

Be good to be wise: Environmental, Social, and Governance awareness as a potential credit risk mitigation factor

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Outline

- ① Introduction
Motivation
- ② Methodology
Data
Analysis
- ③ Results
- ④ Conclusion

Introduction

Abstract

Integrating ESG factors into credit risk assessment is the new frontier for credit risk management as regulators and investors increasingly require banks to channel loans to “sustainable” borrowers and ultimately foster sustainable growth. Our findings show that higher ESG awareness is strongly associated with better creditworthiness (proxied by the Altman Z-score). We apply a two-step methodology to 3331 companies from various industries and geographies in the 2000–2016 period which reveals that high ESG awareness scores are strongly and very significantly associated with a reduction in firm credit risk. We check the robustness by using the Probability of Default as a dependent variable and an instrumental variable constructed with a factor analysis. Our results support the appropriateness of the introduction of ESG awareness parameters in the creditworthiness assessment of borrowers

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Motivation

Role ESG Plays in Credit Risk Management Today

It is playing a growing role

57%

59%

56%

55%

It has become integral to much that we do and plays a major role in our decision-making

26%

22%

33%

27%

It plays a minor role

13%

14%

11%

16%

We are not considering ESG at this time

4%

5%

0%

2%

Figure: The S&P Global Market Intelligence ESG Survey

Research Questions

- Is there a link between ESG factors and credit risk of a company?
- Are there any sub-relationships that may be identified between the three dimensions of ESG and credit risk?
- Are there any differences breaking down the sample by industry and Country?

Strategy of investigation

The strategy of investigation follows a two-steps methodology:

- 1 We create several scoring models in order to evaluate the ESG awareness of the companies included in the sample (Brogi & Lagasio, 2019)
- 2 We use the obtained scores as independent variables of a set of regression models with the purpose of identifying the relationship with credit risk

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ESG Data



Figure: MSCI ESG KLD STATS

ESG Data

MSCI ESG KLD STATS

- Sample: 3,331 large listed companies
 - 79 Countries in the World
 - 19 industrial sectors
- Period: 2000-2016.

Variable	Source	Description	Count	Mean	SD	Min	Max
Z-score	Osiris BvD	Proxy of credit risk	17,270	2.39	2.13	-35.26	41.88
E-score	MSCI KLD Stats	Environmental score	31,056	0.08	0.18	0	1
S-score	MSCI KLD Stats	Social score	31,058	0.07	0.14	0	1
G-score	MSCI KLD Stats	Governance score	29,325	0.10	0.20	0	1
ESG-score	MSCI KLD Stats	ESG-score	31,069	0.09	0.14	0	1

Figure: Descriptive statistics

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Model

Credit Risk

- $ZScore = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1.0X_5$

where $X_1 = \frac{WorkingC}{TA}$; $X_2 = \frac{RetEarnings}{TA}$; $X_3 = \frac{EBIT}{TA}$; $X_4 = \frac{MktValueEquity}{TL}$; $X_5 = \frac{Sales}{TA}$

- $P(Default) = N\left(-\frac{\ln\left(\frac{V_{A,t}}{X_t}\right) + \mu - \frac{\sigma_A^2}{2}}{\sigma_A \sqrt{T}}\right)$ from Vassalou, Xing (2004)

ESG Scoring

- $EScore = \frac{1}{n} \sum_{i=1}^n E_i$

- $SScore = \frac{1}{n} \sum_{i=1}^n S_i$

- $GScore = \frac{1}{n} \sum_{i=1}^n G_i$

- $ESGScore = \frac{1}{3}(EScore + SScore + GScore)$

Model

Panel regressions

- OLS: $ZSCORE_{i,t} = \alpha + \beta_i X_{i,t} + \varepsilon_{i,t}$
- Fixed Effects: $ZSCORE_{i,t} = \alpha + \beta_i X_{i,t} + FE + \varepsilon_{i,t}$
- Random Effects: $ZSCORE_{i,t} = \alpha + \beta_i X_{i,t} + RE_{i,t} + \varepsilon_{i,t}$

where α is the intercept; X is the dependent variable calculated for each bank (i) and year (t); β is the coefficient; ε is the error term. In order to ensure that our analysis is not biased by heteroscedasticity, we include the robust option; thus, our estimation is not affected by this issue

OLS specifications using ZScore

VARIABLES	OLS - Model 1	OLS - Model 2	OLS - Model 3	OLS - Model 4
ESCORE	-0.669*** (0.110)		-0.543*** (0.108)	
SSCORE	-0.435*** (0.145)		-0.296** (0.144)	
GSCORE	-0.224** (0.0940)		-0.159* (0.0897)	
ESGSCORE		-1.319*** (0.112)		-0.992*** (0.114)
Constant	2.503*** (0.0196)	2.513*** (0.0192)	1.490*** (0.202)	1.526*** (0.199)
Observations	16,357	17,257	16,316	17,216
R-squared	0.008	0.008	0.109	0.109
Controls	NO	NO	NO	NO
Year FE	NO	NO	YES	YES
Industry FE	NO	NO	YES	YES
Country FE	NO	NO	YES	YES

FE and RE specifications using ZScore

VARIABLES	Fixed Effects - Model 1	Fixed Effects - Model 2	Random Effects - Model 3	Random Effects - Model 4
ESCORE	-0.0669 (0.0644)		-0.0715 (0.0639)	
SSCORE	-0.209** (0.0819)		-0.211*** (0.0813)	
GSCORE	-0.0417 (0.0548)		-0.0592 (0.0544)	
ESGSCORE		-0.285*** (0.0766)		-0.311*** (0.0757)
Constant	2.415*** (0.0106)	2.418*** (0.0103)	2.244*** (0.0607)	2.245*** (0.0603)
Observations	16,357	17,257	16,357	17,257
R-squared	0.001	0.001		
N	2,040	2,061	2,040	2,061
Controls	NO	NO	NO	NO
Year FE	YES	YES	NO	NO
Industry FE	YES	YES	NO	NO
Country FE	YES	YES	NO	NO

All the models using P(Default)

VARIABLES	OLS - Model 1	OLS - Model 2	Fixed Effects - Model 3	Fixed Effects - Model 4	Random Effects - Model 5	Random Effects - Model 6
ESCORE	0.0224 (0.0225)		-0.0124 (0.0392)		0.0224 (0.0225)	
SSCORE	-0.167*** (0.0209)		-0.318*** (0.0336)		-0.167*** (0.0209)	
GSCORE	-0.0182 (0.0154)		-0.131*** (0.0274)		-0.0182 (0.0154)	
ESGSCORE		- 0.159*** (0.0210)		-0.479*** (0.0402)		-0.159*** (0.0210)
Constant	0.272*** (0.00282)	0.271*** (0.00280)	0.293*** (0.00386)	0.292*** (0.00386)	0.272*** (0.00282)	0.271*** (0.00280)
Observations	1,911	1,926	1,911	1,926	1,911	1,926
R-squared	0.046	0.029	0.162	0.134		
Controls	NO	NO	NO	NO	NO	NO
Year FE	NO	NO	YES	YES	NO	NO
Industry FE	NO	NO	YES	YES	NO	NO
Country FE	NO	NO	YES	YES	NO	NO
N			1,004	1,009	1,004	1,009

Breakdown by Country

VARIABLES	US OLS - Model 1	US OLS - Model 2	US FE - Model 3	US FE - Model 4	EU OLS - Model 1	EU OLS - Model 2	EU FE - Model 3	EU FE - Model 4	Asia OLS - Model 1	Asia OLS - Model 2	Asia FE - Model 3	Asia FE - Model 4
ESCORE	-0.710*** (0.130)		-0.0942 (0.0668)		-0.0162 (0.217)		-0.304* (0.167)		-0.745 (0.535)		-0.983** (0.496)	
SSCORE	-0.412** (0.175)		-0.315*** (0.0864)		-0.0589 (0.284)		0.0253 (0.212)		0.345 (0.648)		-0.0670 (0.545)	
GSCORE	-0.157 (0.110)		-0.0377 (0.0586)		-0.474*** (0.173)		-0.186 (0.136)		0.382 (0.383)		0.254 (0.365)	
ESGSCORE		-1.265*** (0.135)		-0.391*** (0.0814)		-0.680*** (0.233)		0.0372 (0.194)		-0.0409 (0.562)		-0.551 (0.538)
Constant	2.776*** (0.359)	2.819*** (0.356)	2.556*** (0.0109)	2.557*** (0.0107)	2.020*** (0.482)	1.984*** (0.470)	1.889*** (0.0309)	1.910*** (0.0299)	-0.105 (1.363)	-0.0282 (1.329)	2.481*** (0.0701)	2.463*** (0.0646)
Observations	11,694	12,260	11,694	12,260	2,912	3,120	2,925	3,133	1,225	1,310	1,235	1,320
R-squared	0.117	0.116	0.003	0.002	0.074	0.073	0.002	0.000	0.153	0.159	0.005	0.001
N			1,123	1,125			477	487			315	323
Controls	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Industry FE	YES	YES	NO	NO	YES	YES	NO	NO	YES	YES	NO	NO
Country FE	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Breakdown by industry

VARIABLES	Manufacturing		Oil and Gas		Services		Construction	
ESCORE	-0.903*** (0.151)		-1.381*** (0.495)		0.920 (0.793)		0.132 (0.419)	
SSCORE	-0.0767 (0.214)		-1.410*** (0.473)		0.0298 (0.901)		-1.416** (0.614)	
GSCORE	-0.246* (0.134)		0.886** (0.364)		0.141 (0.578)		-0.673** (0.329)	
ESGSCORE		-1.366*** (0.161)		-1.732*** (0.533)		1.168 (0.740)		-1.324** (0.523)
Constant	1.325*** (0.291)	1.386*** (0.289)	2.090*** (0.461)	2.153*** (0.492)	1.443* (0.868)	1.700** (0.846)	1.310 (0.836)	1.219 (0.844)

VARIABLES	Real Estate		Transportation		Utilities		Wholesale	
ESCORE	-1.163 (0.781)		-0.568 (0.529)		-0.0358 (0.278)		-0.0550 (0.608)	
SSCORE	-0.471 (0.948)		-0.449 (0.729)		0.156 (0.344)		-0.273 (0.695)	
GSCORE	0.251 (0.634)		-0.223 (0.499)		-0.337 (0.236)		0.272 (0.370)	
ESGSCORE		-1.123 (0.807)		-1.396** (0.620)		-0.256 (0.284)		0.102 (0.682)
Constant	2.701*** (0.618)	2.632*** (0.556)	2.009** (0.951)	2.023** (0.935)	0.740 (0.861)	0.750 (0.849)	2.427** (1.189)	2.414** (1.184)
Observations	8,256	8,699	747	769	799	839	503	518
R-squared	0.051	0.049	0.155	0.117	0.043	0.041	0.264	0.261
Controls	NO	NO	NO	NO	NO	NO	NO	NO
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Country FE	YES	YES	YES	YES	YES	YES	YES	YES

Instrumental variable

Strategy

We run a factor analysis over the variables reported below, using the PCA for data reduction. This computation leads us to identify **one** factor that represents our instrumental variable

- **GDP Growth rate.** Growth rate of the Gross Domestic Product - *proxy of the **Environmental** and Social factor*
- **GINI Index.** Measures the extent to which the distribution of income among individuals deviates from a perfectly equal distribution - *proxy of the **Social** factor*
- **School.** Gross enrollment ratio regardless of age, to the population of the age group that officially corresponds to the level of education - *proxy of the **Social** factor*
- **Rule of Law.** captures perceptions of the extent to which agents have confidence in the rules of society (e.g. quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence) - *proxy of the **Governance** factor*

Instrumental variable

VARIABLES	IV - Model OLS	IV - Model OLS
GDP	0.00432*** (0.000463)	
GINI	0.00185*** (0.000231)	
RULELAW	0.01210*** (0.00185)	
SCHOOL	0.25600*** (0.0624)	
Factor		0.00500*** (0.000896)
Constant	0.16500*** (0.00892)	0.08380*** (0.000896)

VARIABLES	IV - Model OLS	IV - Model OLS	IV - Panel FE	IV - Panel RE
Factor	-0.0387* (0.0201)	0.0141 (0.0350)	-0.0313** (0.0145)	-0.0329** (0.0141)
Constant	2.405*** (0.0171)	1.609*** (0.361)	2.404*** (0.00771)	2.178*** (0.0659)
Observations	15,328	15,308	15,328	15,328
R-squared	0.000	0.113		
Controls	NO	NO	NO	NO
Year FE	NO	YES	YES	YES
Industry FE	NO	YES	YES	YES
Country FE	NO	YES	YES	YES
N			1,771	1,771

Discussion and findings

Research answers

- We find a link between ESG factors and credit risk as proxied by both the Altman ZScore and the Probability of Default
- The use of the instrumental variable supports the reliability of our model
- We also further confirm our results by looking at the different sub-scores
- Some differences emerge when looking at Country and industry breakdown

Our research provides new evidence to support the effectiveness of the integration of ESG factors in the creditworthiness analysis of borrowers and the inclusion of ESG awareness as a potential credit risk mitigation factor

Shortcomings, current and further research

Shortcomings

- Endogeneity and causality - ***addressed!***
- Sample selection
- Methodology - *non-parametric models? zero-one inflated regressions?*
- Different ESG rating providers

Current and further research

- Deeper investigation on different geographical areas and industries
- Role of disclosure and reporting framework

Thank you for your attention!

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