Article

Understanding the Impact of ESG Practices in Corporate Finance

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Abstract: This study examines the relationship between environmental, social, and governance (ESG) factors and corporate financial performance. Specifically, we study various individual ESG categories, both ESG strengths and concerns, and aggregate ESG factor and their impact on corporate financial performance including profitability and financial risk. We find a positive effect of ESG factors on corporate profitability, and the effect is more pronounced for larger firms. Among different ESG categories, corporate governance has the most significant impact, particularly for firms with weak governance. We also find that ESG variables generally have a positive influence on credit rating. In particular, the social factor has the most significant impact on credit rating, while environmental score surprisingly has a negative effect. Overall, this research provides a rationale for ESG integration in the context of investment management and portfolio construction to maximize value and minimize risk.

Keywords: corporate financial performance; corporate governance; ESG; credit ratings; ESG investing; risk management

1. Introduction

This work explores the relationship between environmental, social, and governance (ESG) factors and corporate financial performance and provides the rationale for ESG-integrated investment management strategies. According to the Financial Times [1], ESG is a term commonly used by investors to assess corporate activities related to environmental, social, and governance areas. ESG factors are also considered non-financial performance indicators and are used to identify issues related to business ethics, corporate social responsibility, and corporate governance.

One of the key ESG investment concepts is ESG integration. According to the United Nations Principles for Responsible Investing [2], ESG integration is defined as "the explicit and systematic inclusion of ESG issues in investment analysis and investment decisions." In other words, ESG integration is the application of ESG factors to the traditional fundamental analysis in the context of investment management.

The notion of ESG or ESG factors has become a key consideration for institutional investors and individual investors. Recently, a growing number of companies have demonstrated a greater commitment to ESG activities in order to be recognized as socially responsible. At the same time, a greater number of asset managers, pension funds and institutional investors have started to assess ESG activities of companies when determining investment decisions. In both academic and professional environments, there is extensive evidence that investors are becoming aware of the ESG and corporate finance relationship. In a recent survey conducted by RBC Global Asset Management [3], approximately 72% of the respondents incorporate ESG principles into their investment approaches and decision-making processes. Ninety percent of the respondents believe that ESG-integrated portfolios are likely to outperform the market and non-ESG-integrated portfolios. Some of the institutional respondents believe there are potential challenges associated with ESG assessment and disclosure.

Some studies have examined the potential differences in ESG practices across different regions. For instance, Garcia, Mendes-Da-Silva, and Orsato [4] conducted empirical research to understand the ESG and corporate financial performance relationship in BRICS (Brazil, Russia, China, India and South Africa). ESG is not only popular in developed economies, but ESG consideration also has strong implications in the emerging economies' capital markets. Many studies, including the study conducted by Friede, Busch, and Bassen [5], highlight that ESG investing has created positive outcomes for returns in emerging markets.

Based on the risk–return tradeoff, a fundamental principle of finance, the current literature focusing on return only is misleading. One exception is Clark, Feiner, and Viehs [6] who show that corporate sustainability standards can be a crucial factor in lowering the cost of capital, which comprises cost of debt (i.e., credit score/risk) and cost of equity. We further study and shed light on whether ESG impacts both return and risk and whether the impact is symmetrical across different dimensions such as ESG category, strength and weakness, and firm size.

We find a positive effect of ESG factors on corporate profitability, and the effect is more pronounced for larger firms. Among different ESG categories, corporate governance has the most significant impact, particularly for firms with weak governance. We also find that ESG variables generally have a positive influence on credit rating. In particular, the social factor has the most significant impact on credit rating, while environmental score surprisingly has a negative effect. Overall, the main goal of the research is not to determine which companies to invest in but provide a rationale for ESG integration in the context of investment management and portfolio construction to maximize value and minimize risk.

The paper proceeds as follows. In the next section, we review the literature on the ESG and corporate finance relationship and develop our hypotheses. Section 3 covers data sources, data extraction, the ESG scoring mechanism, and multivariate regression models, while our results are discussed in Section 4. Section 5 concludes.

2. Literature Review and Hypothesis Development

Prior to this research, various types of empirical studies have examined the impact of ESG factors on corporate finance and investment management.

First, there is evidence to support the positive relationship between ESG and positive investment performance. For instance, Derwall, Guenster, Bauer, and Koedijk [7] found that portfolios with a higher eco-efficiency score provide better investment returns. According to Friede, Busch, and Bassen [5], there were about 2200 individual studies from 1970 to 2015. They identified a drastic increase in ESG studies since 2000. To make a generalized conclusion about the relationship between ESG and corporate finance, they aggregated the test results of empirical studies over four decades while understanding the impact of ESG investing in global capital markets. The research in this area is extensive, accelerating, and still inconclusive depending on data sample, sample period, empirical methods, and different industries or countries (e.g., [8–12]). Among these 2200 studies, approximately 90% of them indicate non-negative relationships between ESG and financial performance variables, while most report the positive impact of ESG factors on corporate financial performance. Most importantly, they found that the positive relationship between ESG and corporate finance performance is stable over time. Based on these results, the following hypothesis was created:

Hypothesis 1: *ESG has a positive impact on corporate profitability.*

In terms of specific ESG components, Gompers, Ishii, and Metrick [13] exclusively researched the impact of corporate governance. Notably, they researched the relationship between corporate governance and corporate finance areas including enterprise value, profitability, sales, fixed asset purchases, and mergers and acquisitions (M&A). Using their unique governance index method to estimate shareholders' rights, they concluded that firms with higher index value showed higher firm value, higher level of profits, higher

sales growth rate, and lower capital expenditure spending, while making a smaller number of corporate acquisitions. The empirical research conducted by Wang and Sarkis [14] concluded that whether companies implement corporate social responsibility (CSR) and corporate governance successfully to generate good CSR outcomes positively impacts their financial performance. CSR practice plays a significant role in corporate finance due to the growing awareness of consumers and investors. Reverte, Gomez-Melero, and Cegarra-Navarro [15] found a direct positive impact of CSR practice on organization performance across various categories of companies. To better understand the impact of specific ESG components, the following hypothesis was created:

Hypothesis 2: *Among different ESG factors, governance category has the most significant impact on corporate finance performance.*

Throughout the literature review, it is possible to identify that most of the available literature focuses on the positive impact of ESG factors on either equity prices or profitability of companies. However, it is also arguable that ESG factors can explain uncertainties and other forms of financial risk. For instance, in the empirical research conducted by Kruger [16], there was evidence of the adverse impact of negative CSR events on shareholders' value, which was expressed in cumulative abnormal returns. Albuquerque, Koskinen, and Zhang [17] found that CSR factor decreases systematic risk and improves firm value.

The studies analyzing the relationship between ESG factors and financial risk are more prevalent in professional investment service industries. The United Nations Principles for Responsible Investment (UNPRI) [18] reports that many investors and credit rating agencies consider ESG factors in their credit risk analysis framework. According to their survey, more than 100 institutional investors and nine credit rating agencies are committed to incorporating ESG factors into existing credit risk and credit rating assessments. In the report, the case study of Pacific Investment Management Corporation (PIMCO) shows how incorporating ESG criteria into their sovereign rating analysis can potentially provide more insight into the creditworthiness of sovereign states. In academia, Attig, Ghoul, Guedhami, and Suh [19] found that CSR strengths and concerns affect the credit rating of companies. The CSR components including community relations, diversity, employee relations, and product characteristics have a significant relationship in explaining creditworthiness of companies. Moreover, Stellner, Klein, and Zwergel [20] found a relationship between corporate bond spreads and corporate social performance in Eurozone areas. To examine the ESG and financial risk relationship, the following hypothesis was constructed:

Hypothesis 3: *ESG factors have a significant correlation with corporate credit risks, which are measured by credit ratings.*

3. Data and Analysis

This section covers the data collection process and the overall research method.

3.1. Data Collection and Variable Construction

To create sample datasets, corporate financial datasets were extracted from S&P Capital IQ—Compustat database. It covers 172,437 observations from 1991 to 2013 based on 4708 firms in all industries. The Compustat database contains financial and statistical information. Table 1 shows the variables that are extracted to perform multivariate regression analyses:

Table 1. Selected corporate finance and environmental, social, and governance (ESG) variables.

	Variables
Size measure	Total assets
Investment	Invested capital
Capital structure	Total liabilities, stockholders' equity
Profitability	Earnings before interest and taxes (EBIT), net income
Taxes and interests	Total income taxes, total interest and related expense
Credit risk	S&P long-term issuer credit rating (SPLTICRM)

Prior to performing an ESG scoring process, two sample datasets were created. The first sample was created by combining the Compustat dataset and the MSCI ESG dataset. Throughout the sample construction process, since the database contains investment fund information, the observations with missing total assets, earnings before interest and taxes (EBIT), and net income values were removed. Although some researchers such as Lins, Servaes, and Tamayo [21] removed the observations with low market capitalization below $250 million due to liquidity issues, this paper includes all the observations. The main reason for this approach is to derive a generalized conclusion about the ESG and corporate financial performance relationship for various types of companies.

For ESG factors, the MSCI ESG Stats database was used to extract the ESG information of companies from 1991 to 2013. Please see Table 2 for ESG variables and number of observations. The database contains environmental, social, and governance scores of publicly traded companies. The ESG ratings are recorded on an annual basis. Therefore, all financial information used for the analyses was on an annual basis. Using the information available on the database, new sets of ESG scores were calculated. Raw environmental, social, and governance scores were assigned with their quantile values as new ESG scores. In Table 3, the scoring-system-based quantile approach is outlined. For instance, if there is an observation with an MSCI environmental strength score of 5, the observation has 0.857143 as a new score. The strongest MSCI score observations had a score of 1. Each MSCI score can be considered a group, range, or quantile, and the observation's new score is the maximum value for the corresponding quantile range (e.g., MSCI 5 for environmental strength ranges from 0.857143 to 0.714286). One of the most notable issues of using raw ESG score is derived from observations with identical ESG scores. For instance, using raw scores can create observations with ESG scores of 0 (for all three ESG areas). Although some observations may have different values for the selected financial performance indicators, it is possible to identify other observations with identical ESG scores. In other words, using raw scores might not effectively explain ESG and corporate financial performance relationships with identical scores but with different financial performance indicators. To overcome the measurement issue, each observation with ESG scores was assigned a quantile value. Table 3 describes the quantile scales for corresponding ESG scores. The total ESG composite scores were calculated using an average of three ESG quantile scores. Certain variables were not used to provide a more objective perspective. The MSCI ESG database also contains the ratings for alcohol, arms sales, gambling, nuclear, military, and tobacco. However, the relevance of these categories is questionable since they are only applicable to certain industries and/or companies in the database.

Table 4 provides formulas and data sources for the dependent variable and control variables we use in our study; Table 5 shows formulas, and data sources for the ESG variables. Lastly, the credit rating information and S&P long-term issuer credit ratings were extracted from the Compustat database and matched to the first research sample. Please refer to Table 6 for more details.

Table 2. ESG variables and number of observations.

Observation	Environmental		Social										Governance	
	Environment		Community		Diversity		Employee Relations		Human Rights		Product		Corporate Governance	
MSCI Score	Strengths	Concerns	Strengths	Concerns	Strengths	Concerns	Strengths	Concerns	Strengths	Concerns	Strengths	Concerns	Strengths	Concerns
0	32,512	33,987	34,296	35,895	27,681	22,868	29,639	27,821	37,752	36,806	35,414	32,625	32,971	26,268
1	3786	2701	3076	2416	6308	12,191	5575	8629	471	1520	2841	4305	5287	10,859
2	1185	1078	790	135	2483	3382	1754	1684	227	116	190	1118	181	1177
3	604	449	220	4	1159	9	655	277		8	5	351	11	134
4	294	190	62		471		442	37				51		12
5	67	45	6		220		234	2						
6	2				104		91							
7					24		45							
8							13							
9							2							
10														

Table 3. ESG variables and scoring system.

Quantile-Based Score	Environmental		Social										Governance	
	Environment		Community		Diversity		Employee Relations		Human Rights		Product		Corporate Governance	
MSCI Score	Strengths	Concerns	Strengths	Concerns	Strengths	Concerns	Strengths	Concerns	Strengths	Concerns	Strengths	Concerns	Strengths	Concerns
0	0.142857	1	0.166667	1	0.125	1	0.1	1	0.333333	1	0.25	1	0.25	1
1	0.285714	0.833333	0.333333	0.75	0.25	0.75	0.2	0.833333	0.666667	0.75	0.5	0.8	0.5	0.8
2	0.428571	0.666667	0.5	0.5	0.375	0.5	0.3	0.666667	1	0.5	0.75	0.6	0.75	0.6
3	0.571429	0.5	0.666667	0.25	0.5	0.25	0.4	0.5		0.25	1	0.4	1	0.4
4	0.714286	0.333333	0.833333		0.625		0.5	0.333333				0.2		0.2
5	0.857143	0.166667	1		0.75		0.6	0.166667						
6	1				0.875		0.7							
7					1		0.8							
8							0.9							
9							1							
10														

Table 4. Variables, formulas, and data sources.

Category	Type	Measure	Formula	Source
Dependent variable	Financial performance	Return on Assets	$\frac{Net\ Income}{Total\ Asset}$	Compustat—Capital IQ (Annual Fundamentals)
		Customized credit rating scale (assigned with numeric values for each rating)	S&P domestic long term issuer credit rating	Compustat—Capital IQ (Daily Updates—Ratings)
Control/independent variables	ESG	Total ESG score	Please refer to Table 5 for more details	MSCI ESG KLD
		Environmental score		
		Social score		
		Governance score		
	Leverage	Debt-to-equity	$\frac{Total\ liabilities}{Shareholders'\ Equity}$	Compustat—Capital IQ (Annual Fundamentals)
	Liquidity	Interest coverage ratio	$\frac{EBIT}{Interest\ Expense}$	
	Size	Total assets	$Ln\,(Total\ Asset)$	
	Investment	Return on invested capital	$\frac{EBIT-Income\ Tax}{Invested\ Capital}$	

Table 5. Variables, formulas, and data sources.

ESG component	Variables	Formula
Environmental	Environmental strength and concerns	$\sum (Environmental\ strength + Environemntal\ concerns)$
Social	Social strengths and concerns (i.e., community, human rights, employment, diversity, product)	$\sum (Community,\ human\ rights,\ empoyment,\ diversity\ and\ product\ strengths + Community,\ human\ rights,\ empoyment,\ diversity\ and\ productconcerns)$
Governance	Corporate governance strength and concerns	$\sum (Corporate\ governance\ strengths + Corporate\ governance\ concerns)$
Total ESG score	Average environmental, social, and governance scores	Average of the new environmental, social, and governance scores

Table 6. Credit ratings and rating scores.

Rating	Score
AAA	24
AA+	23
AA	22
AA-	21
A+	20
A	19
A-	18
BBB+	17
BBB	16
BBB-	15
BB+	14
BB	13
BB-	12
B+	11
B	10
B-	9
CCC+	8
CCC	7
CCC-	6
CC+	5
CC	4
CC-	3
C	2
D	1

3.2. Research Method

Throughout the analyses, firm fixed effect and time fixed effect were applied to deal with endogeneity issues. Natural log was applied to total asset observations to mitigate potential issues related to measurement and measurement scaling.

For the preliminary regression analysis, eight multivariate regression models were constructed: four regressions for the profitability variable (i.e., Return on Assets, ROA) and four regressions for the credit risk variable (i.e., credit rating). Furthermore, the sample dataset was categorized by asset size and total ESG score for further analysis. The main reason for this in-depth analysis process is to identify potential patterns in the sample dataset while gaining a better understanding of the ESG and corporate financial performance relationship in specific settings. The following are the generalized regression formulas that were used throughout the research:

$$
\begin{aligned}
RoA = \alpha \ + \ & \beta_1(Environmental\ score, Social\ score, Governance\ score, or\ Total\ ESG\ score_{i,t}) \\
+ \ & \beta_2(Debt/Equity\ ratio_{i,t}) + \beta_3(Liquidity_{i,t}) + \beta_4\Big(\ln(total\ asset)_{i,t}\Big) + \beta_5(ROIC_{i,t})
\end{aligned}
$$

$$
\begin{aligned}
Credit\ rating = \alpha \ + \ & \beta_1(Environmental\ score, Social\ score, Governance\ score, or\ Total\ ESG\ score_{i,t}) \\
+ \ & \beta_2(Debt/Equity\ ratio_{i,t}) + \beta_3(Liquidity_{i,t}) + \beta_4\Big(\ln(total\ asset)_{i,t}\Big) + \beta_5(ROIC_{i,t})
\end{aligned}
$$

4. Findings

4.1. Preliminary Analysis

4.1.1. Descriptive Statistics

Each ESG component and aggregate ESG score was assessed. Table 7 describes the summary statistics of the variables used to examine the first and second hypotheses, and Table 8 describes the summary statistics for the variables used to examine the ESG and credit rating relationship.

Table 7. Descriptive statistics for ESG and ROA sample.

	Number of obs.	Mean	Median	SD	Skewness	Kurtosis	First Quartile (25%)	Third Quartile (75%)
ROA	21,341	0.0257	0.0409	0.1562	-7.2674	143.0632	0.0100	0.0783
Debt/Equity	21,341	2.4750	1.1643	59.1259	46.5286	3828.2280	0.6011	2.1738
Liquidity	21,341	93.3497	5.7615	1778.3202	31.8462	1807.1002	1.9979	16.8703
Ln(asset)	21,341	7.4543	7.3156	1.6933	0.4788	0.3457	6.2600	8.4700
ROIC	21,341	0.0747	0.0932	1.9128	-125.6928	17315.5472	0.0522	0.1424
Environment	21,341	0.5705	0.5714	0.0631	-0.4206	8.7492	0.5714	0.5714
Social	21,341	0.5861	0.5825	0.0338	0.4867	2.0187	0.5683	0.6000
Governance	21,341	0.6031	0.6250	0.0738	0.0090	1.0532	0.5250	0.6250
Total ESG	21,341	0.5866	0.5896	0.0381	0.0675	3.4128	0.5646	0.6013

Table 8. Descriptive statistics for ESG and credit ratings sample.

	# of obs.	Mean	Median	SD	Skewness	Kurtosis	First Quartile (25%)	Third Quartile (75%)
Rate	10,619	15.0742	15.0000	3.3155	0.0691	−0.2079	12.0000	17.0000
Debt/Equity	10,619	3.6020	1.6275	82.4827	34.1130	2024.1257	1.0125	2.7814
Liquidity	10,619	15.1653	4.5754	281.9472	67.9201	5112.4644	2.1104	10.2205
Ln(asset)	10,619	8.5093	8.3230	1.4433	0.6385	0.5318	7.5100	9.4200
ROIC	10,619	0.0864	0.0994	2.5826	−101.8029	10,448.3578	0.0649	0.1476
Environment	10,619	0.5676	0.5714	0.0823	−0.3405	4.3992	0.5714	0.5714
Social	10,619	0.5898	0.5900	0.0390	0.3499	1.5139	0.5708	0.6100
Governance	10,619	0.5921	0.6250	0.0768	−0.0235	1.1172	0.5250	0.6250
Total ESG	10,619	0.5832	0.5869	0.0454	0.1541	2.5392	0.5588	0.6021

Table 6 reveals summary statistics for corporate financial performance variables, and most of the variables are accounting-based indicators. Overall, the size of the first research sample is 21,341. The firm with median characteristics in the sample has ROA of 0.041, Debt over Equity (D/E) ratio of 1.164267, interest coverage ratio of 5.76149, total assets of about $1.727 billion, and return on invested capital (ROIC) of approximately 9%. In terms of ESG scores, the median sample firm has an environment score of 0.57, social score of 0.5825, governance score 0.625, and total ESG score of 0.59. Nevertheless, it is also possible to identify extreme values in certain accounting-based performance measures. For instance, D/E ratio, interest coverage ratio, and ROIC have very abnormal distribution.

Table 7 shows the descriptive statistics used to assess the ESG–credit rating relationship. Please note that during the sample data structure for the ESG–credit rating relationship, the number of observations decreased by 10,722 compared to the first dataset, which was used to analyze the ESG–ROA relationship. Due to the availability of data and lack of information disclosure, the number of observations decreased by half. In this sample set, the median firm has a credit rating of 15 or BBB-, D/E ratio of 1.628, interest coverage ratio of 4.58, total assets of approximately $4.117 billion, and ROIC of approximately 10%. In terms of ESG scores, the median firm possesses an environment score of 0.571429, social score of 0.59, governance score of 0.625, and total ESG score of 0.586865. Based on the initial finding, it is possible to observe potential issues related to the proposed ESG score calculation method. Apart from the environmental score, the ESG scores are somewhat well-distributed (based on their mean, standard deviation, skewness, and kurtosis statistics). However, the environmental scores from both sample sets have very concentrated distribution near the mean/median. In particular, the first and third quantile for the calculated environmental score are identical.

4.1.2. Correlation Analysis

Table 9 shows the correlation analysis using the first sample dataset. Overall, it is difficult to find any strong correlations (i.e., 0.7 and above) between variables. In terms of the selected ESG variables, the dependent variable is weakly correlated to the firm profitability measure. The size variable, natural log of total assets size, is significant in terms of correlation. First, the control variable is moderately correlated to the profitability variable

(0.16719). In terms of ESG variables, social, and governance variables are moderately correlated to the firm size variable (i.e., 0.19 and -0.20). Among the ESG variables, the social variable has the strongest correlation with the dependent variable.

Table 9. Correlation analysis for ESG—ROA sample.

	ROA	Environment	Social	Governance	Total ESG	Debt/Equity	Interest Coverage	Ln (Asset)	ROIC
ROA	1.000								
Environment	0.021	1.000							
Social	0.054	0.268	1.000						
Governance	−0.016	0.085	0.107	1.000					
Total ESG	0.017	0.687	0.513	0.725	1.000				
Debt/Equity	−0.003	−0.002	−0.002	0.000	−0.002	1.000			
Interest coverage	0.111	0.012	−0.009	0.006	0.008	−0.002	1.000		
Ln (asset)	0.167	−0.019	0.199	−0.202	−0.082	0.016	−0.021	1.000	
ROIC	−0.040	0.002	0.011	−0.004	0.002	0.000	0.002	0.018	1.000

In Table 10, the correlation between the custom credit rating variable and the ESG variables are more significant compared to the previous results in Table 9. In particular, the correlation between credit rating rate and social variable is 0.17712.

Table 10. Correlation analysis for ESG—credit ratings sample.

	Rate	Environment	Social	Governance	Total ESG	Debt/Equity	Interest Coverage	Ln (Asset)	ROIC
Rate	1.000								
Environment	0.065	1.000							
Social	0.177	0.290	1.000						
Governance	−0.062	0.113	0.125	1.000					
Total ESG	0.064	0.830	0.530	0.587	1.000				
Debt/Equity	−0.013	−0.001	−0.004	0.003	0.000	1.000			
Interest coverage	0.012	0.011	0.013	−0.010	0.007	−0.001	1.000		
Ln (asset)	0.568	0.043	0.113	−0.159	−0.015	−0.003	0.004	1.000	
ROIC	0.037	0.003	0.011	−0.004	0.003	0.000	−0.003	0.013	1.000

Based on both correlation results, it is possible to conclude that the ESG variables are barely correlated with other financial measure categories: capital structure, liquidity, and investment. The size variable, natural log of total assets, is correlated with both profitability and credit rating proxy. The relationship between ESG and total assets is further discussed later in the paper.

4.1.3. Regression Analysis 1: ESG and Profitability

Table 11 shows the result of the regression analyses using profitability as a dependent variable. Overall, the regression models have somewhat consistent adjusted R-squared values (0.59–0.6 range with RMSE of approximately 0.111). The first regression model using the environment variable as an ESG factor shows that the variable is not significant. It is also possible to identify that some control variables have very low economic significance (i.e., coefficients close to zero). Some findings from the correlation analysis also appear in this analysis phase. The asset size variable, natural log of total assets, is both economically and statistically significant. Similarly, the regression model with the social variable shows that the variable is not significant. The capital structure variable and liquidity variable also have very limited economic significance. The third regression model shows somewhat similar results as Wang and Sarkis [14] concluded in their research. The governance variable in the third model has a coefficient estimate of 0.0291920181 with t-statistics of 2.17 (*p*-value less than 0.05).

Table 11. Regression analysis for ESG—profitability sample.

Coefficient (t-Value)	1 (Environment Score)	2 (Social Score)	3 (Governance Score)	4 (Total ESG Score)
Dependent Variable	Return on Assets			
Environmental	0.01925888 (1.04)			
Social		0.0113812236 (0.32)		
Governance			0.0289211886 (2.17)	
Total				0.0571147083 (2.09)
Debt/equity ratio	−0.000022 (−1.61)	−0.0000221620 (−1.61)	−0.0000220973 (−1.61)	−0.0000221420 (−1.6)
Liquidity (interest coverage)	0.000003 (6.18)	0.0000032846 (6.19)	0.0000032752 (6.17)	0.0000032766 (6.18)
Ln (total assets)	0.0133348972 (6.36)	0.0135842003 (6.52)	0.0138897899 (6.7)	0.0134972425 (6.48)
ROIC	−0.0077770740 (−17.08)	−0.0077769496 (−17.50)	−0.0077711489 (−17.06)	−0.0076574709 (−17.49)
Firm fixed effect	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes
Adjusted R-squared	0.591289	0.591265	0.591375	0.591366
RMSE	0.111059	0.111062	0.111047	0.111048

Lastly, the total ESG factor variable is also economically and statistically significant. It has a coefficient estimate of about 0.05781 with t-statistics of 2.11 (p-value less than 0.05).

Although two of the ESG variables are not statistically significant, the findings from the governance and total ESG factor regression are moderately aligned with the first two hypotheses. The results are generally consistent with the literature.

Notably, the impact of ESG on firm performance is mainly driven by the governance factor. This supplements the literature findings of the positive relationship between ESG or CSR and performance. As Gompers, Ishii, and Metrick [13] argued, effective corporate governance practice can create positive results in the context of corporate financial performance. Larcker, Richardson, and Tuna [22] conclude that corporate governance has a certain ability to explain operating performance and potential stock returns.

4.1.4. Regression Analysis 4: ESG and Credit Rating

Dunbar, Li, Shi [23] find CSR reduces risk, moderated by corporate governance. We find further support by studying different categories of ESG and firm credit rating. Table 12 shows the result of the regression analyses using credit rating as a dependent variable. Overall, the regression models have very strong adjusted R-squared values (0.90–0.91 range with RMSE of approximately 1.09). Interestingly, all the ESG factor variables are both economically and statistically significant. Among different ESG variables, it is possible that the social variable is the most significant in explaining credit ratings. The first regression model using the environment variable has an environment coefficient estimate of −0.6042 with t-statistics of −3.04. The social regression model has the highest coefficient of 2.6856 with t-statistics of 6.24. The governance variable, which is the most significant variable from the previous exercise, is also significant. It has the coefficient estimate of 0.7441 and t-statistics of 4.27. Lastly, the composite ESG score variable has a coefficient of 0.8308 with t-statistics of 2.56. With the exception of the ROIC variable, the accounting variables are not as significant as the previous exercise.

Table 12. Regression analysis for ESG—credit ratings sample.

Coefficient (t-Value)	1 (Environment Score)	2 (Social Score)	3 (Governance Score)	4 (Total ESG Score)
Dependent Variable	Credit ratings			
Environmental	−0.7921599181 (−3.78)			
Social		3.263782323 (7.20)		
Governance			0.7760999963 (4.23)	
Total				0.8103105806 (2.37)
Debt/equity ratio	0.0000456085 (0.31)	0.000036182 (0.25)	0.0000480792 (0.33)	0.0000466122 (0.32)
Liquidity (interest coverage)	0.0000538304 (1.13)	0.000064069 (1.34)	0.0000556374 (1.17)	0.0000578243 (1.21)
Ln (total assets)	0.1775023853 (5.39)	0.141817092 (4.35)	0.1578156731 (4.84)	0.1505208805 (4.59)
ROIC	0.0227100926 (4.27)	0.022706245 (4.28)	0.0226876339 (4.27)	0.0227131009 (4.27)
Firm fixed effect	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes
Adjusted R-squared	0.899776	0.900202	0.899816	0.899676
RMSE	1.15488	1.152421	1.154646	1.155453

The overall effect of ESG on credit ratings is positive, while the most important factor is the social category. The negative effect of the environment factor on rating may be explained by substitute effect; firms with high credit rating neglect or invest less in environmental issues, or vice versa. This finding is strongly aligned with the empirical evidence suggested by Attig [19] with the exception of environmental factor.

4.2. In-Depth Analysis

4.2.1. Regression Analysis: Total ESG Score and Size

Prior to moving on to different dependent variables, the sample dataset was divided into subsamples according to size and total ESG factor scores to further understand the ESG and corporate financial performance relationship in specific settings. The sample dataset was divided into five asset size groups and five total ESG score groups (i.e., quintile approach). Then, multivariate regression models were created using original control variables and the total ESG score as an ESG factor variable. Table 13 shows the regression results using 5 × 5 sample datasets. Although it is difficult to find the pattern, it is arguable that the ESG and corporate financial performance relationship is more evident in the largest asset size quintile. The economic significance for this quintile is stronger than the rest of the groups.

4.2.2. Regression Analysis 3: Governance Score and Size

To further understand the explanatory power and impact of the governance variable, the sample dataset was divided into asset size measure and governance score. Due to the governance score calculation method and distribution of the score, it was not possible to attain five quantiles for governance. Therefore, the dataset was divided into two groups: above average and below average. Then, multivariate regression models were created using original control variables and the governance score as an ESG factor variable. Table 14 shows the regression results using 2 × 5 sample datasets. At the p-value level of 0.05, three out of five below average governance groups have governance as a significant variable (at the 0.1 level, four are significant). Unlike the previous 5 × 5 regression analysis, the asset size measure has a limited contribution to the assessment of the governance variable. For instance, the largest asset size group has very insignificant governance coefficient estimates. Meanwhile, in other groups with below average governance scores, the governance coefficient estimates are both economically and statistically significant. In

the second governance group (with below average total score), there is a negative impact on corporate profitability.

Table 13. Split regression analysis for ESG—profitability sample (5 × 5 total ESG).

R^2		Total ESG Score				
		Highest (=0)	High (=1)	Medium (=2)	Low (=3)	Lowest (=4)
Size ln (total assets)	Highest (=0)	0.75114	0.902742	0.885207	0.781194	0.526247
	High (=1)	0.869233	0.787742	0.715492	0.691	0.603529
	Medium (=2)	0.887176	0.62698	0.768715	0.564351	0.67757
	Low (=3)	0.780158	0.886243	0.830328	0.786774	0.667924
	Lowest (=4)	0.791453	0.904458	0.796881	0.787387	0.889998
Beta		**Total ESG Score**				
		Highest (=0)	High (=1)	Medium (=2)	Low (=3)	Lowest (=4)
Size ln (total assets)	Highest (=0)	0.1350124	0.87045604	2.33045983	0.4812803	0.04245164
	High (=1)	0.01644166	−2.1898699	−0.951694	−0.2989014	0.29995364
	Medium (=2)	0.30530236	1.9425061	1.7649401	0.40971369	−1.8952604
	Low (=3)	−0.2295688	−1.5754304	0.76355465	−0.2852724	0.23001942
	Lowest (=4)	−0.7302102	6.09083165	−2.1612193	5.76890031	−1.7937121
t-stat (p-val)		**Total ESG Score**				
		Highest (=0)	High (=1)	Medium (=2)	Low (=3)	Lowest (=4)
Size ln (total assets)	Highest (=0)	2.93 (0.0035)	1.02 (0.3101)	2.22 (0.0277)	1.51 (0.1308)	0.57 (0.5709)
	High (=1)	0.27 (0.7869)	−1.59 (0.1129)	−0.98 (0.3270)	−0.62 (0.5384)	1.93 (0.0542)
	Medium (=2)	1.15 (0.2521)	0.81 (0.4158)	1.13 (0.2585)	0.44 (0.6587)	4.31 (<0.0001)
	Low (=3)	0.89 (0.3749)	−0.99 (0.3246)	0.48 (0.6315)	−0.19 (0.8515)	0.26 (0.7935)
	Lowest (=4)	−0.69 (0.4907)	1.61 (0.1077)	−0.43 (0.67)	1.63 (0.1046)	−1.41 (0.1614)

4.2.3. Regression Analysis 5: Total ESG Score and Size for Credit Ratings

To further understand the explanatory power and impact of the social variable in explaining credit ratings, the sample dataset was divided into asset size measure and total ESG score. Due to the social score calculation method and the distribution of the score, it was not possible to attain five quantiles for the social variable. Therefore, the dataset was divided into three groups. Table 15 shows the regression results using 3 × 3 sub sample datasets. At the *p*-value level of 0.05, seven of nine sub-sample groups have the social variable as a significant variable. The analyses using the large firm group sample demonstrate unanimous results. Therefore, it is possible to conclude that social variable is significant when explaining credit ratings, and the impact of the variable is stronger among firms with large assets values.

Table 16 shows the distribution of credit rating observations for each ESG score category. It is possible to identify that the top ESG score category has a higher number of investment-grade credit ratings.

Table 14. Split regression analysis for ESG—profitability sample (5 × 2 governance score).

R²		Governance Score	
		Above Average (=0)	Below Average (=1)
Size ln (total assets)	Highest (=0)	0.708257	0.555197
	High (=1)	0.654775	0.532992
	Medium (=2)	0.509547	0.658058
	Low (=3)	0.683311	0.683472
	Lowest (=4)	0.725478	0.845653
Beta		Governance Score	
		Above Average (=0)	Below Average (=1)
Size ln (total assets)	Highest (=0)	0.00304542	−0.003993766
	High (=1)	0.020960975	0.212051808
	Medium (=2)	−0.012695351	−0.587320937
	Low (=3)	0.000021876	0.47985045
	Lowest (=4)	0.045251001	−1.054522675
t-stat (p-val)		Governance Score	
		Above Average (=0)	Below Average (=1)
Size ln (total assets)	Highest (=0)	0.16 (0.8753)	−0.11 (0.9095)
	High (=1)	0.67 (0.5013)	2.69 (0.0073)
	Medium (=2)	−0.20 (0.8401)	−3.81 (0.0002)
	Low (=3)	0.00 (0.9997)	1.61 (0.1071)
	Lowest (=4)	0.43 (0.6671)	−2.01 (0.0450)

Table 15. Split regression analysis for ESG—credit ratings sample (3 × 3 total ESG).

R²		Total ESG Score		
		High (=0)	Medium (=1)	Low (=2)
Size ln (total assets)	Highest (=0)	0.93564	0.926	0.90289
	Medium (=1)	0.914811	0.918606	0.914881
	Low (=2)	0.937792	0.942719	0.940127
Beta		Total ESG Score		
		High (=0)	Medium (=1)	Low (=2)
Size ln (total assets)	Highest (=0)	3.64371941	6.573761057	3.026479385
	Medium (=1)	2.807320519	6.441510156	4.055975972
	Low (=2)	10.46045362	6.205045382	1.952090913
t-stat (p-val)		Total ESG Score		
		High (=0)	Medium (=1)	Low (=2)
Size ln (total assets)	Highest (=0)	3.61 (0.0003)	3.26 (0.0012)	2.38 (0.0176)
	Medium (=1)	1.49 (0.1364)	2.71 (0.0069)	2.02 (0.0441)
	Low (=2)	4.17 (<0.0001)	2.75 (0.0061)	0.82 (0.4129)

Table 16. Credit ratings distribution by three total ESG scores.

High Total ESG			Medium Total ESG			Low Total ESG		
Rating	**n**	**%**	**Rating**	**n**	**%**	**Rating**	**n**	**%**
AAA	42	1.10%	AAA	19	0.58%	AAA	45	1.38%
AA+	12	0.32%	AA+	14	0.43%	AA+	7	0.21%
AA	52	1.37%	AA	41	1.25%	AA	60	1.83%
AA-	95	2.49%	AA-	35	1.07%	AA-	34	1.04%
A+	210	5.51%	A+	122	3.73%	A+	121	3.70%
A	344	9.03%	A	231	7.06%	A	279	8.53%
A-	269	7.06%	A-	214	6.54%	A-	227	6.94%
BBB+	409	10.74%	BBB+	249	7.61%	BBB+	354	10.82%
BBB	556	14.60%	BBB	483	14.77%	BBB	560	17.12%
BBB-	426	11.18%	BBB-	365	11.16%	BBB-	370	11.31%
BB+	230	6.04%	BB+	201	6.14%	BB+	242	7.40%
BB	278	7.30%	BB	282	8.62%	BB	350	10.70%
BB-	368	9.66%	BB-	385	11.77%	BB-	364	11.13%
B+	268	7.04%	B+	309	9.45%	B+	248	7.58%
B	138	3.62%	B	212	6.48%	B	156	4.77%
B-	90	2.36%	B-	76	2.32%	B-	90	2.75%
CCC+	16	0.42%	CCC+	19	0.58%	CCC+	23	0.70%
CCC	3	0.08%	CCC	4	0.12%	CCC	6	0.18%
CCC-	0	0.00%	CCC-	3	0.09%	CCC-	0	0.00%
CC	1	0.03%	CC	2	0.06%	CC	1	0.03%
D	0	0.00%	D	5	0.15%	D	2	0.06%
SD	2	0.05%	SD	0	0.00%	SD	0	0.00%
Total	3809		Total	3271		Total	3539	
Investment grade	2415	63.40%	Investment grade	1773	54.20%	Investment grade	2057	58.12%
High-yield/junk grade	1394	36.60%	High-yield/junk grade	1498	45.80%	High-yield/junk grade	1482	41.88%

Note: Total number of observations (1991–2013) = 10,619; mean ESG score = 0.5025286.

5. Conclusions

Although it is difficult to generalize the positive impact of ESG factors on corporate finance performance, certain component and aggregate ESG variables positively impact the chosen performance indicators. First and foremost, the total ESG score has a positive impact on corporate profitability. Furthermore, the split regression analyses using the 25 sub-sample dataset shows the positive impact of ESG factors on corporate profitability for firms with large total assets values. Among different ESG components, corporate governance has the most significant impact on corporate profitability. The positive relationship between governance and corporate profitability was only observed in firms with weak governance. In terms of the relationship between ESG and credit risk, all four ESG factors have a significant impact on credit rating. While social, governance and total ESG score have a positive impact on credit rating, environmental score has a surprisingly negative effect on the credit rating, and social factor has the most significant impact on credit rating.

Overall, the findings of this report prove that ESG factors matter in terms of corporate financial performance and risk. However, the effects vary across different dimensions such as ESG categories, strength and weakness, and firm size. These findings can potentially help investors understand the underpinning rationale for recent trends in ESG-linked or ESG-integrated investment strategies. There are also opportunities for further research. The most important area of improvement is the availability of data and data sources.

Secondly, there are other market-based dependent variables including stock returns and equity risk. Using equity risk dependent variables will require equity risk models to assign numerical values for each observation or firm. Lastly, applying interaction terms could provide a better understanding of the channels between ESG factors and corporate financial performance variables.

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