

INTEGRATION OF SOCIAL ENVIRONMENTAL FACTORS IN THE VALUATION OF CORPORATE FIXED INCOME SECURITIES

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ABSTRACT

This study presents a diagnosis of the current practices and a proposal of a roadmap for integrating social environmental variables in corporate fixed income securities valuation. The roadmap does not make a distinction between the different forms that the securities can take on and was developed by identifying the best integration practices adopted by market players. The sample was formed by 67 agents from the corporate fixed income securities market obtained by criteria of engagement in sustainable finance and relevance in the fixed income securities market. The diagnosis indicated a weak consideration of social environmental variables in the valuation of fixed income securities with little difference among the practices of the domestic and foreign financial institutions with credit rating being the main approach used. The roadmap proposed presents basic considerations of risks and opportunities following the path of analysis the sector and corporate social environmental factors accompanied by adjusting contractual rate spreads. The specific contributions expected from the study are to improve the financial strategy of companies, reach greater efficiency in investor portfolio management, and provide guidance that is more adequate by the regulators and formulators of public policies.

Keywords: sustainable finance; social environmental valuation; corporate fixed income securities; asset valuation.

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RESUMO

Este trabalho apresenta um diagnóstico das práticas vigentes e uma proposta de roteiro para integração de variáveis socioambientais na avaliação de títulos de renda fixa corporativos. O roteiro não faz distinção entre as diferentes formas que os títulos podem assumir e foi desenvolvido a partir da identificação das melhores práticas de integração adotadas por agentes do mercado. A amostra de agentes foi obtida por critérios de engajamento em finanças sustentáveis e relevância no mercado de títulos de renda fixa. O diagnóstico indicou fraca consideração de variáveis socioambientais na avaliação dos títulos de renda fixa, pouca diferença entre as práticas das instituições financeiras nacionais e estrangeiras e rating de crédito como principal abordagem utilizada. O roteiro proposto apresenta considerações básicas de riscos e oportunidades, seguindo o caminho da análise de fatores socioambientais setoriais e empresariais, acompanhado de ajuste de spreads na taxa contratual.

Palavras-chave: finanças sustentáveis; avaliação socioambiental; títulos de renda fixa corporativos; avaliação de ativos.

1 INTRODUCTION AND OBJECTIVE

The last decade has registered an increasing effort to bring together the areas of sustainability and finance through specific approaches of financial analysis (Humphrey, Lee, & Shen, 2012; Schramade, 2016) or the consideration of social environmental factors in building portfolios. (Verheyden, Eccles, & Feiner, 2016) The term Sustainable Finance (Soppe, 2004) has gradually been used to designate the approximation between the two fields of knowledge originally very distant. In parallel, business publications on sustainable business models have gained prominence (Makower, 2017).

The incorporation of social environmental impacts in assessing financial activities had as one of its key milestones the launching of the Equator Principles (EP) in 2003 in accordance with criteria applied by the International Finance Corporation (IFC). The main focus with the integration of social environmental factors in the valuation of financial assets since then has been on variable income (stock valuation) and the little attention given to fixed income investments has called the attention of the academic and corporate world (Arjaliès, 2013; PRI - Principles for Responsible Investment, 2013).

Still characterized as a market niche, the segment known as Sustainable and Responsible Investment (SRI) refers to the combination of financial objectives with social, environmental, and corporate governance issues when selecting assets (Haigh & Hazelton, 2004) so as to improve the long-term, risk-adjusted return (Credit Suisse, 2012). In this direction, the United Nations (UN) created in 2006 the Principles for Responsible Investment (PRI) based on the perception that the inclusion of Environmental, Social & Governance (ESG) factors in the valuation of investments would result in a positive impact on the portfolios. The signatory investors have advanced in implementing the six investment principles in hopes that the PRI would stimulate and support the signatories in integrating ESG issues into all asset classes (PRI, 2014).

Fixed income instruments make up the largest class of financial assets with a strong weight in investor portfolios. These types of debt securities are considered safer than those of variable income because they have a greater predictability of cash flow and lower volatility (Arjaliès, 2013; Fabozzi, 2000; PRI, 2013). A major barrier to building a valuation model is the fact that much of the information of the social environmental variables are qualitative, while the traditional models for evaluating fixed income securities are essentially quantitative.

The PRI created a research group in 2011 to advance the inclusion of ESG variables in analyzing fixed income securities by generating analysis tools and specialized knowledge (PRI, 2011). The barriers ranged from the impossibility of engagement via vote and voice on the boards

since there is no shareholding to the characteristics of the various debt securities such as maturity dates and various collaterals. Furthermore, the risk and opportunity factors related to social environmental issues are in general associated with the long-term while fixed income securities can be of short duration, reducing the importance and the horizon of the ESG factors in the investment valuation.

Considering that the third-party capital transactions undergo a credit risk analysis, Weber, Fenchel, and Scholz (2008) drew attention to the problems arising from incorrect pricing of social environmental issues. They stressed the joint liability of banks that can be jointly responsible in environmental accidents and the erosion of the value of assets given as collateral due to environmental factors.

When the creditor does not identify or incorrectly prices the “sustainability risk”, their decision may not reflect the actual risk (Weber, Scholz, & Michalik, 2010). Considering that social environmental factors may have relevant impacts on the value of the loan portfolio (Weber, Fenchel, & Scholz, 2008) and on the price of the debt securities issued by companies, the integration of social environmental factors in the valuation presents itself as a frontier to be explored by investors and by the academic community.

Once the risks related to the ESG factors can impact the cash flows and change prices and yields of the corporate bonds, the PRI (2013) suggests three research and development fronts: (i) incorporation of the factors into the credit rating methodology, ii) linking the quality of the debt to the materiality of social and environmental issues, and (iii) identification of social environmental indicators for fixed income analysts. As for the integration by the credit ratings, the PRI (2013) identified that the agencies already show concerns in the reports published despite the ESG factors still not appearing in a systematic and transparent way in the methodologies.

This study presents a diagnosis of the current practices and a proposal of a roadmap for integrating social environmental variables in the valuation of corporate fixed income securities.

The remainder of this article has been organized into four sections: item 2 brings a brief review of the literature, item 3 describes the research method, and item 4 discusses the main results with the final considerations given in item 5.

2 LITERATURE REVIEW

In the last two decades, there has been a growth of SRI investment funds as well as performance indexes of companies with the best standards of Corporate Social Responsibility (CSR). One of the reasons for this growing interest was the assumption that a high standard of CSR should be reflected in the company's higher value in the long term (Arjaliès, 2013; Menz, 2010).

Ruf et. al. (2001) argue that incorporating social environmental factors in the business models of companies, despite bringing costs, also confers social legitimacy to the entrepreneurial activities in addition to avoiding future negative impacts on the value. Given that the transactions with the stakeholders are continuous throughout the entire existence of the companies, the good relationship can become a valuable factor of competitive advantage.

The studies that had as their objective to check the relationship between the corporate financial performance (CFP) and the social environmental performance (SEP) varied greatly by period and region with conflicting results. Considering the large number of these studies, some researchers have sought to consolidate them by means of meta-analyses.

Analyzing 167 studies between 1972 and 2007, Margolis, Elfenbein, and Walsh (2009) found a small relationship between CFP and SEP. They concluded that there is no destruction of shareholder wealth when companies invest in social environmental performance and that the

negative financial impacts generated by socially irresponsible attitudes are relevant. Beurden and Gossling (2008) arrived at the same evidence, but using only studies later than 1990. In another meta-analysis with 149 papers, Endrikat, Guenther, and Hoppe (2014) found a positive and partially bidirectional relation between SEP and CFP.

The literature on the integration of social environmental factors in the fixed income instruments valuation focused on the search for correlations between specific variables, such as CSR, credit rating, and debt yields. The authors attempted to identify whether companies with better levels of CSR were rewarded by investors and financiers with lower rates on their debt securities or if the credit ratings published by risk agencies reflected these levels. While some authors found influence from the social environmental risks on the prices of corporate bonds or on the credit ratings (Attig, El Ghoul, Guedhami, & Suh, 2013; Bauer & Hann, 2010; Chava, 2014; Nandy & Lodh, 2012; Oikonomou, Brooks, & Pavelin, 2014; Schneider, 2011), others did not demonstrate this relationship (Goss & Roberts, 2011; Menz, 2010).

In accordance with Oikonomou and Pavelin (2014), Attig, El Ghoul, Guedhami, and Suh (2013), Nandy and Lodh (2012), Chava (2014), Schneider (2011) and Bauer and Hann (2010), companies with better levels of social environmental management pay lower spreads on their debts as they are seen as being less risky and receiving better credit ratings from the agencies.

When measuring the credit risk perception by Credit Default Swap (CDS) spreads, Fritz and Busch (2013) concluded that the media attention on social environmental issues is priced by investors. Attig et al. (2013) observed that the rating agencies include the CSR performance in their credit ratings, reinforcing the perception that the SEP is connected to the CFP since it involves risk reduction, efficient use of resources, creation of intangible assets, and cost reduction.

Along the same line, Oikonomou and Pavelin (2014) concluded that companies with a better social environmental performance have less financial cost and a higher rating, and the effect on the yield and rating is more visible in securities with longer maturities. This reinforces the idea that the effects of the SEP on the value of the companies are long term.

On the other hand, Menz (2010) did not find a correlation between the CSR level and risk premium, concluding that the ESG factors do not influence the pricing of corporate debt securities. Meanwhile, Goss and Roberts (2011) found a negative correlation between SEP and cost (better performance and lower cost), but without a relevant magnitude. The small premiums paid by companies with a worse SEP would not encourage best practices of corporate governance and would be a second-order factor in the evaluation by the banks.

Another usual approach of social environmental risks in fixed income securities is focused on reducing the value of assets pledged as collateral such as the contamination of land (Thompson & Cowton, 2004; Weber et al., 2008, 2010). Although the incorporation of these risks at all stages of the credit risk management can contribute to creating value, Weber, Fenchel, and Scholz (2008) observed that a small portion of banks adopts this procedure. Weber, Scholz, and Michalik (2010) concluded that the inclusion of information regarding the social environmental management of companies would improve the credit rating process, resulting in a lower risks for the banks.

Fixed income investors seek to select the issuers that best balance interest rate, probability of default, and collaterals, being understandable that they focus on analyzing the downside risks in this class of assets (Arjaliès, 2013). The credit analysis attempts to identify securities and companies more likely to undergo change in the future to anticipate investments or disinvestments in securities with a disconnection between rates and risk perception (Derwall & Koedijk, 2008).

The credit market looks to solvency with the social environmental management being able to be a variable for the credit risk (Bauer & Hann, 2010) to be priced through higher interest rates to compensate for potential liabilities and reputation risks (Chava, 2014).

Thompson (1998) suggests three types of risk: direct (joint liability), indirect (default of the debtor), and reputation. For Credit Suisse (2012), the ESG scores can connect warning signs regarding risks and future impacts on the credibility of companies so that the banks adjust their investment recommendations.

The covenants, or maturity anticipation clauses if the debtor breaks one of the obligations, can be a substitute for higher interest rates as a mechanism for considering credit risks (Goss & Roberts, 2011). Another approach may be the collaterals, which are useful when the banks deal with very risky debtors (Jimenez, Salas, & Saurina, 2006), mainly to solve problems of adverse selection and moral hazard (Nandy & Lodh, 2012).

Nandy and Lodh (2012) call attention to maturity as a relevant characteristic. The risk of the debtor may be reflected by the maturity of the operation, and the maturity is correlated with the transaction's rate (Goss & Roberts, 2011). Another perspective about the problem of the integration and the risk's pricing is the assessment of potential liabilities in the balance sheet of companies. For Bauer and Hann (2010), the investors of debt securities need to be more attentive to potential liabilities, whether environmental or social, caused by violations by companies, generating costs of cleaning, fines, and reparations.

3 RESEARCH METHOD

The first stage of mapping the integration practices of social environmental issues in the valuation of corporate fixed income securities was defining the sample of relevant actors in the market. The following agents were highlighted based on the literature, with an emphasis for Fabozzi (2000) and PRI(2013): financial institutions, regulatory agencies, certifying associations of financial analysts, and credit quality classification agencies. The interests of these agents are different depending on the moment in which they participate in the market and the strategies adopted.

The financial institutions are constituted by trade, investment, or development banks and by fund managers. Their performance in the market of fixed income securities ranges from setting up the transaction all the way to distributing the securities and their role as investors and financiers. The definition of the sample of banks and fund managers had as criteria for the involvement with corporate sustainability and the relevance in the market of fixed income securities.

The first step was to identify the signatory institutions of two relevant international initiatives in the area of sustainable finance: The Equator Principles (EP) and Principles for Responsible Investment from the UN (PRI). The second criterion was the inclusion into one of three sustainability indexes in the capital market: Dow Jones Sustainability Indexes (DJSI), FTSE4Good Index Series (FTSE4Good), and Corporate Sustainability Index (ISE, in Portuguese) of the Brazilian Stock Exchange (B3 - Brasil, Bolsa, Balcão, in Portuguese). The third filter considered the first ten institutions by total amount of emissions in the Brazilian market of fixed income securities, according to the ranking of the Brazilian Association of Entities from Financial and Capital Markets (ANBIMA, in Portuguese) of Fixed Income and Hybrids of April 2014. The amounts generated by these institutions accounted for approximately 96% of the total in Brazil. The fourth and last stage considered the expertise, leadership, and engagement for incorporating social environmental variables in corporate fixed income securities, checking the institutions that were part of the study group created by PRI to move this theme forward. The committee was composed of 14 members from 13 different institutions included in the sample. Considering these four procedures, 59 financial institutions were selected.

The second group of institutions were the regulatory and inspection agencies of the capital market. The ones chosen were the *Comissão de Valores Mobiliários* (CVM) of Brazil and the Securities and Exchange Commission (SEC) of the United States.

The third group consisted of risk rating agencies, which follows Fabozzi (2000) who argues that the agencies *Standard & Poor's (S&P)*, *Moody's*, and *Fitch Ratings* are the most relevant in the market of fixed income securities, and the main consultation sources for investors who do not have their own risk analysis departments.

The fourth group was of the associations of financial analysts and institutions that trade on the capital markets. These institutions are responsible for certifying professionals and controlling their activities, being involved with new knowledge that affects the work of the affiliates. The CFA Institute, the Association of Investment Analysts and Professionals of the Capital Market (APIMEC, in Portuguese), and the Brazilian Association of Entities from Financial and Capital Markets (ANBIMA, in Portuguese) were chosen due to their relevance.

Once this process was finalized, 67 agents from the corporate fixed income securities market, which included 59 financial institutions, 2 regulatory agencies, 3 analyst-certifying associations, and 3 risk-rating agencies, formed the research sample. The selection criteria described above indicate that these segments were well represented in the sample since they are of a different nature. As an illustration, the regulatory agency will be unique in a country with hundreds of financial agents.

The next step was to define the main characteristics of the fixed income securities. The following 6 characteristics were identified based on Bauer and Hann (2010), Fabozzi (2000), Menz (2010), Nandy and Lodh (2012), PRI (2013), and Schneider(2011): rate, credit rating, maturity, collaterals, covenants, and potential liabilities.

The third stage of the method consisted in defining the social environmental factors, adopting an adaptation of the Trajano and Lemme proposal (2013) as shown in Chart 1.

Chart 1 - Main social environmental factors adopted in investment valuation.

Environmental Factors	Social Factors / Relationship with Stakeholders
Climate Change	Clients
Water, Energy, and Materials	Communities
Biodiversity and Soil Use	Suppliers
Waste Management	Workers
	Regulators

Source: adapted from Trajano and Lemme (2013)

The sources of information for the study were the most recent reports and information on the websites of the sample's agents. Also analyzed were the prospectuses of fixed income issues of 14 different companies in the United States registered with SEC, extracted from the Bloomberg terminal. Only companies whose main activity were considered potentially polluting by Law 10,165/2000 were included when selecting prospectuses of public offerings of fixed income securities in Brazil registered with the CVM, which resulted in prospectuses being analyzed from 12 companies.

The grid shown in Chart 2 was used for classifying and analyzing information, which was based on the literature reviewed in the previous section, identifying for each market agent its initiatives for including social environmental criteria in the evaluation of the six characteristics of the corporate fixed income securities.

Chart 2 - Grid for analyzing the social environmental information in the valuation of fixed income securities by the various market agents.

Agents Participating in the Fixed Income Market	Characteristics of Fixed Income Securities					
	Rate	Analysis and Credit Rating	Maturity	Collaterals	Covenants	Potential Liabilities
Financial Institutions						
Regulatory Agencies						
Certifying Institutions						
Rating Agencies						

Source: summary of authors based on a review of the literature

For insertion in the grid, the information was classified according to an adaptation of the Epstein and Roy scale (2003) that combines sustainable initiatives of companies with corporate financial performance. Chart 3 presents the scale used in this study.

Chart 3 - Classification of the information on the scale adapted from Epstein and Roy (2003), associating social environmental variables with the valuation of corporate fixed income securities.

Classification of the Information Analyzed	
Level 0	Sources do not mention considering social environmental variables in fixed income securities valuation or the institution does not disclose this information.
Level 1	Sources present only a qualitative approach in considering social environmental variables for fixed income securities valuation.
Level 2	Sources present a quantitative approach in considering social environmental variables for fixed income securities valuation or present a concrete example.

Source: adapted from Epstein & Roy (2003)

Once the analysis grid was filled out, the score for each market agent was determined with the sum of the results in the six characteristics.

As a complementary procedure of statistical inference, hypothesis tests of proportions were carried out based on the binomial distribution, since there were only two alternatives for each characteristic analyzed at each level: integrate or not the social environmental variables in the valuation. The significance level of 5% and one-tailed tests were adopted to check the statistical significance of the proportions, with the following hypotheses:

$$H_0: p = 0$$

$$H_1: p > 0$$

Two-tailed tests were also run on the differences in proportions with the same level of significance to check if there was a significant difference between domestic and foreign financial institutions according to the following hypotheses:

$$H_0: p_{\text{national}} = p_{\text{foreign}}$$

$$H_1: p_{\text{national}} \neq p_{\text{foreign}}$$

It is important to highlight the fragility of the statistical tests since the sample did not fully meet the requirement of randomness, but its contribution is in signaling a possible approach for other studies of this nature.

Due to the simplicity of the statistical treatment adopted, all calculations were performed with the statistical supplement of MS-Excel 2010©.

The last phase of the diagnosis was identifying the qualitative highlights, which are the best practices of the agents from the sample in integrating social environmental variables in the evaluation of the characteristics of the corporate fixed income securities. This mapping can be useful to provide benchmarks for improving the practices by all agents. Finally, the aspects observed during the diagnosis were used for proposing a roadmap for integrating social environmental variables into securities valuation.

4 RESULTS ANALYSIS

The discussion of the results was divided according to the two research objectives: diagnosis of current practices and a proposal of a roadmap for integrating social environmental variables in corporate fixed income securities valuation. In the end the results were compared with studies conducted previously.

4.1) Diagnosis of current practices

Table 1 presents the absolute and relative frequencies of the score of the 67 agents from the sample, keeping in mind that the maximum possible score would be 12, if the integrations in all six characteristics were classified at level 2.

Table 1 - Frequency distribution of the score of all agents in the incorporation of social environmental factors for valuing corporate fixed income securities

Score	Absolute Frequency	Relative Frequency	Absolute Accumulated Frequency	Relative Accumulated Frequency
0	28	42%	28	42%
1	18	27%	46	69%
2	15	23%	61	92%
3	3	4%	64	96%
4	3	4%	67	100%

Source: research results

It should be noted that nearly half of the agents did not score and that the highest score obtained was 4 by only three agents, indicating the incipient stage for considering social environmental criteria in fixed income securities valuation. All the hypothesis tests of proportions for the relative frequencies of the scores observed rejected the null hypothesis.

While some institutions may decide on all the characteristics of the corporate fixed income securities, such as banks when setting up loan transactions, other agents from the sample are more limited. For example, the pricing of rates and defining maturities are not part of the scope of the credit risk rating agencies, though they may express opinions in their reports. Therefore, it is useful to examine the isolated results of the financial institutions according to the relevance in the sample and scope of activity in this market. Table 2 presents the absolute and relative frequencies of the score of the 59 financial institutions.

Table 2 - Absolute and relative frequencies of the score of the financial institutions in incorporating social environmental factors for valuing corporate fixed income securities.

Score	Absolute Frequency	Relative Frequency	Absolute Accumulated Frequency	Relative Accumulated Frequency
0	24	41%	24	41%
1	16	27%	40	68%
2	13	22%	53	90%
3	3	5%	56	95%
4	3	5%	59	100%

Source: research results

It should be noted that nearly half of the financial institutions did not score, which means that they did not mention in any of the sources of information the integration of any social environmental variable in the analysis of the six characteristics of the securities. It is important to add that the tests on the differences in proportions suggested that there is no relevant difference in this respect between Brazilian and international institutions.

The regulatory agencies, the second group of market agents, did not provide guidelines for the financial institutions to integrate social environmental factors in the analyses. References to social environmental issues and characteristics of securities were found in prospectuses issued by companies, but it was not possible to associate them to the standardization of the regulators. Embryonic integration practices were found in 8 of the 12 prospectuses analyzed in the Brazilian issuances regulated by CVM, while being found in 4 of the 14 prospectuses in the American issuances under the SEC regulation. While the prospectuses regulated by CVM presented practices classified as level 1 only for covenants and potential liabilities, those regulated by SEC presented practices with the same rating only for potential liabilities.

The three rating agencies received scores 0, 1, and 2. The only characteristic cited by those that scored was analysis and credit rating. On the other hand, this was the only group in which an agent reached level 2 in one of the characteristics: the agency S&P in a report together with the World Resources Institute, providing a clear and quantitative example of integration and influence of social environmental variables on analyses and rating decisions. This may be a good indication of the potential for improving the analyses if the agencies approach the institutions specialized in social environmental issues.

As for the certifying institutions, curricula, tests programs, reports, and the sustainability area in the websites revealed that none of them require knowledge about the integration of social environmental variables in the analysis, even when it has to do with stockholding. What stands out, however, is that CFA hosts a blog in which one of its directors proposes the discussion of ESG variables in investment analysis.

Table 3 presents a ranking that consolidates all the characteristics of fixed income securities in the sample (listed in Chart 2) formed by the sum of the classifications assigned to each characteristic for all agents. It is worth remembering that the maximum score for each characteristic would be 134 (67 agents and a score equal to 2).

Table 3 - Ranking of the score of the characteristics of the corporate fixed income securities in all the agents of the sample.

Placement	Characteristic	Score
1	Credit Rating Analysis	27
2	Covenants	16
3	Potential Liabilities	15
4	Collaterals	6
5	Rate	4
6	Maturity	2

Source: research results

Three characteristics were highlighted: rating, covenants, and potential liabilities, but the highest score was a little more than 20% of the maximum possible. The integration of social environmental factors by Analysis and Credit Rating appeared as the most common practice and was also the only one to reach level 2 in one of the 67 agents from the sample, the risk rating agency Standard & Poor's (S&P). Only financial institutions mentioned maturity, rate, and collateral.

When examining the financial institutions separately, we observed that 35 of the 59 (59%) informed that they integrate social environmental variables in the evaluation of at least one of the six characteristics given in Table 3. Some differences could be observed when the origin of the capital was divided between national and foreign. No institution with national capital highlighted the integration of social environmental factors on the rate in comparison with 3 of 50 institutions of foreign capital. When the focus were collaterals and covenants, the scenario changed with national institutions taking the lead: 44% (4 institutions) affirmed considering maturity anticipation clauses and covenants related to social environmental variables, while in foreign institutions the frequency was only 20% (10 institutions). Examining the documentation did not identify reasons for the differences observed, making it necessary to conduct further studies mainly in relation to the requirement of collaterals.

It was difficult to establish some comparison between the four groups of agents due to differences in the size of the samples, but the certifying institutions and regulatory agencies seem to be a step behind the financial institutions and risk-rating agencies in relation to the integration of social environmental variables.

It seems appropriate to examine some qualitative highlights, which are the differentiated approaches to the six characteristics of securities adopted by some agents of the sample. They can serve as a reference for improving the process of integrating social environmental variables in corporate fixed income securities valuation.

The financial institutions FMO and Rabobank Group reported that they consider corporate social responsibility and commitment with sustainability by companies when evaluating the interest rates of the transactions, with reduced rates for companies with best practices. The certifying institution CFA also defends the joint consideration of the ESG variables with the spread of rates, which must be high enough to compensate for the risks from social environmental issues and governance.

The rating agency Standard & Poor's tried to estimate how two possible scenarios for changes in the North American climate policy could affect the credit rating of companies in the chemical industry. Also using the scenarios, Barclays-MSCI Bank highlighted that changes in regulation can result in creating new taxes, limit subsidies, or put a threat on licenses, which are fac-

tors that must be considered in analyzing credit, for bringing impacts to the company's operation. Meanwhile, Santo Antônio Energia mentioned in their prospectus for issuing debentures that the generation of cash may be delayed due to climatic factors.

As for the maturity of the securities, a highlight should be given to AMP Capital Investors that made considerations about the relationship between the maturity of the fixed income securities and the time frame in which the social environmental issues can impact the issuer.

When looking at the collaterals, the banks Sumitomo Mitsui, BIC Bank, and Itaú mentioned the possibility of environmental contamination of pieces of land offered as collaterals, thus compromising their market value. Itaú Bank went even farther citing the need to check the Legal Reserves in rural areas where land is pledged as collateral.

In the case of social environmental covenants, Banco do Brasil cited contractual clauses related to human rights and illegal deforestation. BIC Bank also mentioned human rights while Itaú Bank highlighted contractual clauses of environmental regularity and child exploitation. The reference to the Equator Principles in funding operations appeared in Santander Bank and in the prospectus of a public issue of fixed income securities of the company Rodovias do Tietê (2013).

Regarding potential liabilities, Santander Bank affirmed analysis, through an area specialized in social environmental risk, the client's social environmental management and of its value chain, checking items such as contaminated areas, deforestation, labor violations, and other problems that may generate penalties. Labor issues that could generate potential liabilities for the issuing companies also appeared among the concerns of BIC Bank. TD Bank considered regulatory fines and penalties, as well as investments related to reducing carbon dioxide (CO₂). The prospectus of public offering of debt securities by the company Rodovias do Tietê (2013) showed that the company may be held jointly liable for any damage caused to the environment or to third parties arising from the activities provided by third-party companies.

It should be pointed out that the vast majority of the sample's agents did not go deeper into the discussion of the social environmental factors when assessing any of the six characteristics of corporate fixed income securities. It was common to see generic expressions and imprecise definitions of the methods adopted, which reinforced the need for a proposal for the integration of social environmental factors in evaluating the securities, briefly described in the following item, with the intent to provide a point of departure for reaching more comprehensive and precise formulations in the future.

4.2) The roadmap proposed for integrating social environmental variables in corporate fixed income securities valuation

The roadmap was a result of the association of the best practices found in the diagnosis with the ideas discussed in the literature review, consisting of six stages (A, B, C, D, E, and F). It starts with a macro analysis that considers the company, social environmental factors, sector and regional issues, and then includes specific issues of the security such as contractual protections and rates. It can be used in both the primary and secondary market, by investors or lenders. On the one side the lender can balance risks, include contractual protections, and decide on rates when setting up the transaction, while the investor can concentrate on comparing with peers and on the pricing of non-financial risks. The six stages are presented below.

A. Identifying the most relevant sector and regional social environmental issues

This stage proposes examining the social environmental factors that are the most rele-

vant in the company's sector and region (see Chart 1) with their respective time frames, estimating the probability of occurrence of social environmental events. It can be subdivided into three categories:

1. Relevance and materiality: identify the most relevant social environmental factors in the company's sector and region. A starting point could be arranging the social and environmental factors in large dimensions, as shown in Chart 1. For example, in the beverage industry, the environmental dimension "water use" ("water, energy, and materials") should be analyzed. In the petrochemical industry, the environmental dimension of "waste management" can generate huge potential liabilities, affecting the ability of paying the fixed income securities.
2. Time horizon: the relevant social environmental factors of the sector and region must be divided into time frames of occurrence—short (up to 1 year), medium (between 1 and 5 years), or long (over 5 years). The division is important to tailor the horizon of the impacts with the maturity of the security examined. An impact that can happen after maturity loses importance in pricing.
3. Probability: estimate the probability of relevant social environmental impacts within the time frame set. For example, a division at a low (up to 25%), medium (between 25% and 75%) or high (above 75%) probability.

B. Mapping the social environmental issues specific to the company and its potential liabilities

At this stage, the evaluator needs to examine the company's specific social environmental factors on the basis of Chart 1, adopting the same criteria of relevance, time frame, and probability of the previous stage. Deepen the understanding of the company's business model and check how the issues may become potential liabilities such as fines and penalties.

C. Checking public social environmental ratings

The third stage is to check the company's positioning in indexes, rankings, and public ratings of corporate sustainability. Stages (A) and (B) are internal to the evaluating institution, while this is external and makes it possible to compare with companies that operate in the same industry, checking the opinions of other market agents. In this study we used three sustainability indexes, ISE, FTSE4Good, and DJSI, but there are many others, some broad and others more specific, designed to assess some social environmental dimension.

D. Confrontation with the security's collaterals and covenants

In this fourth stage, the evaluator needs to confront the social environmental issues, within the security's time frame, with two other characteristics: covenants and collaterals. Social environmental issues can affect financial indexes and trigger covenants such as those associated with labor relations and human rights. In relation to the collaterals, the evaluator needs to check if they cover both default as well as joint liability. Another aspect to be considered is the social environmental evaluation of the collateral such as in the case of land, subject to contamination by toxic wastes with a reduction in market value.

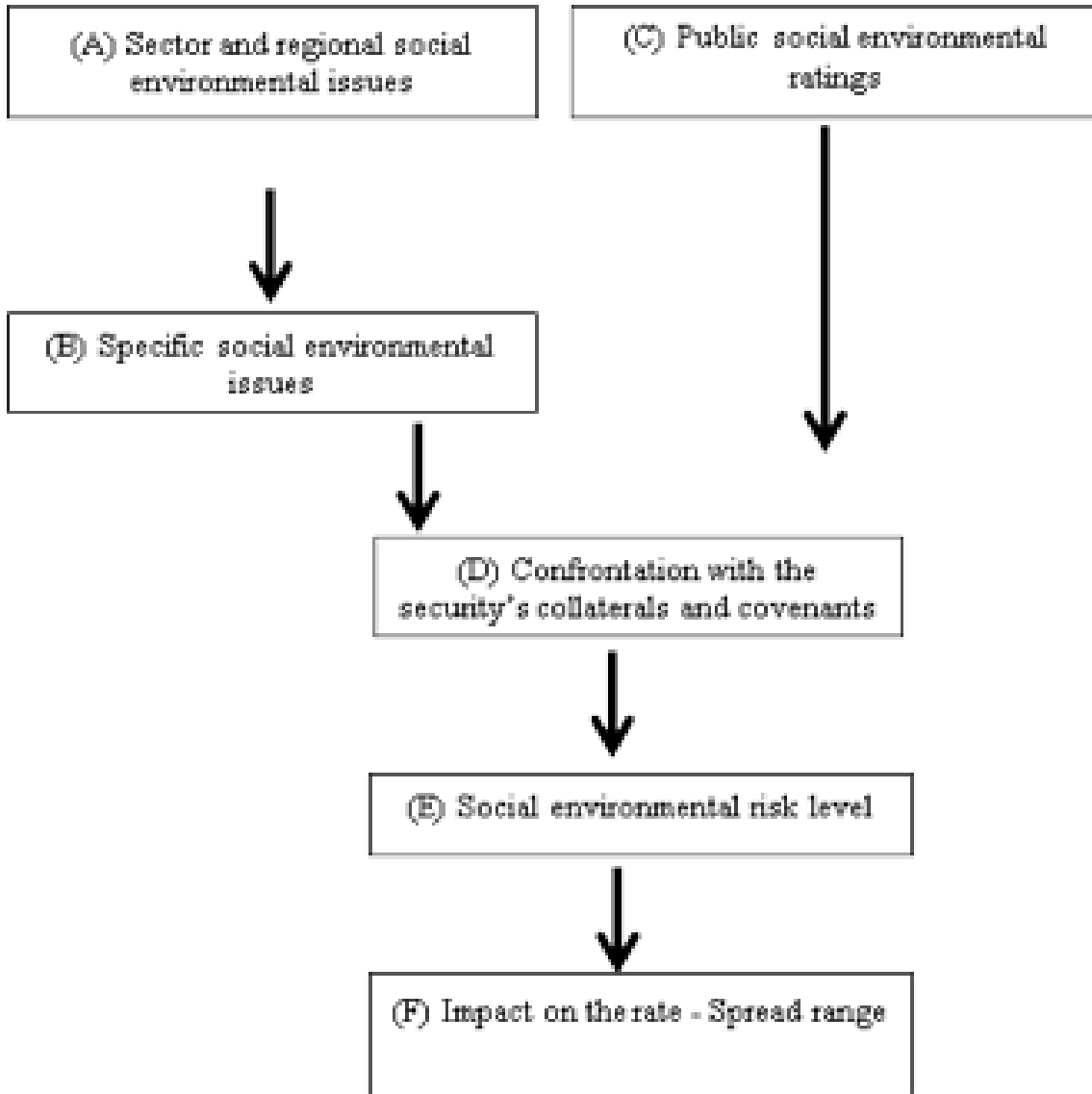
E. Framing in the social environmental risk level

After the previous analyses, the security can be rated on a scale of five levels of social environmental risk. The highest levels can imply in the infeasibility of the operation instead of indicating only a price adjustment.

F. Definition of the impact on the rate, on the covenants and on the collaterals

Finally, the evaluator should consider the risk scale, creating ranges for the spreads in basis points (bps) and integrating the most relevant social environmental factors on the rate, on the covenants, and on the collaterals. Figure 1 shows a simplified diagram illustrating the proposal.

Figure 1 - Schematic diagram of the integration proposal



This proposal is in line to a certain extent (see Table 3) with the procedure of the sample that reached the highest score in the adapted scale of Epstein & Roy (2003). Standard & Poor's (S&P) report, although it does not go deeper into the rating and the associated rate, points to this path when it discusses through two cases the impacts of the changes on the American climate policy on the credit risk of companies in the chemical industry. The first shows that metrics and indexes used in the credit analysis, such as financial leverage and the EBITDA margin, would be affected, and these variations have a neutral or slightly negative impact on the credit's quality. In the second case, the agency indicates that the credit's quality can be moderately and negatively affected.

4.3) Comparison of the results with those from previous studies

The diagnosis indicated that the market players are still far from a reasonable level of integration of the social environmental variables in their evaluations, which is in line with the observations of Humphrey, Lee, and Shen (2012), Arjaliès (2013), PRI (2013), and Schramade (2016). Almost no concrete example or more accurate quantitative method was found. Qualitative information, although more frequent, had a generic character and appeared in a little more than half of the sample.

The division of agents into groups pointed to the leadership of the financial institutions, but still needing better risk management, as previously noted by Weber, Fenchel, and Scholz (2008), Weber, Scholz, and Michalk (2010), and PRI (2011). It is interesting to note that no relevant differences were found between the practices of domestic and foreign financial institutions.

Although “maturity” was the characteristic less found in mapping the current integration practices, it is important to note that it can be a key element for furthering integration, which has already been highlighted by Goss and Roberts (2011) and by Nandy and Lodh (2012). Fixed income securities can have very diverse maturity dates, which need to be compared with the time frames of social environmental impacts. For example, for a security with a maturity in one year, climate change will have less relevance than specific changes in the environmental regulation.

The adjustment of the rate by spread ranges associated to risk adopted in the roadmap proposed seems to be promising, as discussed by Bauer and Hann (2010), Chava (2014), Schneider (2011), Nandy and Lodh (2012), PRI (2013), Attig et al. (2013), Fritz and Busch (2013), and Oikonomou, Brooks, and Pavelin (2014).

5 FINAL REMARKS

This study presents a diagnosis of the current practices and a proposal of a roadmap for integrating social environmental variables in corporate fixed income securities valuation. The starting point was the observation that the integration of social environmental variables in corporate fixed income securities is progressing slowly compared with variable income. The need for integration becomes more relevant when we observe that the social environmental variables may impact the various characteristics of the securities.

It is important to point out the superficial approach that the social environmental factors were handled with rare examples of going deeply into issues such as climate change, biodiversity, or labor relations. The identification and specification of the factors are crucial for the materialization and quantification of the variables and consequently for integrating them into security valuation.

Regulatory agencies, certifying institutions, and risk rating agencies, which have the potential to guide the behavior of financial institutions, do not seem to be carrying out their role satisfactorily.

Finally, the systematic application of the valuation roadmap proposed can help in comparing among fixed income securities from different issuers and characteristics considering social environmental issues. This may generate relevant knowledge for the academic area, improving the financial strategy of companies, greater efficiency in portfolio management by the investors, and opportunities for guidance for the regulating agencies and public policy formulators.

Forthcoming studies may verify how social environmental factors impact specific financial aspects of the companies such as degree of financial leverage, liquidity, and operational cash flow. Another possibility would be to correlate the credit risk (rating) with the potential liabilities in different time frames. A third alternative could be a qualitative approach based on interviews

with investment managers and credit analysts to understand the perceptions of the process for integrating social environmental variables in the pricing of securities.

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Contribution	[Author 1]	[Author 2]
1. Definition of research problem		√
2. Development of hypotheses or research questions (empirical studies)	√	√
3. Development of theoretical propositions (theoretical work)		
4. Theoretical foundation / Literature review	√	√
5. Definition of methodological procedures	√	√
6. Data collection	√	
7. Statistical analysis	√	√
8. Analysis and interpretation of data	√	√
9. Critical revision of the manuscript		√
10. Manuscript writing	√	
11. Other (please specify)		