.

Table 3. Baseline regressions

	Ret	***exRet***	***Alpha1***	***Alpha3***
ESG	−0.0639**	−0.0659**	−0.0003***	−0.0002*
	(0.0281)	(0.0283)	(0.0001)	(0.0001)
LMV	0.8324***	0.8525***	0.0027***	0.0021***
	(0.0857)	(0.0907)	(0.0003)	(0.0003)
PB	0.0023	0.0023	0.0000**	0.0000**
	(0.0023)	(0.0023)	(0.0000)	(0.0000)
LTA	−0.5140***	−0.5221***	−0.0019***	−0.0016***
	(0.1252)	(0.1498)	(0.0005)	(0.0004)
ROE	0.0933	0.1033	0.0004	0.0003
	(0.1298)	(0.1387)	(0.0005)	(0.0004)
Lev	0.0027**	0.0029***	0.0000	0.0000**
	(0.0635)	(0.0011)	(0.0000)	(0.0000)
Constant	0.3173	0.3866	0.0047	0.0060
	(1.4725)	(1.6738)	(0.0050)	(0.0041)
Year fixed effect	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes
Observations	265	260	260	260
R^2	0.6803	0.5622	0.5462	0.4637
F	50.2117	25.2521	22.6358	16.5973

Note: This table presents the fixed-effects regression analysis of stock performance on ESG ratings and control variables, following Equation (1). Four proxies define stock performance: *Ret* represents the raw stock return, *exRet* is the stock excess return over market returns, *Alpha1* denotes Jensen's one-factor alpha, and *Alpha3* is the Fama-French three-factor alpha. Robust standard errors are indicated in parentheses below the estimated coefficient of each variable. *, **, and *** represent the levels of statistical significance at 10%, 5%, and 1%, respectively.

Table 4. Nonlinear quadratic regressions

	Ret	***exRet***	***Alpha1***	***Alpha3***
ESG	−0.1779**	−0.1859**	−0.0008***	−0.0006***
	(0.0719)	(0.0701)	(0.0002)	(0.0002)
ESG^2	0.0286*	0.0299*	0.0001**	0.0001**
	(0.0166)	(0.0162)	(0.0001)	(0.0000)
LMV	0.8603***	0.8822***	0.0029***	0.0022***
	(0.0876)	(0.0914)	(0.0003)	(0.0003)
PB	0.0018	0.0017	0.0000**	0.0000**
	(0.0021)	(0.0022)	(0.0000)	(0.0000)
LTA	−0.5237***	−0.5279***	−0.0020***	−0.0017***
	(0.1287)	(0.1514)	(0.0005)	(0.0004)
ROE	0.0989	0.1067	0.0004	0.0003
	(0.1358)	(0.1440)	(0.0005)	(0.0004)
Lev	0.0009	0.0011	0.0000	0.0000
	(0.0016)	(0.0016)	(0.0000)	(0.0000)
Constant	0.2407	0.2452	0.0041	0.0056
	(1.5753)	(1.7460)	(0.0052)	(0.0042)
Year fixed effect	Yes	Yes	Yes	Yes
Firms fixed effect	Yes	Yes	Yes	Yes
Observations	265	260	260	260
R^2	0.6859	0.5708	0.5565	0.4728
F	44.7250	26.5907	22.6601	16.4315

Note: This table delineates the nonlinear quadratic regression analysis of stock performance on ESG ratings, the squared term of ESG ratings, and control variables, as per Equation (4). Robust standard errors are shown in parentheses beneath the estimated coefficient of each variable. *, **, and *** represent the levels of statistical significance at 10%, 5%, and 1%, respectively.

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Table 5. Moderating effects of control variables

	Ret	***Ret***	***Ret***	***Ret***	***Ret***
ESG	−0.2764	−0.1023***	−0.0943	−0.0500	−0.0656**
	(0.2490)	(0.0267)	(0.2227)	(0.0349)	(0.0287)
ESG×LMV	0.0253				
	(0.0298)				
ESG×PB		0.0058**			
		(0.0028)			
ESG×LTA			0.0021		
			(0.0139)		
ESG×ROE				−0.1327	
				(0.1749)	
ESG×Lev					0.0009
					(0.0007)
LMV	0.8221***	0.7606***	0.8350***	0.8369***	0.8332***
	(0.0874)	(0.0956)	(0.0935)	(0.0859)	(0.0860)
PB	0.0022	0.0019	0.0023	0.0023	0.0023
	(0.0022)	(0.0018)	(0.0023)	(0.0023)	(0.0023)
LTA	−0.5109***	−0.4826***	−0.5161***	−0.5188***	−0.5141***
	(0.1256)	(0.1200)	(0.1261)	(0.1258)	(0.1255)
ROE	0.0965	0.1496	−0.0915	0.1109	0.0920
	(0.1293)	(0.1231)	(0.1324)	(0.1314)	(0.1308)
Lev	0.0025**	0.0036***	0.0025**	0.0013	−0.0021
	(0.0011)	(0.0010)	(0.0011)	(0.0020)	(0.0041)
Constant	0.3544	0.4393	0.3261	0.3470	0.3162
	(1.4413)	(1.3224)	(1.4681)	(1.4807)	(1.4769)
Year fixed effect	Yes	Yes	Yes	Yes	Yes
Firms fixed effect	Yes	Yes	Yes	Yes	Yes
Observations	265	265	265	265	265
R^2	0.6814	0.6884	0.6804	0.6808	0.6806
F	43.6557	42.5944	46.0704	46.7145	585.4491

Note: This table displays the results of the fixed-effects regression analysis following the incorporation of various interaction terms, as outlined in Equation (5). The robust standard errors are disclosed in parentheses beneath the estimated coefficient of each variable. *, **, and *** indicate the levels of statistical significance at 10%, 5%, and 1%, respectively.

The COVID-19 pandemic has significantly disrupted financial markets. For robustness, the sample is segmented into two subperiods: 2016–2018 and 2019–2020. The findings in Table 6 illustrate that from 2016 to 2018, a company's ESG ratings maintained a substantially negative influence on its stock return. Post-2019, the dynamics between a company's ESG ratings and stock performance shift from negative to positive, yet lack statistical significance, likely attributable to the profound effects of the COVID-19 pandemic. Consequently, the negative correlation between ESG ratings and stock performance is predominantly influenced by the outcomes in the initial subperiod.

Finally, the negative correlation between ESG ratings and stock performance raises causality concerns. Companies adopting ESG practices may encounter investment constraints potentially detrimental to their future stock performance. Conversely, firms with superior stock performance could become overconfident, diminishing their ESG efforts. To differentiate causal directions, this study strategically employs lagged ESG ratings to predict stock returns and lagged stock returns to explicate ESG ratings, with the findings detailed in Table 7. As anticipated, lagged ESG ratings exhibit a significantly negative effect on stock returns, while lagged stock returns do not significantly influence ESG ratings. This outcome substantiates the hypothesis that a high ESG rating adversely affects stock performance rather than vice versa.

Table 6. Subperiod analysis

	2016–2018 *Ret*	2019–2020 *Ret*
ESG	–0.0807**	0.1191
	(0.0374)	(0.1173)
LMV	0.8653***	0.9732***
	(0.1379)	(0.3533)
PB	0.0016	0.0486*
	(0.0012)	(0.0274)
LTA	–0.4908***	–1.0974**
	(0.1621)	(0.5445)
ROE	–0.1252	–0.1349
	(0.1674)	(0.3628)
Lev	–0.0148***	0.0040***
	(0.0020)	(0.0012)
Constant	–0.1726	7.1394
	(1.9235)	(6.1220)
Year fixed effect	Yes	Yes
Firms fixed effect	Yes	Yes
Observations	152	113
R^2	0.4142	0.6541
F	22.7612	30.9047

Note: This table displays the fixed-effects regression analysis for two subperiods, 2016–2018 and 2019–2020, following Equation (1). Robust standard errors are detailed in parentheses under the estimated coefficient of each variable. *, **, and *** denote the levels of statistical significance at 10%, 5%, and 1%, respectively.

Table 7. Reverse causality analysis

	Ret	*ESG*
Lagged ESG	–0.1173***	
	(0.0365)	
Lagged Ret		0.2392
		(0.1457)
LMV	0.6547***	0.3534
	(0.1192)	(0.3567)
PB	0.0375***	0.0244
	(0.0113)	(0.0334)
LTA	–0.4255***	0.5452
	(0.1484)	(0.5865)
ROE	0.0653	–0.0486
	(0.1156)	(0.4823)
Lev	0.0054***	0.0134***
	(0.0013)	(0.0044)
Constant	0.5738	–10.0106
	(1.8106)	(7.9832)
Year fixed effect	Yes	Yes
Firms fixed effect	Yes	Yes
Observations	203	203
R^2	0.7441	0.4453
F	57.0927	10.7020

Note: This table presents the results of fixed-effects regression analysis employing lagged variables for reverse causality assessment following Equations (6) and (7). Robust standard errors are delineated in parentheses beneath the estimated coefficients of each variable. *, **, and *** denote the levels of statistical significance at 10%, 5%, and 1%, respectively.

4. DISCUSSION

Table 3 demonstrates that ESG ratings negatively influence various proxies for stock performance. This outcome endorses Hypothesis 2 while refuting Hypotheses 1 and 3. It contrasts with studies indicating a positive association between ESG ratings and stock performance in mainland China (Deng and Cheng, 2019), Taiwan (Chiu et al., 2020), and Australia (Chandra and Tourani-Rad, 2021). However, Deng and Cheng (2019) measured stock performance through earnings per share, in contrast to stock return or alpha in this study. The result in Table 3 aligns with the sin stock concept posited by Hong and Kacperczyk (2009), wherein sin stocks bearing lower ESG scores deliver higher anticipated returns than analogous equities. Pyles (2020) observed higher abnormal returns for portfolios of firms with lower ESG scores based on Bloomberg ESG disclosure data. Similarly, Avramov et al. (2022) reported a negative link between ESG ratings and future performance in stocks with low ESG uncertainty. Overall, these results suggest that the costs associated with high ESG activities outweigh the benefits derived from such activities.

Table 4 displays a nonlinear and convex linkage between ESG ratings and stock performance, suggesting a tapering off in the downturn of stock performance as ESG ratings escalate. It is significant to note that companies with advanced ESG ratings exhibit a reduced likelihood of crashes and less tendency to accumulate negative information, as delineated in Kim and Li (2014). Avramov et al. (2022) analyze the impact of ESG uncertainty on the risk-return equation, revealing that the negative ESG-alpha correlation exists among stocks with low ESG uncertainty. The observations in Table 4 corroborate the investigation by Nollet et al. (2016), examining the link between corporate social ratings and financial performance. Employing Bloomberg's ESG disclosure score for S&P 500 firms from 2007 to 2011, the linear model's results indicate a marked negative association between ESG ratings and return on capital. In addition, nonlinear models manifest a U-shaped relationship between ESG ratings and accounting-based metrics of corporate financial perfor-

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mance. These results suggest a nonlinear convex relationship between ESG rating and stock performance, with the negative association exhibiting a diminishing marginal impact.

Table 5 indicates that most interaction terms' regression coefficients are insignificant. Nevertheless, the price-to-book ratio marginally moderates the negative effect of ESG ratings on stock returns, aligning with prior research. Naimy et al. (2021) documented a convex and negative influence of ESG on the price-to-book ratio for East Asian industrial sector firms. Analyzing ESG pillars individually, they found a convex relationship between governance and the price-to-book ratio. Gavrilakis and Floros (2023) investigated the interplay between price-to-book value, market capitalization, Sharpe ratio, and ESG score of European firms with their stock performance. The study's conclusions indicate that eschewing investments in entities with elevated ESG scores could predispose investors towards smaller firms possessing higher price-to-book ratios and Sharpe indices, as these are more apt to generate superior returns. Overall, the detrimental effect of ESG ratings on stock performance is mitigated by a high price-to-book ratio (or growth stocks) and overshadowed by the companies' growth prospects.

Table 6 reveals that from 2016 to 2018, companies' stock returns were significantly and negatively influenced by ESG ratings. Post-2019, however, the link between firms' ESG ratings and stock performance has been insignificant. This aligns with Broadstock et al. (2021), who, utilizing a novel dataset of China's CSI300 constituents, demonstrated that portfolios with high ESG scores typically outperform those with low ESG scores during the COVID-19 pandemic. Similarly, Ferriani and Natoli (2021) found that during the early stages of the COVID-19 crisis, marked by soaring uncertainty, investors preferred funds with low ESG risk, with environmental concerns remaining paramount. Engelhardt et al. (2021) noted that European corporations with high ESG ratings correlate with augmented abnormal returns. Furthermore, ESG demonstrates value augmentation in nations characterized by diminished trust, lax security regulations, and inferior disclosure norms. The escalated market volatility and uncertainty following the COVID-19 pandemic appear to have redirected investor inclination towards high-ESG equities, negating the previously adverse effect of ESG ratings on stock performance. Fundamentally, these results suggest a reduction in the negative impact of ESG ratings on stock performance amidst the COVID-19 pandemic.

Table 7 demonstrates that lagged ESG ratings influence stock performance, whereas lagged stock performance does not affect ESG ratings, aligning with the existing literature. Chen and Xie (2022) employed a staggered difference-in-differences methodology to tackle the endogeneity stemming from reverse causation between ESG disclosure and financial outcomes. Their findings indicate that ESG disclosure substantially affects companies' financial performance. Yu and Xiao (2022) implemented a two-stage least squares regression methodology to examine potential endogeneity between ESG performance and firm value, utilizing the industry-year average ESG score as an instrumental variable. The results support the causality from ESG ratings to firm value. Similarly, Gao et al. (2023) utilized one-, three-, and five-period lagged ESG to assess their impacts on future corporate performance. Their tests revealed a significant correlation between lagged ESG variables and corporate performance, suggesting that past ESG practices influence corporate performance and that ESG has a long-term contributory effect. Consequently, ESG ratings appear to adversely impact stock performance instead of stock performance influencing ESG ratings.

CONCLUSION

This study examines the effect of ESG ratings of publicly listed Chinese companies in the internet sector on their stock performance. The study utilizes a fixed-effects model, examines nonlinear quadratic relationships, employs interaction terms, conducts subperiod analysis, and undertakes causality analysis. Four alternate stock performance metrics are used: raw stock return, stock excess return relative to market return, Jensen's single-factor alpha, and Fama-French three-factor alpha. In most regression models,

ESG rating exhibits a significantly negative impact on stock performance. This study highlights the detrimental effect of ESG practices on the stock performance of Chinese internet firms. Furthermore, the study uncovers that the relationship between ESG rating and stock performance is not strictly linear. The association between ESG rating and stock performance is convex, resembling a U-shaped curve. The lower a company's ESG ratings, the more pronounced the negative impact on stock performance. The analysis also reveals that prior to 2018, a company's ESG rating had a significantly negative effect on stock performance, a correlation that dissipated post-2019. Causality analysis reveals that an elevated ESG rating results in diminished stock returns, as opposed to superior stock performance precipitating a reduced ESG rating.

A significant contribution of this paper is bridging a gap in the existing literature, which has yet to thoroughly explore the interplay between ESG ratings and stock performance in the Chinese internet industry in recent years. While most prior studies have concentrated on ESG issues within the broader economy, the banking sector, or other specialized industries, the growing prominence of the internet industry, particularly in China with its extensive internet user base, renders this study highly relevant to a broad audience. The empirical findings highlight that the ESG rating of Chinese internet companies adversely affects their stock performance. This negative impact of ESG ratings on stock performance also presents variability in ESG levels, price-to-book ratios, and different time frames, underscoring the diversity of outcomes. Overall, this study offers recommendations for the sustainable growth of internet companies and guidance for investment decisions of ESG-conscious investors in China. However, this paper is not without its limitations. The number of Chinese internet companies that have adopted ESG practices is relatively small, leading to a limited sample size. Further research is encouraged to elucidate the mechanisms that define the relationship between ESG ratings and stock performance.

AUTHOR CONTRIBUTIONS

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