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Proposition of an Objective and Standardized Sustainability Index: An Alternative to ISE B3

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Abstract

In Brazil, the financial advances in market in the recently years are visible, the type B3, is in progression. Studies about the difficulty of measuring corporate sustainability, mainly through qualitative research, fail to assess corporate social performance in companies, mainly because biases and heuristics end up altering the perception of decision makers, making conceptions that should be biased. be rational. Through the MAUT multi-criteria decision support method, we propose an alternative sustainable development index to the ISE with information from the financial statements, considering the proposed index efficient and correlated with the other ESG indexes of B3.

Keywords: Index, MAUT, sustainable development, financial market

1. Introduction

In the capital market, it is no exaggeration to say that deficit agents (capital borrowers) were much closer to surplus agents (capital providers), resulting in benefits such as reduced fees,

speed and security of transactions, since in few areas the science and technology have been so applied (Cavalcanti and Misumi, 2009). In Brazil, the advances in recent years are visible, B3, the only stock exchange in the country, is the largest in Latin America, with a market capitalization in the range of US$ 1,078 trillion and 383 companies with listed shares.

In the progression of this development and stakeholders increasingly avid for information that gives them security in their investments, topics such as institutional efficiencies, motivations of economic agents, market organization, corporate sustainability intertwine and are objects of analysis (Pinheiro, 2019). The relationships of publicly traded companies with investors, the environment and the community in which they operate, created an important debate of multiple environmental, social and corporate governance and compliance interest, called ESG, regarding decision-making. In short, the profitable and healthy longevity of the company is directly related to "the entire management and monitoring process that takes into account the principles of corporate responsibility (fiscal, social, labor, community, environmental, corporate), interacting with the environment and the public " (Gonzalez, 2012).

Given the dissemination of sustainability precepts in Brazil, which is increasingly present among stakeholders, the need to create performance indicators on the Brazilian stock exchange, B3 , arose . In the country we can list The Carbon Efficient Index (ICO2), created in 2010, aims to be an instrument inducing the discussion of climate change, taking into account greenhouse gas (GHG) emissions, in 2020 the S&P /B3 ESG Index was created, which encompasses all publicly traded companies on the stock exchange, its methodology uses a questionnaire that weights the index together with the performance of the participant in the UN Global Compact (UNGC) and excludes those with disqualifying scores or from sectors such as tobacco, weapons and thermal coal, and lastly, the Corporate Sustainability Index (ISE), among those mentioned above, this index is the best known and used as a benchmark metric, created in 2005, it measures the average performance of the assets of companies that have recognized their commitment to sustainability being composed of a variable portfolio of companies that reach a certain score in a compiled between a questionnaire, an index referring to m climate change and a reputational risk index on ESG aspects (B3, 2021).

However, studies such as the one by Moreira (2020) have asked about the difficulty of measuring corporate sustainability, mainly through qualitative research such as interviews and questionnaires, which fail to assess the environmental, social and governance impact of the company. In parallel, the measurement of an objective index that is not influenced by emotions or convictions of the parties related to the corporations that compose it is impaired, as Douglas (2015) explains "Our minds are not naturally programmed to be objective [...] Our convictions will always present a limited version of the possibilities of the environment [...] not necessarily an absolute statement of reality", resulting in the valorization or devaluation of a certain question put under evaluation.

Another sensitive point is the lack of data standardizing, based on the assumption that the best way to obtain uniform and reliable information from a company is through accounting-financial reports governed by normative instructions or pronouncements. In August 2004, the Federal Accounting Council tried to minimize this problem, approving the Brazilian Technical

Accounting Standard No. 15, which deals with information of a social and environmental nature, in which the company should disclose the expenditure of resources related to: a) generation and distribution of wealth, b) human resources, c) interaction of the entity with the external environment and d) interaction with the environment, however the non-mandatory and non-existence of an International Financial Reporting Standard (IFRS) discouraged the adoption of the NBC -T15, we currently only find outdated social balances on the companies' investor relations sites.

From the above, our problem arises, how can we measure sustainability indices in the most objective way possible and that bring less risk of biased effects, using mandatory, reliable and standardized accounting and financial statements, common to all Brazilian publicly traded companies? The objectives of this article are to develop a sustainability index that uses accounting-financial metrics in its methodology , weighted by environmental, social and governance criteria through information in publicly available reports, adopt and structure a multi-criteria method that is best suited to measure the preference of a set of alternatives in certain criteria, define the alternatives and criteria of the model according to the information in the financial statements that best inform aspects of sustainable development and finally apply the methodology in a practical case and compare the result with Brazilian market indices and corporate sustainability.

1.1 Theoretical Reference

The literature defines the desirable properties of an index as a good indicator, among other attributes, being reliable, useful, not too expensive, having a theoretical basis, being easy to understand both its result and its construction and being sensitive to changes in the measurable object (Carvalho and Barcellos, 2010). More specifically in the area of sustainable development, information on corporate social performance (CSD) is extremely important for us to assess the results of policies and practices of organizations, so that this information on social performance results in good indicators of sustainable development for companies. According to Pereira *et. al.* (2020), evaluating the performance of corporations and understanding what makes them perform better than others are purposes of studies of strategies and organizations, which arouses the interest of both researchers on the subject and managers.

1.2 Corporate social performance (CSP) and accounting-financial statements

This study aims to integrate the basic qualitative characteristics of accounting in terms of understandability, relevance, reliability and comparability, with corporate results and practices, which reflect the responsibility of the business for the various social goods (Salazar, Husted and Biehl, 2012).

According to, Szüster, Szüster and Szüster (2005) as a social science, accounting is a product of the environment reflecting the different socio-economic-political-legal conditions , financial statements constitute the great platform of security for all economic agents . As a consequence, in order to fulfill its mission, it must follow the changes in the society in which it operates. It is important that there is society's perception of the seriousness and validity of the accounting structure. Financial statements are an important source of information to guide investment and

financing decisions and support stakeholders ' forecasts , whether they are anywhere in the world. The preparation of these statements requires uniform rules, the convergence to accounting standards makes it possible for investors and organizations to analyze and interpret company information (Silva, Bringhenti and Klann , 2018).

Despite the accounting evolution and harmonization process carried out by the Accounting Pronouncements Committee (CPC) with the convergence to the international accounting standards issued by the International Accounting Standards Board (IASB), institutions still do not contemplate accounting pronouncements (*standards*) regarding sustainable development. But with the internationalization of the economy, consequently a dynamic and competitive environment, the importance of economic-financial information for decision-making has been accentuated, which requires more information, including ESG, from the accounting department regarding the transparency of companies, having greater visibility so that they can play their role in society (Garcia, Sousa-Filho and Boaventura , 2018), the awareness that the benefits of disclosure for companies have contributed to the dissemination of various optional information, such as the demonstration of value added, social balance, the statement of cash flows and information by business segment (Silva, Bringhenti and Klann , 2018) which gives relatively acceptable subsidies for the analysis of data relevant to sustainability.

Studies on corporate social performance (CSD), initiated in the 1980s, basically relate to business ethics, corporate citizenship, sustainability and stakeholder management. In general, the CSD is a configuration of the business of each company in the processes of responsiveness, principles of social responsibility and policies, programs and observable results related to the organization's social interactions (Wood, 1991, *apud.* Garcia, Sousa-Filho and Boaventura , 2018). The studies mainly consider environmental, social and governance (ESG) databases, reputation indices, sustainability reports and questionnaires (Xie *et. al* , 2019, *apud.* Pereira *et. al.* 2020).

According to Pereira *et. al.* (2020), in the literature on CSD, it appears as the link that interconnects the activities and investments of corporate social relations - CSR (*input)* with the actions carried out by stakeholders *(output)* in relation to corporations. In this context, how companies respond to stakeholder assessment of their social performance becomes an important issue, prompting them to increase their voluntary CSR activities, this is especially true for companies operating in countries where strong demonstrations of commitment to employee well-being, customer satisfaction, social contribution, and environmental protection. Given that social problems such as poverty and environmental problems such as global warming have intensified in the world (Xu and Zeng , 2020).

1.3 Sustainability Index - ISE and the Halo Effect .

The history of indices directly related to sustainability is recent, mainly as a result of the emergence of the sustainability agenda, recognizing the various social and environmental problems not addressed by economic systems. Societal pressure groups are starting to demand more responsibility from companies in dealing with global problems, many of them considered externalities of economic activities. Thus, while corporations started discussions on corporate sustainability, the financial sector started the debate on socially responsible investment. The

Dow Jones, a leading company in the index segment, was the first major group in the sector to incorporate sustainability into its products, Dow Jones Sustainability Index (DJSI) was launched in 1999 by Dow Jones Indexes and Sustainable Asset Management (SAM), Swiss asset manager specializing in companies committed to social, environmental and cultural responsibility (Monzoni , 2005).

The corporate sustainability index (ISE) was created in 2005 and according to Silva and Callado (2017), this index aims to reflect the return of a theoretical portfolio composed of shares of publicly traded companies on B3 with recognized commitment to social responsibility and corporate sustainability, and also to act as a promoter of good practices in the Brazilian business environment. This index invites companies from the eligible universe annually to participate in a selection process where corporations must cumulatively meet several criteria. Data collection takes place through responses to the ISE B3 questionnaire. The answer is voluntary and self-reporting, and the respondent must be rigorous and conservative. The information in the questionnaire defines the base score of each of the issuing companies and is complemented by the score CDP- Climate (index used to evaluate companies in relation to issues related to climate change) and the Rep risk Index , which is an index of reputational risk in ASG aspects (B3, 2022).

However, the voluntary and self-reported adoption in a questionnaire makes the index inconsistent and unreliable due to the biases that the Halo Effect implies in the responses of this tool used as a metric to define the weights of the ISE.

In behavioral economics, several biases that end up changing the perception of decision makers were classified, making conceptions that should be rational biased. What often happens in the results of a questionnaire answered by the top management of corporations is what Tversky and Kahneman (1974) classify as an affect heuristic, in which people let their dislikes and sympathies determine or at least have a decisive weight in the your beliefs about a given situation, your preferences determine the arguments you deem correct. Kahneman (2012, p.177) proposes that estimates of results proposed by people, depending on their emotional state or their convictions, play a central role in decision making.

The Halo effect is a cognitive bias whereby people form an opinion about a characteristic of an attribute based on their positive or negative predisposition (Nicolau, Mellinas , and Martin-Fuentes , 2020). The context in which judgments about performance are formed and in which evaluations are obtained are influenced and represent a bias in judgment in which overall impressions of the company's performance have an undue effect on specific judgments of the topic being considered in the questionnaire. , in addition to the familiarity of the appraiser (manager) with the appraisee (company) can influence (Murphy, Jako and Anhalt , 1993). When people form impressions from limited information that may not always be objectively correct, they can inhibit more objective evaluation processes and result in distortions. Considering the biased effect of interviews with managers, Rosenzweig (2021, p. 72) rejects that a good way to minimize the Halo Effects is not to ask managers if their companies have good results in sustainable development, but to use a set of data independent to make this assessment.

2. Materials and Methods

The characterization of our study is configured as applied research regarding its purpose, since the main intention is to offer a practical model for the solution of the problem of the corporate sustainability index - ISE, regarding its objective, exploratory character, since " seeks to understand the problem faced by the researcher, as well as to gather ideas and information" (Malthora , 2012, apud Bezerra, 2021) and classified as qualitative because it tries to build a new approach to measure ESG issues based on the literature review and quantitative because it uses of a matrix mathematical model to define the index (Manoel Júnior, 2020).

The study will cover the concepts of the multi-criteria decision support method in order to define the criteria to be considered.

The selection of shares participating in the Ibovespa will be our population reduced to a sample, the 30 companies with the highest trading volume included in the highest level of transparency of the B3, the Novo Mercado and with a free float equal to or greater than 40%. The period of data analysis will be the year of price quotations of the year 2021, based on the financial statements of the directly previous year to carry out the methodology of multi-criteria analysis in the theory of multi-attribute utility (MAUT) and define the weights of each asset.

In the 1960s, the first multi-criteria methods to aid decision making appeared. This methodology seeks to clarify and usually recommend, or favor a decision, in order to raise the consistency and evolution of the process and objectives, as well as value systems (Figueira et al., 2005, apud Sebba, 2012), and also seeks to build a structure of the problem, proposing an evaluation model given the preexisting reality (Bana et al. Costa, 1993, apud Sebba, 2012).

In the universe of Multicriteria Decision Aid (MCDA) we find a variety of schools, which we have to define which ones best suit our objective, in studies of literature review Steuer and Na (2003), as cited by Dembogurski (2008), and Bezerra (2021), most models linked to the area of finance and corporate sustainability are related to compensatory methods of the American school, in particular, the TOPSIS (Technique for Order) preference by Similarity to Ideal Solution), AHP (Analytic hierarchy Process), MAUT (Multi-Attribute Utility Analysis in English) and ANP (Analytic Network Process in English).

The Multiattribute Utility Theory (MAUT) was developed in 1976, it is part of the American school which has its main characteristic to use the value function (category that considers conditions of certainty) or utility function (category that considers conditions of uncertainty and risk associated with alternatives) as a representation of decision preference, this function provides a value to each alternative, where the one with the highest score performs better (Gomes et al., 2009). According to Sebba (2012), the additive utility function is the most common way of evaluating and aggregating alternatives with multiple attributes, basically it first calculates the usefulness of the alternatives in each of the criteria separately, then the values in each are multiplied. criterion by their relative weight, to add the final values that define a score, represented by the following equation:

$$v(a) = \sum_{i=1}^{n} w_i . v_i(a)$$

Where $v(a)$is the total value of alternative "a", $v_i(a)$ is the value of alternative "a" in criterion "i", for "i"= 1, 2, ..., n, and $w_i$is the weight of criterion "i" . The MAUT method was selected for this study, as it is widespread and has a vast literature; the utility function having the option of being cardinal, providing the intensity of preference (value) of an alternative; simplicity in its development, not requiring hard-to-access software licenses; and easy intelligibility of the results (Sebba , 2012).

Then, defining that the multi-criteria decision support model will be the MAUT method, where each alternative has an evaluation according to its performance relative to each defined criterion, it was extracted from the following mandatory financial statements for publicly traded companies listed on B3 (Reference Form, Balance Sheet, Income Statement for the year, Income Statement for the Comprehensive Year, Statement of Changes in Equity and Statement of Cash Flow) the updated data of the criteria that were used to build the decision matrix.

Table 1. Criteria and weights of the decision matrix.

Dimension	Criteria	Description	Weight
Environmental	Investment Cash Flow (C1)	Indicates investments in new projects for energy efficiency, consumption of raw materials, gas emissions, etc.	0.17
Socio-environmental	Sector of Activity (C2)	Filtering based on socio-environmental risk criteria	0.16
	Labor/Environmental Processes (C3)	Indicates the amount provisioned for lawsuits and fines likely to have to be paid .	0.11
Social	Employee Compensation (C4)	Indicates how the company cares about the cost of living of its employees	0.12
	Turnover Index (C5)	Represents the average rate of layoffs in relation to the average number of employees in the company.	0.11
Governance	External audit (C6)	Indicates how much the company is willing to pay to make its financial disclosures and compliance more transparent	0.11
	Related parts (C7)	Relationship with other companies in which their controlling partners are owners and which may cause a conflict of interest	0.11
	Board of Directors (C8)	Number of professionals that make up the board of directors.	0.11

Source: Authors

3. Results

The data necessary to carry out the analysis were taken from the B3 website, R programming

was used with the help of the Quantmod , PerformanceAnalytics and Tideverse packages , for the modeling of the study in question, and the data referring to the end of the 2020 accounting year were collected between the 25th and 28th of February. According to the selection criteria listed in the methodology, the 30 actions that were chosen follow: VALE, MGLU, B3SA, HAPV, VIIA, PRIO, JBSS, BBAS, NTCO, LREN, BRFS, RAIL, WEGE, RENT, LWSA, TOTS , CSAN, EQTL, AMER, RADL, VBBR, SUZB, BRML, CIEL, RRRP, EMBR, UGPA, MRFG, ENEV, CCRO.

The decision matrix was built with the evaluation of each alternative according to its criteria, to then carry out the normalization of the same giving maximum value to the best alternative, minimum to the worst alternative and by interpolation to intermediate values, according to the equation where $X_i$it refers to the value to be normalized, X_{min}it is the smallest value in the range of a certain criterion and X_{max} is the maximum value of the criterion in the interval.

$$X_{normal} = \frac{X_i - X_{min}}{X_{max} - X_{min}}$$

Since the scales of criteria used to analyze potential actions come from different scales.

After normalizing all the values of the decision matrix, the MAUT method was used, through the program developed in R software, also considering the scale factors of the criteria present in Table 1. At the end, the value was determined in an additive way total of alternatives.

Although the main objective of this is not the comparison of our proposed index with the Business Development Index - ISE, it is inevitable that we do not make some pertinent correlations. After setting the ideal weighting of each company's share for the index with objective and standardized preferences to ESG characteristics, we integrate these values with the daily price changes of each company during the year 2021 and compare with the performance of the ISE in the same period.

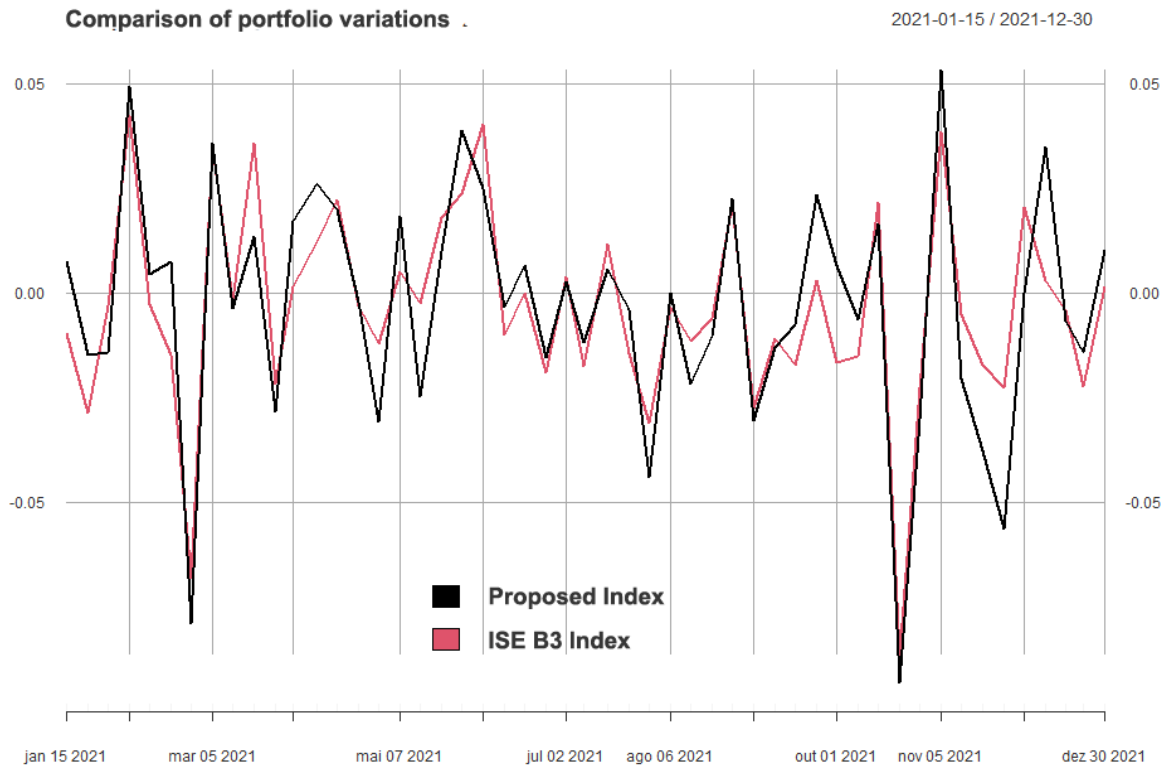
It is observed that the positive and negative variations of the two indexes present a strong correlation, however the index proposed in this article, represented by the black line, in situations of more accentuated highs or lows of the market tends to have greater variations, this can occur due to smaller amount of assets that make up it (30 companies) compared to the amount that make up the ISE (46 companies).

With regard to the performance accumulated during the year under study, from the beginning to mid-November the proposed index performed better than the ISE, closing 2021 again with better performance, despite most of the year the two indexes showed a downward trend. . This trend, it is worth mentioning, is strongly related to the COVID-19 pandemic.

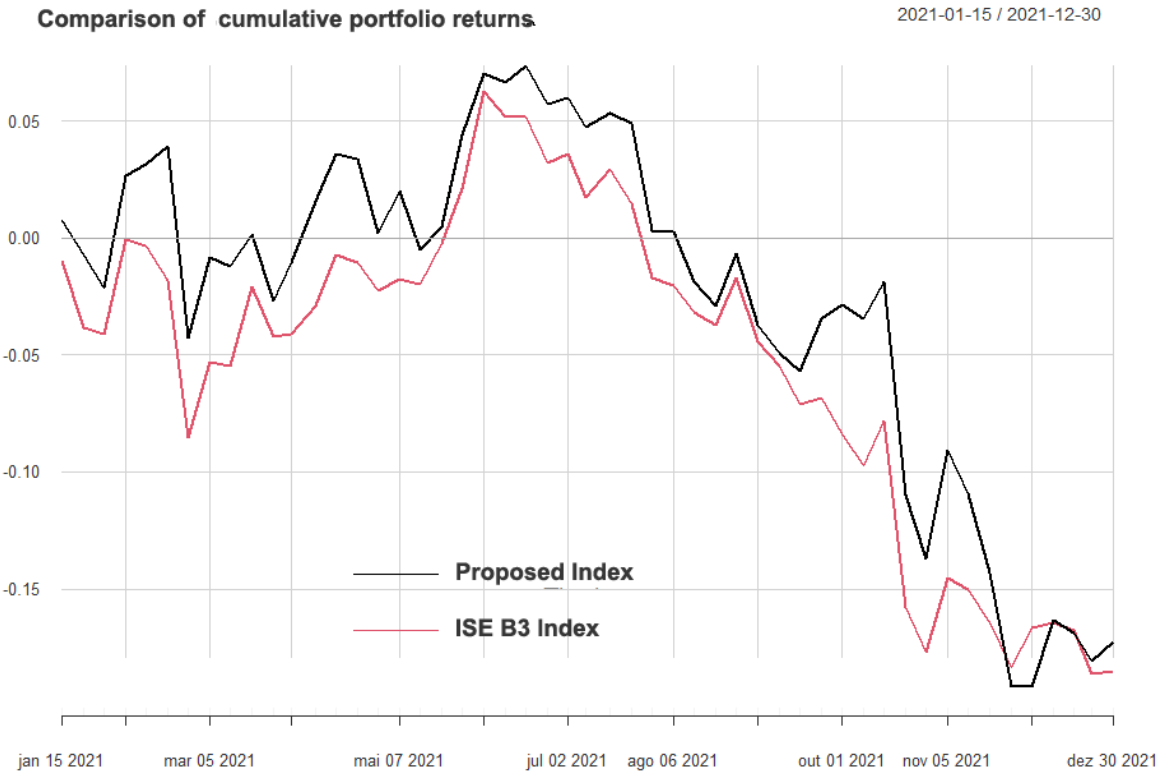
Table 2. Decision matrix composed of the 30 assets and their criteria in the normalized MAUT model.

	C1	C3	 C4	C5	C6	C7	C8	C2	Total Score	Weights in the Index
Weight	**0.17**	**0.11**	**0.12**	**0,11**	**0,11**	**0,11**	**0,11**	**0,16**		
JBSS	0,00250	0,10676	0,00165	0,09499	0,00000	0,10698	0,02563	0,07111	0,40960	**3,19%**
MRFG	0,00229	0,10703	0,00214	0,11000	0,00191	0,10988	0,03500	0,07111	0,43936	**3,42%**
BRFS	0,00268	0,08467	0,00079	0.09961	0.00481	0.09479	0.03500	0.07111	0.39345	**3.06%**
RAIL	0.01060	0.06166	0.00028	0.10240	0.00750	0.10764	0.03500	0.08889	0.41397	**3.22%**
WAYS	0.00148	0.10602	0.00112	0.10423	0.00500	0.10972	0.04594	0.08889	0.46239	**3.60%**
EMBR	0,00297	0,09975	0,00523	0,10974	0,01879	0,10399	0,05219	0,08889	0,48155	**3,75%**
CCRO	0,00208	0,10017	0,00249	0,09927	0,01068	0,09076	0,05375	0,08889	0,44809	**3,49%**
MGLU	0,00233	0,08622	0,00473	0,08688	0,00117	0,10848	0,01938	0,10667	0.41587	**3.24%**
VIIA	0.00216	0.10901	0.00426	0.08753	0.00908	0.10943	0.00688	0.10667	0.43501	**3.38%**
LREN	0.00357	0.10400	0.00287	0.07602	0.00460	0.11000	0.01938	0.10667	0.42709	**3.32%**
RENT	0.00205	0.09655	0.00275	0.10503	0.00208	0,10918	0.02147	0,10667	0,44577	**3,47%**
AMER	0,00667	0.09933	0,00574	0.05395	0,00434	0,10812	0.03188	0,10667	0,41669	**3,24%**
NTCO	0,00132	0.08618	0.01841	0,10026	0.01169	0,10951	0.03813	0.03556	0,40104	**3.12%**
B3SA	0.00000	0,10002	0.03732	0,10342	0.00484	0,10915	0.03188	0.14222	0,52886	**4.11%**
BBAS	0.01921	0.06070	0.00390	0,10843	0.00350	0,10975	0,11000	0.14222	0,55772	**4.34%**
BRML	0.02667	0.07158	0.06638	0.09773	0.02320	0,10748	0.01938	0.14222	0,55464	**4.32%**
SKY	0.00343	0.00000	0.02530	0.08632	0.00545	0.10484	0.04438	0.14222	0.41193	**3.20%**
VALE	0.00467	0.09179	0.01316	0.10595	0.00271	0.07456	0.05838	0.01778	0.36899	**2.87%**
SUZB	0.00238	0.03844	0.00490	0.10261	0.01576	0.00000	0.03213	0.01778	0,21399	**1.66%**
PRIO	0.00944	0,10293	0.02309	0.08778	0.01672	0,11000	0.00272	0.00000	0,35268	**2.74%**
CSAN	0.00609	0.09479	0.00000	0,10520	0.01123	0.06523	0.03344	0.00000	0,31598	**2.46%**
VBBR	0.00195	0,10246	0.02357	0,08656	0,00001	0,02009	0,02225	0,00000	0,25689	**2,00%**
RRRP	0,17000	0,10141	0,12000	0,00000	0,11000	0,10329	0,00000	0,00000	0,60470	**4,70%**
UGPA	0,00243	0,10261	0,00456	0,09418	0,00397	0,10936	0,04359	0,00000	0,36071	**2,81%**
HAPV	0,00450	0.07853	0.00020	0.10983	0.00281	0.10501	0.00688	0.16000	0.46777	**3.64%**
RADL	0.00261	0.10937	0.00190	0.08770	0.00058	0.10996	0.03916	0.16000	0.51127	**3.98%**
LWSA	0.01028	0.10874	0.00410	0.09064	0.03547	0.10993	0.01000	0.12444	0.49360	**3.84%**
ALL	0.00499	0.07760	0.00380	0.09860	0.03935	0.10922	0.01522	0.12440	0.47324	**3.68%**
EQTL	0.00517	0.06483	0.00350	0.09273	0.00261	0.10910	0.02563	0.05333	0.35689	**2.78%**
ENEV	0.01922	0.11000	0.00961	0.09997	0.02847	0.11000	0.00297	0.05333	0.43358	**3.37%**
Total	0.34	2.66	0.40	2.79	0.39	2.95	0.92	2.42	12.85	**100.00%**

Source: Authors



Source: Authors' Model



Source: Authors' Model

4. Discussion

It was considered plausible the hypothesis proposed in this article that the modeled index has a close relationship with the results presented by the corporate sustainability indices available on B3, using official accounting and financial information, avoiding as much as possible the affective bias affecting the Halo Effect, by use of questionnaires to weight assets in indices.

Considering the development presented here, it is also concluded that with a practical process of choosing a portfolio using only indicators extracted from accounting reports, can be easily used as a measure of Sustainable Development for investors in the Brazilian stock exchange, promoting the dissemination of more subsidies of information on the subject in the financial market.

5. Final considerations

The work proposed here is not exhaustive, that is, given the various ways of weighting the criteria and so many decision support models, there are several different ways to approach the problem of choosing that meets the stakeholder's requirements, either by adding or restricting criteria, however, the biggest concern, or focus, is on the model presented and not on the peculiarities and discussions that involve the problem.

Given that discussions on sustainable development and ESG are relatively recent, it is extremely important to produce studies that will contribute to the agenda. It is recommended, for future works, the expansion of both the criteria and the alternatives of the model, with regard to the criteria, information from the Global Reporting can be added Initiative (GRI) and as for alternatives, use a larger sample of publicly traded companies on B3 that provide ESG information will make the indicator more robust and reliable. Another line could be the development of indexes with other multicriteria decision support methods, such as AHP, TODIM and TOPSIS.

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