

## **ESG Performance and Credit Risk in Latin America**

### **Desempenho ASG e risco de crédito na América Latina**

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#### **Abstract**

Previous studies suggest that the environmental, social and governance (ESG) performance of companies helps to build a stronger image and reputation, thus providing better financial performance. However, most of these studies were conducted only for developed economies, so the impact of ESG performance on corporate financial performance for undeveloped economies is still underexplored. This research seeks to fill this gap by analysing the relationship between ESG performance and credit risk in Latin American publicly traded companies. The results, obtained through an ordered logistic regression, considering the rating of the companies and the performance of the ESG dimensions, obtained by the Refinitiv base, provide evidence that ESG performance and credit risk are positively related, considering a significance level of 1%. This result suggests that an improvement in ESG performance is not able to reduce the credit risk in Latin American companies, a result that diverges from those presented for developed economies. The results are robust, even when considering capital structure, profitability, leverage, size, and asset turnover.

**Keywords:** credit risk, rating, ESG, ESG performance, Latin America.

#### **Resumo**

Estudos anteriores sugerem que o desempenho ambiental, social e de governança (ASG) das empresas ajuda a construir uma imagem e reputação mais fortes, proporcionando assim um melhor desempenho financeiro. No entanto, a maioria desses estudos foi realizada apenas para economias desenvolvidas, portanto, o impacto do desempenho ASG no desempenho financeiro corporativo para economias subdesenvolvidas ainda é pouco explorado. Esta pesquisa busca preencher essa lacuna analisando a relação entre o desempenho ASG e o risco de crédito em empresas latino-americanas de capital aberto. Os resultados, obtidos por meio de uma regressão logística ordenada, considerando o *rating* das empresas e os desempenhos das dimensões ASG, obtidos pela base de dados Refinitiv, fornecem evidências de que o desempenho ASG e o risco de crédito estão positivamente relacionados, considerando um nível de significância de 1%. Esse resultado sugere que uma melhora no desempenho ASG não é capaz de reduzir o risco de crédito em empresas latino-americanas, resultado que diverge dos apresentados para economias desenvolvidas em estudos anteriores. Os resultados são robustos, mesmo considerando estrutura de capital, rentabilidade, alavancagem, tamanho da empresa e giro dos ativos.

**Palavras-chave:** risco de crédito, *rating*, ASG, desempenho ASG, América Latina.

## 1. INTRODUCTION

Previous studies show that different stakeholders (shareholders, government regulators, consumers, employees, and the community) are increasingly interested in the environmental, social and governance (ESG) performance of companies (Dixon-Fowler et al. 2013; Dobler et al. al. 2014; Endrikat et al. 2014). Part of this interest is driven by the positive relationship between ESG performance and financial performance. Researchers also argue that ESG performance contributes to competitive advantage (Chan, 2005), to increase the efficiency of the use of natural resources (Klassen & Whybark, 1999), to lower systematic market risk (Bansal & Clelland, 2004), to stakeholder management (Buysse & Verbeke, 2003) and to the improvement in innovation capacity (Nidumolu, Prahalad & Rangaswami, 2009).

Among the benefits of adopting ESG practices, the positive impact on financial performance stands out, as demonstrated by Orlitzky and Benjamin (2001) the higher ESG performance the lower its financial risk. The authors affirm that “a firm that is socially responsible and responsive may be able to increase interpersonal trust between and among internal and external stakeholders, build social capital, lower transaction costs, and therefore, ultimately reduce uncertainty about its financial performance” (Orlitzky & Benjamin, 2001, p.23).

While these results are consistent with other studies such as Attig et al. (2013), Oikonomou et al. (2014) and Seltzer et al. (2021), which show that ESG performance is negatively related to credit risk, and so ESG may reduce credit risk and thereby induce a lower cost of capital as well (Aslan, Poppe & Posch, 2021), other studies show that ESG performance is positively related to credit rating (such as Jiraporn et al., 2014), or even that there is no relationship between ESG performance and credit risk (Stellner et al., 2015).

So, in the academic literature, numerous studies have sought arguments in favour of the adoption of ESG practices by companies. However, there is still a controversy regarding whether the adoption of ESG practices can reduce or not the firm's financial risk. The different ways of measuring variables, the models used, and the study design could be an explanation for these outcomes (Madorran & Garcia, 2016). Another important issue about these controversies is that all these studies' samples were companies in developed economies with mature financial markets. This fact hinders the extension of the results to undeveloped countries, such as those in Latin America. Undeveloped countries face much greater social and environmental challenges, suggesting that ESG practices adopted by companies could lead to a more substantial change (Cunha, Meira & Orsato, 2021).

Therefore, this study seeks to contribute to this debate by analysing the relationship between ESG performance and credit risk in Latin American publicly traded companies, using a robust ordered logistic regression. We choose the rating presented by Fitch and Moody's companies as the dependent variable, and the performance of the ESG dimensions presented by the Refinitiv database as the independent variable. Following previous literature, for control variables, we used capital structure, profitability, asset turnover, leverage, and company size. The results show that ESG performance and credit risk are positively related, considering a significance level of 1%. This result suggests that an improvement in ESG performance is not able to reduce the credit risk in Latin American companies, a result that diverges from those presented for developed economies (Hsu & Chen, 2015; Lin et al., 2017; Albuquerque et al., 2018).

The relationship between ESG performance and credit risk is important for managers and investors, as managers seek to reduce the uncertainty to which their companies are subject, providing safer investments to risk-averse investors. Therefore, it is useful to know if the improvement in ESG performance is capable of increasing or decreasing the company's default risk (Oikonomou et al., 2012). As a contribution, this study brings evidence that an increase in

ESG performance cannot reduce the rating of companies based in undeveloped economies. Even with the problems that environmental, social, and governance aspects can bring to the business, the rating does not seem to reflect the risks associated with such aspects. None of the ESG dimensions (environmental, social, and governance) has been shown to reduce credit risk, which demonstrates the urgent need for companies to review risk analysis metrics for non-mature financial markets. This fact that has already been addressed by Standard & Poor's and Fitch on incorporating ESG risks in the credit risk evaluation since 2021 (S&P, 2021).

This article is organized as follows: in section 2 the theoretical framework and previous studies on the subject are discussed, in section 3 the methodology is described, encompassing data collection and sample composition, dependent, independent and control variables, and the proposed model to test the hypothesis. Section 4 presents and discusses the results, with descriptive statistics and regression results. Finally, in section 5 we present some final considerations of this study.

## **2. THEORETICAL FRAMEWORK**

Environmental, social, and governance practices evoke terms such as corporate social performance (Carroll, 1979; Wartick & Cochran, 1985; Wood, 1991; Wang & Berens, 2015; Grewatsch & Kleindienst, 2017; and Arminen et al., 2018), responsiveness corporate social (Ackerman 1973; Ackerman & Bauer, 1976; Sethi, 1975; Waddock & Graves, 1997; Margolis & Walsh, 2001; Ciliberti et al., 2008), and corporate citizenship (Wood & Logsdon, 2001; Sison, 2009). But it should not be confused with such concepts. From the 1980s onwards, the emergence of concepts such as Sustainable Development (Bansal, 2002) and Eco-development encouraged discussions on socio-environmental performance and business activity. Studies searching for a relationship between ESG performance and financial performance have grown. But the research about the company's engagement in environmentally and socially responsible behaviour still has several gaps to be explored.

A company cannot be said to be socially responsible if it only meets the minimum requirements determined by law (Davis, 1973). There are social obligations that lead the company to go beyond legal requirements. Megginson, Mosley and Peitri Jr (1998) state that when companies assume social responsibility, they develop several programs aimed at employees, customers, the environment, and the community. In other words, the ESG practices that companies adopt are not only for their shareholders but for the various actors that are related to the company, as stated in the Stakeholder Theory. The presentation and further development of the Stakeholder Theory (Freeman, 1984; Jones, 1995; Freeman & McVea, 2001) provided the theoretical foundation that ESG practices can assist the company in building solid relationships with its related parties – among them, employees, consumers, local communities and, government agents – and thus ensure the maintenance of long-term financial performance.

The Stakeholder Theory is associated with better financial performance (Jones, 1995), as responsible treatment of related parties can reduce, for example, outcomes such as lawsuits, adverse regulation, consumer boycotts, strikes and negative publicity (Cornell & Shapiro, 1987; Spicer, 1978; Steadman, Zimmerer & Green, 1995). By avoiding negative outcomes, the company reduces expenses and the financial risk associated with the uncertainty of the return (Freeman & McVea, 2001).

When analysing only the short term, the commitment to social and environmental problems can result in lower profit, however, in the long term, engagement with ESG practices can become a favourable condition to maintain and improve profitability, ensuring the survival of the company (Alberton, 2003). Klassen and McLaughlin (1996) state that, within the context of maximizing returns in the long term, process optimization, cost reduction and improvement of the institutional image are arguments favourable to the adoption of ESG practices by

organizations. Such practices can translate into more loyal consumers, increased sales, more motivated employees, more committed suppliers, better access to the capital market, and new business and innovation opportunities (Reis, 2002).

Salama, Anderson, and Toms (2011) examine the relationship between ESG performance and company risk in the UK context, using environmental and community liability ratings for all UK companies rated between 1994 and 2006. The authors suggest that a company's ESG performance is negatively related to its systematic financial risk. Furthermore, the research by Oikonomou et al. (2012) provides important evidence that social irresponsibility can contribute to increased financial risk for companies. The authors show that there is a positive and significant association between the systematic risk of companies and their disregard for ESG practices.

Attig et al. (2013) provide evidence of the relationship between ESG practices and credit ratings of companies, through the analysis of US companies between 1991 and 2010. The authors state that risk rating agencies tend to grant relatively high ratings to companies with good social performance. Also, according to the authors, the results suggest that ESG performance provides important non-financial information to credit rating agencies, which can be used in their assessments to determine ratings. Finally, the study shows that implementing ESG policies, especially those capable of reflecting what is desired by society, can lead to lower financing costs, as they reduce the financial risk of companies (Attig et al., 2013).

In addition, to reduce financial risk, Aslan, Poppe and Posch (2021) find that ESG performance, and its corresponding pillar performance, negatively affect the probability of credit default, by investigating a sample of 902 firms in the US. They affirm that ESG may induce lower credit ratings and thereby lower cost of capital.

Thus, after several studies have presented similar results, it can be argued that there is a negative association between ESG and a firm's risk, as supported by the Stakeholder Theory. However, the studies were mostly carried out in developed economies, with mature financial markets. The impact of ESG performance on credit risk for undeveloped economies remains unknown since studies in these economies are scarce. Therefore, this study aims to analyse the relationship between ESG performance and credit risk in Latin American publicly traded companies to contribute to the literature in non-developed countries.

Thus, based on the Stakeholder Theory and the previous literature presented we propose the following research hypothesis:

**H<sub>0</sub>:** for Latin American companies, the higher firms' ESG performance the lower their credit risk.

### **3. METHODOLOGY**

#### *3.1 Sample and data*

We collected the data from the Refinitiv database. The sample is composed of publicly traded companies from seven Latin American countries: Argentina, Brazil, Chile, Colombia, Cayman Islands, Mexico, and Peru. We consider a period of 10 years, from 2011 to 2020.

The universe of Latin American publicly traded companies in the Refinitiv database corresponds to 1,652 companies. Many companies still do not disclose ESG information, so by excluding all companies that did not have information during the period analysed, we obtained a final sample of 342 companies.

### 3.2 Variables

Credit risk can be understood as the risk of economic loss due to non-compliance with the contractual obligation by the contracting party (Lima, 2015). In the literature, there are some proxies for credit risk, but despite other variables Rego et al. (2009) suggests that the rating becomes a preferred measure.

A company’s rating, given by agencies such as Moody’s and Fitch, can be defined as a prospective assessment scale of the issuer's ability to fully honour its financial commitments within the term established in the contract. It is an indicator of default risk, serving investors and equity or debt issuers in decision making of investment (Caporale, Matousek, & Stewart, 2012). Moody’s and Fitch credit ratings are variations of the scale A, B, C or D, where AAA is the best rating and D the worst. So, if a company’s rating is AAA that means very low probability of default. In general, rating agencies consider several factors to calculate the ratings, such as the company's revenue and fixed assets, business profile, cash flow and financial policy. The calculation methodology and the factors considered can be changed according to the sector in which the companies operate (Lima, 2015).

As the rating is measured differently by Moody’s and Fitch, it was necessary to establish rating degrees to standardize the data. The chosen equivalence of ratings, presented by Lima et al. (2018), is a scale from 0 to 7, where 0 represents the best rating (AAA or Aaa) and 7 the worst, as shown in Chart 1.

Moody's	Fitch	Credit risk level	Existence of investment grade
Aaa	AAA	0	Yes
Aa1, Aa2, Aa3	AA+, AA, AA-	1	
A1, A2, A3	A+, A, A-	2	
Baa1, Baa2, Baa3	BBB+, BBB, BBB-	3	
Ba1, Ba2, Ba3	BB+, BB, BB-	4	No
B1, B2, B3	B+, B, B-	5	
Caa1, Caa2, Caa3	CCC+, CCC, CCC-	6	
Ca, C	CC, C, D	7	

**Chart 1** - The equivalence of ratings

Source: adapted from Lima et al. (2018).

To measure ESG performance many studies have used indices calculated by organizations specialized in corporate policies. Some studies use information contained in annual reports and other documents, and many studies use the stock exchange sustainability index to measure ESG performance. In this study, we choose to use the performance indices of the ESG dimensions of the Refinitiv base, which measures the company’s ESG performance based on verifiable reported data, adding 630 company-level ESG measures, of three pillars: environmental, social and governance (Refinitiv, 2022). In addition, we used the Environmental pillar score, Social pillar score and Governance pillar score, to investigate the impact of each ESG dimension on credit risk.

The Environmental pillar score aggregates measures from three categories, resource use, emissions, and innovation. While the Social pillar score aggregates from categories, workforce, human rights, community, and product responsibility. And the Governance pillar from other three categories, management, shareholders, and CSR (Corporate Social Responsibility) strategy. The pillar weights are normalised to percentages ranging between 0 and 100 (for

further information, refer to Refinitiv, 2022). Chart 2 provides a detailed view on the ESG themes covered by Refinitiv in each category.

These metrics are often used in the literature as an indicator of a firm’s performance on environmental, social and governance dimensions (Ioannou & Serafeim, 2012; Cheng et al., 2014; Hartmann & Uhlenbruck, 2015; Rees & Rodionova, 2015; Del Bosco & Misani, 2016; Zhou & Cui, 2019; Yu, Luu & Chen, 2020; Flammer, 2021).

Pillar	Categories	Category weights	Themes
Environmental	Emission	0.15	Emissions Waste Biodiversity Environmental management systems
	Innovation	0.15	Product innovation Green revenues, research and development (R&D) and capital expenditures
	Resource use	0.13	Water Energy Sustainable packaging Environmental supply chain
Social	Community	0.09	Equally important to all industry groups, hence a median weight of five is assigned to all
	Human rights	0.05	Human rights
	Product responsibility	0.04	Responsible marketing Product quality Data privacy
	Workforce	0.13	Diversity and inclusion Career development and training Working conditions Health and safety
Governance	CSR strategy	0.03	CSR strategy ESG reporting and transparency
	Management	0.17	Structure (independence, diversity, committees) Compensation
	Shareholders	0.05	Shareholder rights Takeover defences

**Chart 2 - ESG scores by Refinitiv database**  
Source: adapted from Refinitiv (2022)

Finally, control variables that incorporate into the model other effects that can influence the credit risk of companies were necessary. These variables were chosen according to previous studies, as shown in Chart 3.

Variable		Description	Relationship expected	Source
Capital structure	CS = total debt/ total equity	Represents how much third-party capital represents from the company's equity.	+	Altman (2005); Benlemlih and Girerd-Potin (2017); Hsu and Chen (2015).
Profitability	Profit = EBITDA/total assets	Represents the profitability of the company's current and non-current assets.	-	Hsu and Chen (2015)
Asset turnover	AT = net income before taxes /total assets	Represents the efficiency with which the company uses its current and non-current assets to generate revenue.	-	Altman (2005); Hsu and Chen (2015).
Leverage	Lev = retained earnings (loss)/ total asset	Represents how much of the total assets is financed by retained earnings.	+	Altman (2005); Hsu and Chen (2015).
Size	Size = ln market value	Represents the size of the company, considering its market value.	-	Utz (2018); Benlemlih and Girerd-Potin (2017); Hsu and Chen (2015)

**Chart 3** – Control variables

### 3.3 Models

To test hypothesis H<sub>0</sub> – for Latin American companies, the higher firm’s ESG performance the lower its credit risk – the following models were used:

$$Rat_{i,t} = \beta_1 ESG_{i,t} + \beta_2 CS_{i,t} + \beta_3 Profit_{i,t} + \beta_4 AT_{i,t} + \beta_5 Lev_{i,t} + \beta_6 Size_{i,t}$$

$$Rat_{i,t} = \beta_1 ENV_{i,t} + \beta_2 SOC_{i,t} + \beta_3 GOV_{i,t} + \beta_4 CS_{i,t} + \beta_5 Profit_{i,t} + \beta_6 AT_{i,t} + \beta_7 Lev_{i,t} + \beta_8 Size_{i,t}$$

In model 1, coefficient  $\beta_1$  expresses the relationship between credit risk and the proxy for ESG performance,  $\beta_2$  expresses the relationship between the variable capital structure and rating,  $\beta_3$  the coefficient for the relationship between credit risk and profitability,  $\beta_4$  the ratio between risk and asset turnover,  $\beta_5$  the ratio between leverage and rating and  $\beta_6$  the ratio for the size and credit risk ratio. Where  $i$  are companies from 1 to 342, and  $t$  are the years from 2011 to 2020.

In model 2, the coefficient  $\beta_1$  expresses the relationship between credit risk and the proxy for environmental performance,  $\beta_2$  expresses the relationship between risk and the proxy for social performance,  $\beta_3$  expresses the relationship between risk and proxy for corporate governance performance,  $\beta_4$  expresses the relationship between the capital structure variable and the rating,  $\beta_5$  the coefficient for the relationship between risk and profitability,  $\beta_6$  the relationship between risk and asset turnover,  $\beta_7$  the coefficient between leverage and the rating and  $\beta_8$  the coefficient for the size and financial risk ratio. Where  $i$  are companies from 1 to 342, and  $t$  are the years from 2011 to 2020.

We used model 2 to analyse the impact of each dimension of ESG performance (environmental, social, and corporate governance performance) on credit risk, individually, because the impact of each pillar of ESG performance could influence companies' credit risk in different ways (Diebecker & Sommer, 2017; Mervelskemper & Streit, 2017; Cheng et al., 2014).

As the dependent variable (rating) is a dummy that can assume values from 0 to 7, presented in an orderly manner (0 being the best classification and 7 the worst) we choose to use the ordered logistic regression, rather than binary logistic regression. The logistic regression (logit) is a statistical technique used when the phenomenon to be studied is qualitatively presented and, therefore, represented by one or more dummy variables, depending on the number of response possibilities (categories) of this dependent variable (Fávero & Belfiore, 2017).

Logit model is used for estimating the probability and group membership of independent variable by making logistic transformation of a linear combination of dependent variable. In ordered logit model, cumulative probabilities of class membership are used to derive the non-cumulative probabilities of class membership and the instance is assigned to the class having the highest probability (Öğüt et al., 2012).

#### 4. RESULTS

Table 1 presents descriptive statistics for the model's variables. The results show that, on average, between 2011 and 2020, companies present their risk ratings between level 2 and 3 (corresponding to grades A1, A2, A3 or A+, A, A-, and Baa1, Baa2, Baa3 or BBB+, BBB, BBB), which means that such companies are classified as investment grade.

**Table 1 – Descriptive statistics**

Variable	Obs	Mean	Standard deviation	Minimum	Maximum
Rating	1167	2.64	1.60	0	7
ESG	1167	43.9%	22.49	0.10%	93.49%
Environmental	1167	36.41%	28.02	0%	96.04%
Social	1167	45.49%	26.26	0.17%	96.88%
Governance	1167	48.32%	23.74	0.06%	96.88%
Capital structure	1167	1.24	5.18	-37.36	151.27
Profitability	1167	0.09	0.68	-24.77	27.81
Asset turnover	1167	0.03	0.57	-25.10	2.23
Leverage	1167	0.06	0.12	-35.06	0.84
Size	1167	14.23	1.79	7.28	18.86

Source: research data.

On the other hand, the ESG performance, as well as the performances of the separate dimensions (environmental, social and governance) of the companies in the sample, show huge variations. For example, in 2019 the Peruvian company Inversiones Centenario had an environmental performance of 0%, a social performance of 38% and a governance performance of 57%, demonstrating a lack of balance between the practices adopted by the company. Meanwhile, in the same period, the company Vale had 84% environmental performance, 91% social and 81% governance, indicating that the company seeks to maintain a balance in the adoption of ESG practices. In addition, performances also change over the years, in the same company, which contributes to the high standard deviation of the variables.

The companies, considering the average values presented, seem to have a capital composition formed by third-party capital, with low profitability and little efficiency when using their resources. It is noteworthy that little of the companies' assets are financed with retained earnings, which explains the high proportion of third-party capital.

It was expected that the indicators for the companies in the sample would not perform well, given that they are companies from undeveloped economies, that is, companies that



operate in deficient financial markets. Table 2 shows the correlation matrix for the variables used in the model.

**Table 2** - Correlation matrix

	Rating	ESG	Env	Soc	Gov	CS	Profit	AT	Lev	Size
Rating	1									
ESG	0.06 (0.05)	1								
Environmental	0.03 (0.26)	0.86 (0.00)	1							
Social	0.02 (0.62)	0.93 (0.00)	0.80 (0.00)	1						
Governance	0.08 (0.00)	0.70 (0.00)	0.40 (0.00)	0.49 (0.00)	1					
Capital structure	-0.02 (0.47)	0.08 (0.00)	0.09 (0.00)	0.06 (0.00)	0.06 (0.00)	1				
Profitability	-0.14 (0.00)	0.07 (0.00)	0.11 (0.00)	0.06 (0.00)	0.02 (0.51)	0.00 (0.92)	1			
Asset turnover	-0.22 (0.00)	0.05 (0.00)	0.05 (0.00)	0.05 (0.02)	0.02 (0.40)	-0.01 (0.75)	0.69 (0.00)	1		
Leverage	-0.35 (0.00)	0.12 (0.00)	0.11 (0.00)	0.13 (0.00)	0.04 (0.12)	0.00 (0.86)	0.24 (0.00)	0.39 (0.00)	1	
Size	-0.27 (0.00)	0.42 (0.00)	0.41 (0.00)	0.42 (0.00)	0.19 (0.00)	-0.00 (0.94)	0.07 (0.00)	0.12 (0.00)	0.23 (0.00)	1

Source: research data.

The result of the correlation matrix is not consistent with established results in the literature for developed economies, the ESG performance is positively and significantly associated with rating for our Latin America sample, the expected would be a negative association. Moreover, according to these results, when analysed individually, only the corporate governance dimension presents a statistically significant association with rating. In other words, by this correlation analysis, the higher the firm's ESG performance, the higher its credit risk.

For our control variables, we emphasize that the capital structure it is not significantly associated with rating, but it is positively and significantly associated with ESG performance. This fact suggests that an increase in ESG performance may be associated with a higher share of third-party capital in companies. Similarly, the other four control variables are positively and significantly associated with ESG performance, which suggests that higher ESG performance could increase the profitability, the asset turnover and the leverage of companies, and that companies with higher market value have higher ESG performance as well.

To test the hypothesis, we proposed two models to investigate whether the ESG performance helps to reduce the credit risk of Latin American companies. The first model investigates ESG performance calculated as an index that encompasses environmental, social and governance practices in a balanced way, while model 2 brings separate indicators for environmental, social and governance performance to analyse which dimensions have a greater relationship with credit risk. Table 3 shows the results of the robust ordered logistic regression for model 1.

**Table 3** – Logistic regression results – Model 1

Variable	Coefficient	P-value	Expected relation
ESG	0.01	0.000	-
Capital structure	-0.07	0.722	+
Profitability	2.00	0.064	-
Asset turnover	-2.23	0.063	-
Leverage	-2.26	0.000	+
Size	-0.22	0.000	-
Obs.	1,167		
Wald chi2	139.60		
Prob > chi2	0.000		
Pseudo R2	0.035		

Source: research data.

The results show that  $\beta_1$  is positive, considering a significance level of 1%. This result suggests that the higher firm's ESG performance the higher its credit risk, and, therefore,  $H_0$  is rejected. Furthermore, the model is considered appropriate and meaningful. Asset turnover, size and leverage control variables showed significant results at 1%, and asset turnover and profitability at 10%. However, the signals obtained for profitability and leverage are contrary to expectations. As this work did not seek to investigate such effects on credit risk, these results will not be discussed in greater depth.

Table 4 presents the results of the logistic regression for model 2. When considering indices for each ESG dimension, we can see that the environmental and governance dimensions are positively related to the rating, with a significance level of 5%. These results suggest that when a firm has better environmental and governance performance it end up increasing their credit risk. This finding is contrary to recent studies results such as Hsu and Chen (2015); Lin et al. (2017) and Albuquerque et al. (2018), which highlights the importance of having more research on ESG practices in emerging and undeveloped countries.

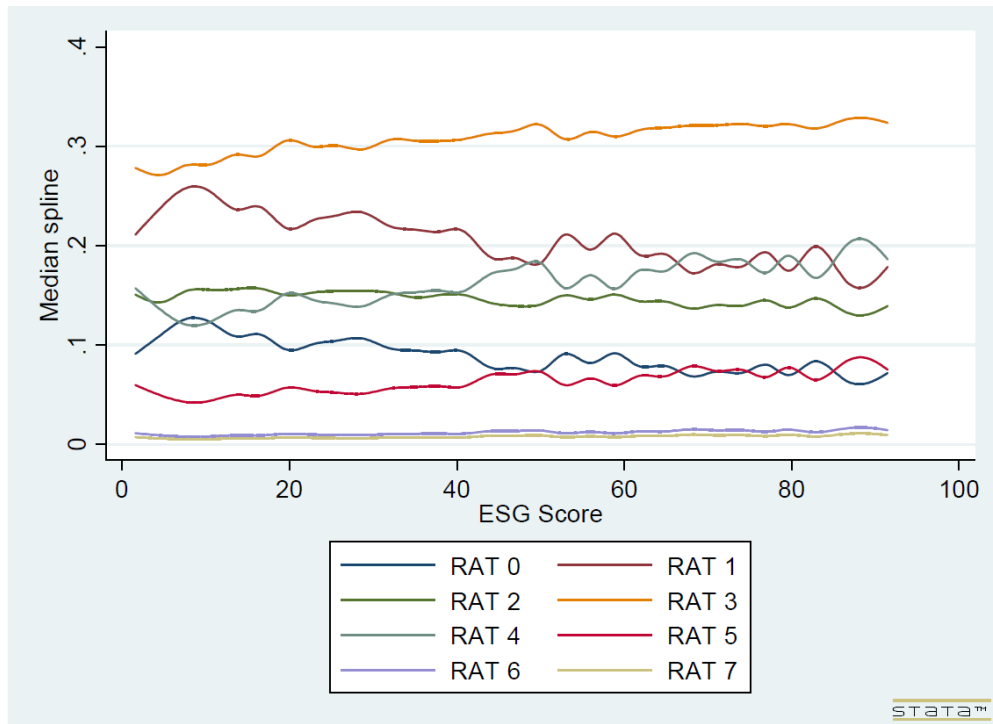
It seems that only the social performance could have a negative impact on credit risk, but the result is not statistically significant. Finally, when we insert proxy variables for countries, only Argentina and Peru present statistically significant results, at 1% and 5%, respectively, in both models.

**Table 4** - Logistic regression results – Model 2

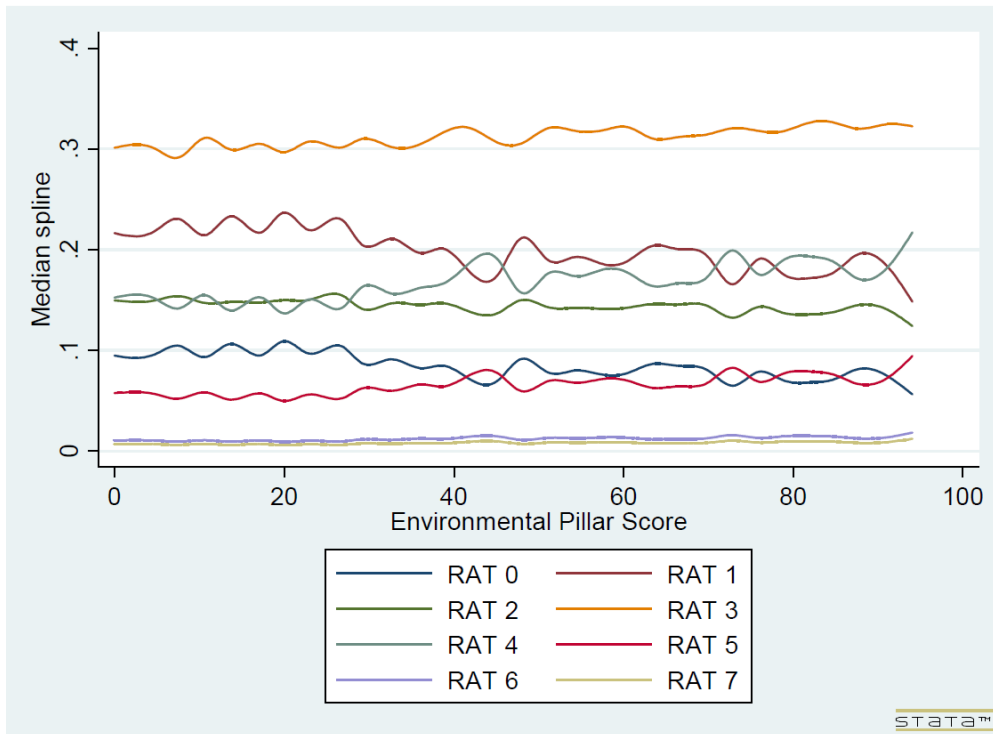
Variable	Coefficient	P-value	Expected relation
Environmental	0.007	0,028	-
Social	-0.03	0,363	-
Governance	0.006	0,012	-
Capital structure	-0.01	0,618	+
Profitability	1.55	0,162	-
Asset turnover	-1.90	0,112	-
Leverage	-2.32	0,000	+
Size	-0.21	0,000	-
Obs.	1,167		
Wald chi2	143.13		
Prob > chi2	0.000		
Pseudo R2	0.036		

Source: research data.

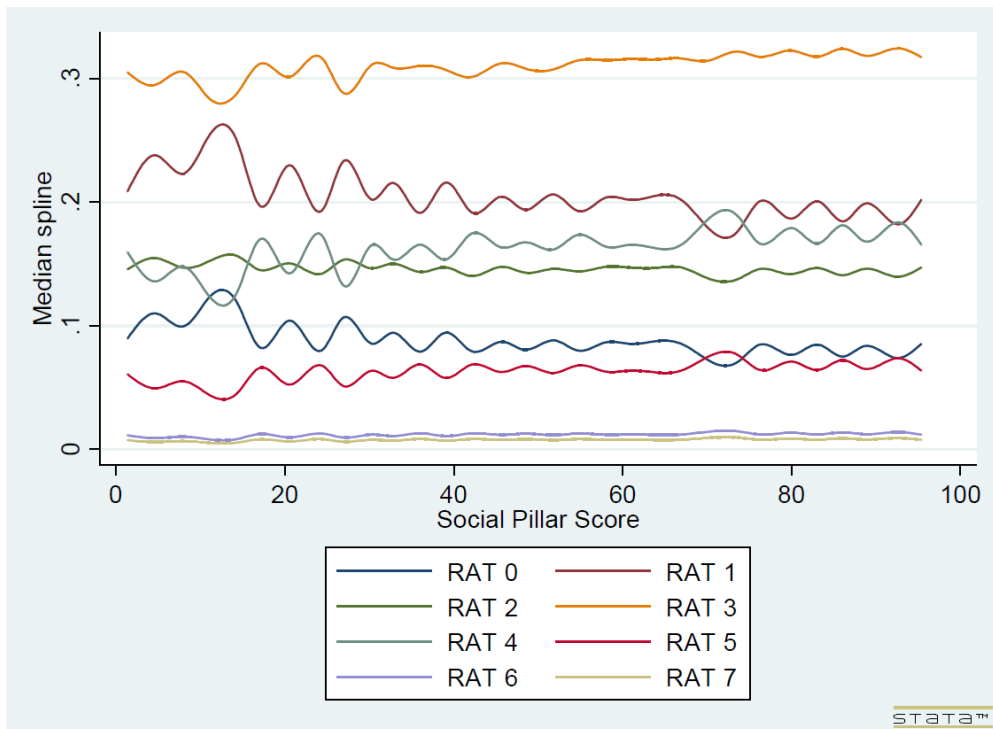
To verify the predictive power of the models, we present in Graphs 1 to 4 the sigmoid of the probabilities as a function of the independent variables (ESG performance, environmental performance, social performance, and governance performance). We also calculated the confusion matrix to verify the global accuracy of both models. The findings show that for both models the global accuracy is 27%. This indicates that out of every 100 ratings the models correctly predict only 27. Despite the low power of predictability, we found that the models better predict the rating when the credit risk is high (from level 3 onwards) than when the credit risk is low, as we can see in the graphs below.



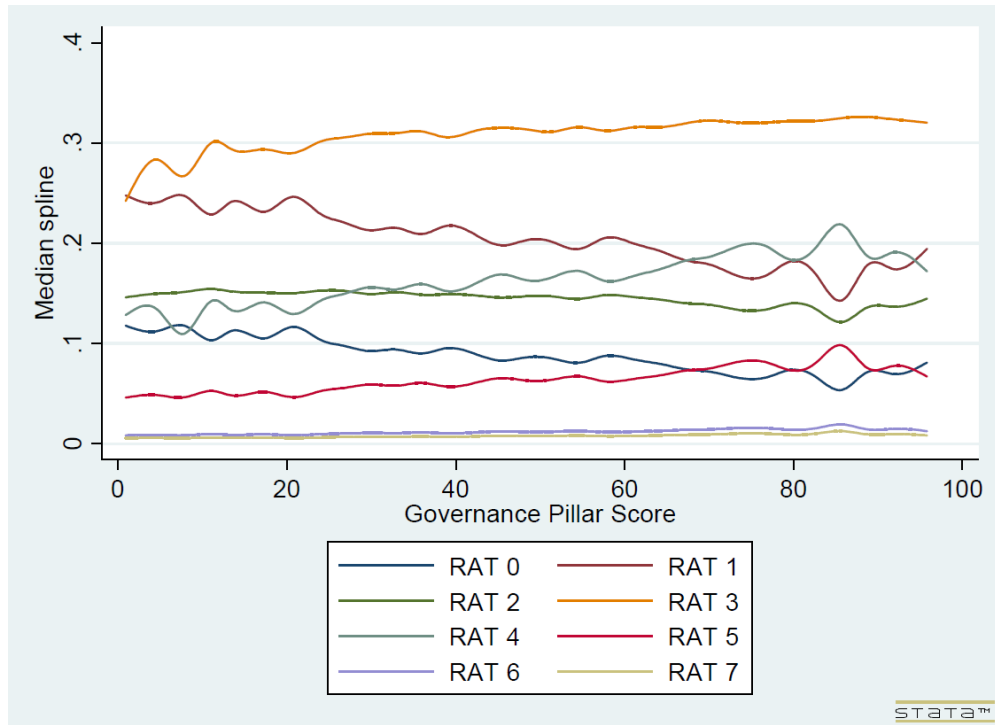
**Graph 1** - Sigmoid of the probabilities as function of ESG performance



**Graph 2** - Sigmoid of the probabilities as function of environmental performance



**Graph 3** - Sigmoid of the probabilities as function of social performance



**Graph 4** - Sigmoid of the probabilities as function of governance performance

In short, our results suggest that the better the ESG performance of Latin American companies, the greater their credit risk. Previous studies have found similar results, Bannier et al. (2022) show that European firms’ credit ratings deteriorate with stronger environmental and social activities, and when the authors tested for a market-based credit risk measure instead of credit rating, the social component of ESG, only displays a negative association with market-based credit risk for European but not U.S. firms. Considering only European companies, Sassen et al. (2016) found that the environmental dimension of ESG only affects the credit risk in environmentally sensitive industries, and the authors could not detect a significant effect of corporate governance performance on firm risk.

One explanation for this result when we consider Latin American companies could be the lack of importance that investors in undeveloped countries attribute to ESG issues. Aras et al. (2010) affirm that investors in undeveloped economies do not consider relevant aspects related to social responsibility when selecting their investments. So, if the investors do not care for ESG practices, companies which spend financial resources adopting these practices, and so have better ESG performance, could be less interesting as an investment choice. Therefore, these results could also imply that the market in Latin American economies have not been influenced by ESG corporate information, reinforcing the perception of inefficiency in these markets.

In addition, many companies have metrics for ESG performance disclosed by Refinitiv database only between 2016 to 2019, which undermines the long-term analysis. And, according to Stakeholder Theory, in the short term the commitment to ESG issues could result in lower profit, leading to a higher credit risk (Alberton, 2003).

## 5. CONCLUSION AND FINAL REMARKS

Despite the growing body of research on the impact of ESG practices on companies' financial performance, with the premise that ESG performance can be financially rewarded, there are still several gaps to be investigated, especially when we consider undeveloped economies. So, this study sought to analyse the relationship between ESG performance and credit risk in Latin American publicly traded companies. For this, based in previous literature we propose the following research hypothesis: for Latin American companies, the higher firm's ESG performance the lower its credit risk. The dependent variable chosen as a proxy for credit risk was the rating, carried out by credit risk rating companies Moody's and Fitch. The methodology used was the estimation by robust ordered logit, as the rating is a categorical variable.

Our findings suggest that ESG performance is positively related to rating and, therefore, the higher firm's environmental, social and governance performance the higher its credit risk. So, ESG practices such as reducing greenhouse gas emissions and investments in the reuse of water resources, ecologically efficient buildings, employee training, gender equity policies, are not yet able to mitigate the credit risk. The results are robust, even when considering the profitability, leverage, size, and asset turnover.

When considering the environmental, social and governance dimensions individually, in model 2, we observe that environmental and governance practices contribute to the positive relationship of ESG and credit risk, while social practices could be able to reduce risk (but the result is not statistically significant). It is noteworthy that the results are significant for Argentine and Peruvian companies, while the proxies for other countries were not statistically significant.

We conclude that despite the actions of rating agencies, such as Moody's and Fitch, to integrate environmental, social, and corporate governance issues into their ratings, it is still not possible to verify the impact of ESG issues on the rating for Latin American companies. This scenario highlights the importance of these companies reviewing their methodologies, so that ESG actions are increasingly encouraged in companies, especially now that we are facing a climate crisis.

One of the limitations of this study is the non-inclusion of some variables that can explain the rating classification, such as the forecast of analysts. We chose not to use this variable due to the lack of data available in the database used. For future studies in this field, we recommend researchers to use more than one variable for credit risk, and another proxy for ESG performance. As we suggested earlier, the rating may not be able to incorporate ESG risks because investors in undeveloped markets do not consider ESG issues relevant to their investment selection. In addition, for the ESG performance proxy, we saw that with the available data it is still not possible to analyse the impact of ESG performance on credit risk in the long term, which may impair our analysis.

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