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The BRICS in the sustainable agenda: Performance analysis of ESG indices in the financial markets in Brazil, China, India and South Africa

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ABSTRACT

The term ESG emerged in the report of the Global Compact (UN) in partnership with the World Bank, entitled Who Cares Wins: Connecting Financial Markets to a Changing World. However, the concept and measurement associated with ESG is not a fixed concept and there is no consensus on the exact list of issues and their materiality, but it is certain that it affects the value creation of a company. In 2006, a grouping was created, incorporating the foreign policy of Brazil, Russia, India and China, the bloc focuses on solving socioeconomic problems and using its competitive advantages, the BRICS has a proposal for sustainable development and consequently ESG. This study is justified by the fact that several empirical evidences show the benefits of the ESG agenda in the market, however, there is a gap when considering developing countries. In this article, a comparison was made between returns and performances through the average return, then the risk measurement measures are presented, namely variance, standard deviation, volatility and value at risk, in addition to the calculation of covariance, correlation, beta and drawdown, with data from the MSCI ESG Leaders index. We confirm the theory of long-term gains since in the period studied the average profitability of the ESG indices were higher in all countries compared to the broad index. As for volatility risk measures, our study confirmed the hypothesis that the risks of larger companies are greater than those of ESG companies.

Contribution/Originality: This study differs by enriching the discussion of the concept and measurement associated with ESG, since there is no exact consensus on the subject. Especially when considering developing countries, there is a gap on the subject.

1. INTRODUCTION

Social norms shape economic behavior and can influence market outcomes, social and environmental responsibility has become a focal point of society in recent years and this trend has spread to financial markets (Amel-Zadeh & Serafeim, 2017). Historically, the inclusion of social, environmental and/or governance issues in investment decisions has existed since the 19th century. However, it was in 1960 that, due to some historical events, a concern began with the environmental problems generated by the incompatibility of production with the regeneration of the environment, discussing the environmental impact of the chemicals, oil and pulp and paper sectors, in addition to the social implications of the Vietnam War, the struggle for civil rights in the USA and apartheid in South Africa , these issues were each increasingly inserted in the decisions of activist investors (Eccles, Lee, & Stroehle, 2020).

Before the year 2004, issues about regarding the environment (climate change, energy and water use, carbon emissions), society (fair trade principles, human rights, product safety, gender equality, health and security) and

corporate governance (board independence, corruption and bribery, reporting and disclosure, shareholder protection), did not include the term ESG as an acronym. The first appearance of such, came in a report by the United Nations (UN) Global Compact in partnership with the World Bank titled *Who Cares Wins: Connecting Financial Markets to a Changing World*, Kofi Annan invited a joint initiative of 50 chief executive officers (CEOs) of major financial institutions to develop guidelines and recommendations on how to best integrate environmental, social and corporate governance issues into the asset management, securities brokerage services and associated research functions. The initiative's report was endorsed by a group of 20 financial institutions, comprising major banks (BNP Paribas, HSBC and Morgan Stanley), financial asset owners (Allianz SE and Aviva PLC), asset managers (Henderson Global Investors) and other stakeholders (United Nations Global Compact & Slingue, 2021). In line with ESG objectives, the following year the Freshfields Report of the UN Environment Program Finance Initiative was issued, which provided the first evidence on the financial relevance of ESG issues and discussed at length the concern of fiduciary duty in the use of this information in decisions of investment (Eccles et al., 2020). Interest in the ESG agenda has grown exponentially, with the emergence of the Responsible Investment Principles (PRI in portuguese), launched in 2006, in which managers and investors pledged to incorporate ESG issues into their analysis of investments and management policies and practices, currently surpassing more 3,800 signatories and has approximately US$120 trillion in assets under management (Galbreath, 2013; United Nations UN, 2016).

The growth of interest in ESG issues by managers and investors has culminated in an increase in demand for data specially to inform and support what is often called responsible, impact or ESG investing which has spurred the creation and growth of an entire provider sector. this information in a relatively short period of time. The origin of these organizations can be dated back to the end of the 1970s, when sustainability issues entered the capital market metrics, often driven by Non-Governmental Organizations (NGOs) that sought to inform investors about the involvement of companies in controversial issues (Eccles & Stroehle, 2018) officially Vigeo-Eiris was the first ESG data classification company, it emerged in 1983 in France, basically to serve specialized investors such as religious organizations, culminating from then on several other corporations with this purpose in the world. Currently, after several mergers and acquisitions, the main providers of this data are pointed to: Vigeo-Eiris (acquired by Moody´s), Sustainalytics (acquired by morningstar), ISS-Oekom, Bloomberg and MSCI. From this ESG rating data supply, insights were used to create indices such as the Dow Jones Sustainability Index (DJSI), the FTSE4Good Index Series, MSCI World ESG Leaders Index and others , thus rating agencies and Indices seek to provide investors with a way to assess the ESG performance of companies in a similar way to credit ratings by allowing investors to analyze the quality of particular companies. (Berg, Koebel, & Rigobon, 2019). The growth of the ESG market shows that these ratings are likely not only impacting the financial market but also the behavior of corporations and their managers who need to adapt to the concerns of their shareholders and stakeholders, i.e. understanding the link between environmental and financial performance, in the face of a global industrial restructuring in which the 'eco-efficiency' and environmental performance of companies are becoming much more critical for their competitiveness, profitability and even survival (Eccles et al., 2020).

2. LITERATURE REVIEW

2.1. ESG Concepts

The concept, and associated measurement, of ESG, has no consensus on the exact list of issues and their materiality, yet the concern regarded is that some of them may affect the value of a company's creation. These issues are increasingly current because a growing portion of the company's value is within intangible assets (Matos, 2020), although without formal definition, it is undoubtedly powerful. ESG is not a fixed concept, apart from the combination of three important categories, most ESG metrics are very diverse in application used to create corporate reports, rankings, various portfolio rankings, sustainability indices, etc (Eccles & Stroehle, 2018). In Brazil, for example, we can mention some important indices such as the Corporate Sustainability Index (ISE in portuguese) , Efficient Carbon

Index (ICO2 in portugese), Index with Differentiated Corporate Governance (IGC in Portuguese) , among others. Although there are criticisms regarding the differences in classifications that can change the results of the conclusions, preventing prudent decision-making that contributes to an environmentally sustainable and socially fair economy (Berg et al., 2019) a good range of researchers such as Beal et al. (2017) quoted Eccles and Stroehle (2018) believe that the demand for high quality ESG data will likely continue to grow, as there is empirical evidence that positive ESG performance is related to positive financial performance, and that incorporating ESG data into decisions investment can contribute to superior returns.

Other advantages are listed when talking about investment management focused on the ESG agenda, De Carvalho, ChimMik, Da Silva, and De Araújo Carvalho (2019) states that the practice of choosing investment alternatives based on environmental, social and ethical aspects opens a new front in the analysis of the competitiveness of companies in the market, attracting more investors and improving competitiveness since investors are looking for social investment responsible. For Pástor and Vorsatz (2020) investors are seeking protection in funds with higher sustainability ratings as they perform better and are more resilient during a major crisis; Berg et al. (2019) cite that good ESG ratings helped sustain stock returns during the 2008 financial crisis, indicating that they are seeing ESG issues as a necessity. Eccles and Stroehle (2018) and Chouaibi, Rossi, Siggia, and Chouaibi (2022) state that investing in corporations aligned with the ESG raise financial returns in investors' portfolios in the long term, by improving the company's competitiveness, since it positively influences its image regarding ethical reasons, transparency, in the evaluation reputation, legal and regulatory risk that consequently positively impacts financial performance, along the same lines Amel-Zadeh and Serafeim (2017) gave evidence in their studies that investing in ESG-oriented assets mitigate negative externalities and have less systematic risk, attracting thus a positive risk premium. Bassen, Meyer, and Schlange (2006) provide evidence that a corporation's ESG profile has a significant effect on its cost of capital, in particular, both equity investors and private lenders consider concerns this agenda by the company, leading to a higher cost of equity and debt for the company as lenders charge lower interest rates on bank loans to companies that earn significant revenues from products with sustainable appeal.

We justify this study, due to the fact that several empirical evidences already show the beneficial effects of the introduction of ESG agendas in the financial market, however there is a gap in this subject, when we take into account developing countries that have great potential for growth in these issues and many holds the main positions in population, territory and also, holders of reserves of different strategic natural resources, including hydrocarbons and rare -earths, as well as important sources of biodiversity such as the BRICS, countries that are active protagonists in the politics of their respective regions, engaged in integration and cooperation projects with their neighbors (Baumann et al., 2015) data show that investment in ESG is more widespread in Europe, but has grown rapidly in the United States and is taking over emerging countries , even with an embryonic capital market (Matos, 2020).

2.2. Particularities of Two BRICS

The creation of the acronym BRICs (even without the insertion of South Africa) was created in 2001 by the economist Jim O'Neil when the report entitled "Building Better Global Economic BRICs", was published by the investment bank Goldman Sachs, to which O´ Neil held the position of Chief Economist, and there he presented forecasts on the evolution of the economies of Brazil, Russia, India and China that predicted a markedly superior economic performance for these countries in relation to those projected for the G7 countries -(group of the seven most industrialized countries in the world (Germany, France, Italy, United Kingdom, USA, Canada and Japan) , since they had a positive demography and were carrying out significant structural transformations, qualifying -them as interesting destinations for investment (Baumann et al., 2015). The 2001 report predicted that the economies of the BRICs would represent, together, 14% of world Gross Domestic Product (GDP) in 2011, in contrast to what was presented in the year in question, in which the participation of these countries in world GDP was already greater than 18 %. According to Baumann et al. (2015) a publication compiled on the bloc in 2007, made the boldest prediction,

stating that, in 2050, the BRICs would be among the six largest economies in the world, along with the United States and Japan.

In 2006, the concept gave rise to a grouping itself, incorporated into the foreign policy of Brazil, Russia, India and China, with the emergence of a political mechanism of cooperation and coordination bringing together these countries, as a rule, the bloc focuses on solving strategic socio-economic issues and the efficient use of national competitive advantages, based on a comprehensive assessment of their possible contribution to achieving sustainable socio-economic development and strengthening national competitiveness, the long-term objective of the partner countries is to transform the BRICS into a complete platform for continuous and strategic interaction on key issues (Sokolov, Shashnov, & Kotsemir, 2021). In 2011, on the occasion of the III Summit in Sanya, South Africa became part of the group, at the suggestion of the hostess at the time, China, and from then on, the acronym BRICS was adopted. For Daldegan and Carvalho (2022), it is regarded as a dynamic phenomenon since the development follows the perceptions of the members on the world stage accordingly, without establishing limitations on the strategies and initiatives of each member country and process in which the members do not point to any destination or institutionalization to be achieved, despite this, the main objective of the group's institutional emergence is to multiply the instances of dialogue and the joint action of the five members at different levels of representation, starting to designate the vision of the countries themselves about their opportunities for joint action and their place on the international scene . In short , influencing global geopolitics and the market, based on the alleged importance of large developing countries with a crucial role in the economy (Medeiros, Ribeiro, & Lyra, 2017). Another peculiar point of the BRICS is its informal yet proactive and participatory nature, as according to Baumann et al. (2015) the bloc does not have a constitutive treaty or secretariat, the activity of the mechanism is guided by the political will of the Heads of State and Government (called Leaders), who adopt a declaration at each summit. The fulfillment of activities agreed by the Leaders takes -place during the period between summits, through meetings and sectoral activities, while political dialogue is conducted in meetings between heads of state and government.

Since its inception, the BRICS have indirectly proposed sustainable development and, consequently, ESG, studies by Wen et al. (2022) and Sokolov et al. (2021) on the performance of the BRICS from a sustainable perspective, state that the strong promotion of the socioeconomic performance of the region is highly plausible if one considers the efficient use of natural resources, invested and producing through sustainable technology. Since the beginning of the summits, ESG themes have been addressed, as stated by Lobato (2018) and social issues, such as equality, combating poverty and inclusive and sustainable development, with respect to the sovereignty of countries, are permanent flags of the group, thus creating a global governance based on the objective of economic development with human and social development and environmental sustainability.

As already evidenced, it is a consensus by several scholars that the way of thinking from the maximization of shareholder wealth is shifting towards the maximization of stakeholder wealth, the concept of ESG reporting is clearly connected to stakeholder theory, which emphasizes that organizations are obligated to meet the needs of both internal and external stakeholders of the company, the interests of stakeholders is the main focus of the sustainable business strategy based not only on maximizing economic profit, but also on maximizing the value of the company, which must be implemented through of an ESG management system. The objective here in this work is to interpret how this is unfolding in developing countries, specifically in Brazil, China, India and South Africa, since in most of them, financial markets and their products are still very young and undeveloped especially with regard to ESG aspects. However, they represent 41.2% of the world's population, 29.6% of the earth's territory and produce about 25% of the world's GDP (United Nations UN, 2022).

3. DATA AND METHODS

The characterization of the study is configured as empirical-analytical, with the approach used being identified as quantitative, usage of secondary data, in which a quantitative database of a determined sample, being presently

done. This follows the intent to establish relationships or inferences about the operationalization of a certain fact within science. Quantitative research serves as a means of testing objective theories, in which the relationship between variables is examined. Through the measurement of these variables by instruments used for this purpose, numerical data can be analyzed by statistical procedures (Alexandrino, 2020).

In this article, we will compare returns and performances by calculating the average return ($\bar{R}$) of the ESG indices and the broad index (Assaf, 2012) made available by the MSCI, for each country that is part of the BRICS. Next, a comparison will be made between the measures of variance (σ^2), standard deviation (σ), volatility (Vol) and value at risk (VaR), considering the returns of the ESG and broad indices for each country included in the BRICS, later also calculating the covariance ($\sigma^2_{A,B}$), correlation ($\rho_{A,B}$), beta (β) and drawdown (DD) of these indices, which according to Ross, Westerfield, and Jaffe (2011) are measures for measuring risk. For this, the algorithms will be applied and the results will be analyzed. It is worth mentioning that before these studies, the descriptive statistics of the indices (maximum, minimum, average, median and quartiles) will be analyzed, comparing them even between the countries of the bloc in question.

Secondary data will come from the "index factsheet" of the MSCI ESG Leaders index of Brazil, India, China and South Africa in the period from 2008 to 2021, Russia was not included in the study because its corresponding index has been discontinued by the supplier company of the Dice. The MSCI ESG Leaders index was chosen as a subsidy of secondary information for this study because it is the only survey that provided standardized information on the largest number of BRICS countries, over a longer period of time, openly and free of charge. Eccles and Stroehle (2018) emphasize that the MSCI ESG provides sustainability ratings for more than 6,000 companies and more than 400,000 stocks and fixed income securities, being the largest ESG rating agency in the world. These indices are designed to represent the performance of companies that have high environmental, social and governance (ESG) ratings relative to their industry peers, to ensure the inclusion of the best high-end companies from an ESG perspective, these indices are revised annually each May, overall, the MSCI ESG Leaders Indices aim for 50% coverage of the underlying MSCI core index (MSCI, 2020).

After the phases of choosing the period and surveying the indices, it is necessary to process the data. In this phase, the asset return rates (R_i) were first calculated using the expression below, where P_t is the share price at time t given in years to have the average return of the indices ($\bar{R}$).

$$R_i = \frac{P_t - P_{t-1}}{P_{t-1}}$$

The measure to characterize the distribution of rates of return is a measure of the risk existing in these returns. This measure is given by the degree of dispersion of the frequency distribution, that is, the measure of how much a given return can deviate from the average return. The measurement of the risk of an investment is generally processed using the probabilistic criterion. To know the variability of returns, the most commonly used measures are variance and standard deviation (Assaf, 2012). For the variance mathematically we have:

$$\sigma^2 = \frac{\sum_{i=1}^{T}(R_i - \bar{R})^2}{T-1}$$

Where $\bar{R}$ is the arithmetic mean of the sample of n elements and $R_i - \bar{R}$ deviation of each number R_i from the sample mean $\bar{R}$.

The standard deviation (σ) statistically measures the variability of a set of values in relation to its mean. It is a measure that informs how much the values of a set are distributed or dispersed in relation to their central point, to obtain it, it is enough to perform the square root of the variance (Levine, Stephan, Krehbiel, & Berenson, 2011) as follows:

$$\sigma = \sqrt{\frac{\sum_{i=1}^{T}(R_i - \bar{R})^2}{T-1}}$$

The historical volatility indicator (Vol) is calculated in percentage, from the standard deviation of the periods multiplied by the square root of the chosen number of periods, as can be seen below:

$$Volatility = \sigma \; x \; \sqrt{period}$$

Finally, we have the methodology for evaluating market risk VaR, which is a measure of the percentage loss of an investment portfolio subject to market risks, and is also known as the variance-covariance method or analytical method, taking the profitability data ($\bar{R}$), the historical risk (σ), and a random normal value (Z) for a given confidence level (α) we use the formula:

$$VaR = \bar{R} + Z_\alpha \sigma$$

The previous metrics serve to measure variables individually, if we want to measure the relationship between rates of return between two variables, we need a statistical measure of association between two variables. Correlation and covariance measure the intensity of association between two variables that are directly related (Ross et al., 2011) mathematically for correlation we have:

$$\sigma_{AB} = cov\,(R_A, R_B) = [(R_A - \bar{R}_A)x(R_B - \bar{R}_B)$$

Where $\bar{R}_A$ and $\bar{R}_A$ are the average returns for the period (expected) and $R_A \; e \; R_B$ are the actually observed returns for variables A and B.

The covariance returns us a numeric value, which unless we can put it in perspective, we don't know what to do with it, to solve this problem the correlation (ρ) is calculated, which is the division of the covariance by the deviations-standard of the returns, to which σ_A and σ_B are the standard deviations of the returns of the variables, it will always be oscillating between -1 and +1, due to the standardization process as a result of the division by two standard deviations, which allows us, consequently compare correlations of pairs of different variables (Levine et al., 2011) as follows mathematically:

$$\rho_{AB} = Corr(R_A, R_B) = {Cov(R_A, R_B)}\big/_{\sigma_A \; x \; \sigma_B}$$

It is worth noting that the order of the variables is not important, so the covariance or correlation of A with B is equal to the covariance or correlation of B with A.

Market indices are usually the composition of theoretical portfolios given some prerequisites for choosing assets, for Ross et al. (2011) the best measure of comparative risk between assets and broad indices is the beta (β) of this asset. The definition of beta can be the sensitivity of an asset to market movements, so mathematically we have:

$$\beta_A = {Cov\,(R_A, R_B)}\big/_{\sigma^2(R_B)}$$

Where $Cov\,(R_A, R_B)$ is the covariance between the returns of the asset and a broad index and $\sigma^2(R_B)$ is the variance of the broad index. If greater than 1, more sensitive, the asset will be more sensitive to market variations, if equal to 1, the asset will move according to the market and if beta is between 0 and 1 minus variations, the asset will suffer in relation to market fluctuations.

The concept of drawdown (DD) can be used to show a sharp loss in the value of an asset, investment, portfolio or index. We consider the drawdown to be the negative return observed between a maximum peak and the next minimum, and investors are generally interested in this metric in order to minimize the risk of large negative variations (Geronazzo, 2019).

Mathematically we can define it as follows: $DD_t = {(Min\,Value_t - Max\,Value_t\,)}\big/_{Max\,Value_t}$

Where the drawdown is calculated considering the maximum and minimum value in a given period t.

4. ANALYSIS AND DISCUSSIONS

The initial procedure for a better understanding of the variables studied was the analysis of the descriptive statistics of the MSCI ESG Leaders indices of Brazil, India, China and South Africa, in relation to the broad MSCI

indices of the BRICS countries. Figure 1 presents the box plots for the annual growth rate variables between 2008 and 2021 considering a portfolio of ESG companies and a portfolio with the largest companies in each country.
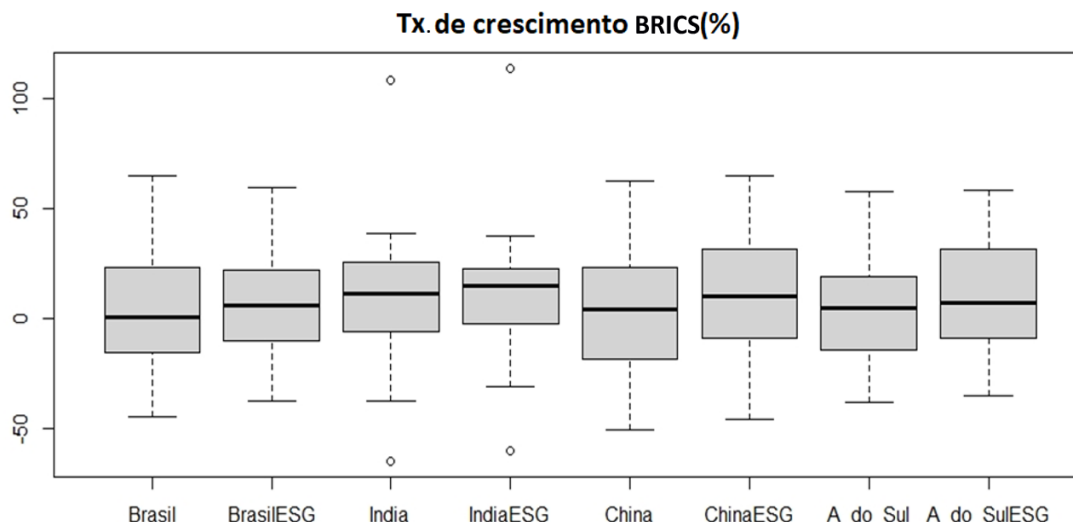

Figure 1. Box diagram of the annual variations of the MSCI indices in the BRICS from 2008 to 2021.

We can see that the lows of the leading MSCI ESG indices of all countries were lower than in their broad index, that is, in the years when there was a fall in the market of these countries, the ESG indices suffered less losses. As for the maximum growth rates, it is observed that all countries except Brazil, obtained more accentuated rises among the indices with ESG companies than in the broad index of the largest companies. Another point to be analyzed are the amplitudes of the maximum and minimum values, only in India did the ESG index vary more than the broad index, while in all the others the amplitude of variation of the ESG index was smaller, which may present us with a smaller variation given the economic situation of the period, it is worth noting that by presenting outliers, the interpretation may be compromised. When we analyze the bloxplot together with the calculation of the average return ($\bar{R}$) of the indices, we notice that they are higher among companies with an ESG nature than companies in general, as shown in Table 1, compacting with what we perceive graphically regarding the medians of the ESG indices higher than the broad indices in all countries.

Table 1. Average annual performance of the indices from 2008 to 2021.

	Brazil	India	China	South Africa
MSCI ESG leaders average return	5.59%	13.57%	10.46%	8.84%
MSCI Broad average return	4.29%	10.52%	6.74%	5.43%

Despite India having a higher average return ($\bar{R}$) in the period among the ESG indices of the other countries compared, China obtained a higher gap between the average returns of the ESG indices in relation to the broad indices with 3.72% of additional gain, on average, the ESG indices of the BRICS performed 2.87% above the broad indices over the 14-year period, with Brazil differing from the others due to the difference between its indices being much smaller than those of the others. It is also worth mentioning the two global financial crises that occurred in the period under study, in the subprime crisis in 2008, all countries in the bloc showed a less pronounced drop in the MSCI ESG Leaders index than in the broad index, already in the crisis of the COVID pandemic -19 of 2020, India and China showed growth in their indices, however the ESG index stood out on average 6.27% in relation to the broad index , in Brazil and South Africa most performances were negative and the broad indices had better performance in 2020 than the ESG, the difference from one to the other was an average of 2.37%, so it can be seen that when the broad index performs better than the ESG, it is in a percentage well below when the opposite happens.

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For better intelligibility, we will condense the measures of variance (σ^2), standard deviation (σ), volatility (Vol), value at risk (VaR) at 1% and 5% confidence and drawdown (DD) of these indices, in Table 2 where we will discuss each one of them relating the result of the MSCI ESG index with the respective broad index of each BRICS country.

Table 2. ESG and broad BRICS indices risk metrics.

	Brazil	India	China	South Africa
MSCI ESG leaders variance	0.059441	0.147918	0.090660	0.082866
MSCI broad variance	0.072474	0.154845	0.093179	0.071032
MSCI ESG leaders standard dev.	0.243805	0.384601	0.301098	0.287865
MSCI broad standard dev.	0.269209	0.393504	0.305252	0.266518
MSCI ESG leaders volatility	47.78	75.38	59.01	56.42
MSCI Broad Volatility	52.76	77.12	59.82	52.23
MSCI ESG leaders VaR (1%)	51.13%	75.90%	59.58%	58.12%
MSCI broad VaR (1%)	58.33%	81.03%	64.26%	56.57%
MSCI ESG leaders VaR (5%)	34.52%	49.69%	39.06%	38.50%
MSCI Broad VaR (5%)	39.98%	54.21%	43.46%	38.41%
MSCI ESG leaders drawdown	-29%	-3%	-23%	-25%
MSCI ESG broad drawdown	-18%	-7%	-22%	-24%

Through Table 2, we can draw some conclusions regarding the risk if we compare the ESG and broad indices of each country, with regard to variance and standard deviation we see that in Brazil, India and China the respective sustainable indices have a lower value that their indices include the largest companies, except in South Africa, thus inferring that the risk of investing in a portfolio of good companies with ESG guidelines is lower (safer) in three of the four BRICS countries, also considering that the greatest difference between risks is found in Brazil, while in China the difference in standard deviations is the smallest, characterizing that the risks of the ESG and broad portfolios are very similar. With regard to volatility, the dynamics of the data follow a very close relationship with what is seen in the variance and standard deviation, when the values presented by the volatility of the ESG indices of Brazil, India and China are smaller than the volatilities of the broad indices, what clashes with this logic is again South Africa, which has the highest volatility in its index of ESG companies, among the BRICS the country that presented the highest volatility in the period was India, and Brazil presented the lowest volatility among all the countries in the ESG agenda while South Africa had the lowest among the BRICS in terms of broad indices. An alignment can be seen with regard to these three measures initially presented, as they are derived directly or indirectly from the standard deviation itself, and it is up to us here to analyze not only the absolute numbers but also the discrepancies between the values presented by each indicator and interpret its impacts on the risk how it was done.

Despite the measures of Value at Risk and the Drawdown, being presented in percentage terms and showing percentage losses of the indices in each country, different from the previous indicators, each one brings a different perspective in its interpretation as members of the BRICS. When we show in the value at risk at 1% confidence level in Brazil, India and China the probability of having a significant loss is percentagewise lower in the country ESG indices than in the broad indices only in South Africa the ESG performance is worse than the broad, emphasizing the results in Brazil where there is a 1% chance of losing 51.13% or more in value investing in companies included in the ESG index portfolio, while investing in the Brazilian broad index there is a chance of losing 7.2% the most , since there is a 1% chance of being able to lose 58.33%. China, both in the ESG and in the broad index, has the highest percentages of chances of loss at 1%, being 75.90% and 81.03% respectively. Once the value at risk rises to the 5% confidence level, the values drop significantly but the relationships between the ESG and broad indices hold, however in South Africa the ESG and broad values practically match and there is 5% chance that there will be a value loss equal to or greater than approximately 38%. Again, it is in China that the highest percentage of losses occurs at a confidence level of 5% both in the ESG index and in the broad index when compared among the BRICS. Despite having the highest probability of losses at confidence levels of 1% and 5%, India was the one that presented the smallest drop after a maximum (maximum Drawdown) in the period under study, the drops both in the MSCI ESG Leaders index (-3 %) when in the broad MSCI (-7%) they were much lower than the BRICS averages, which were -

19% and -18% respectively. Still regarding the drawdown, observing Table 2 shows that in Brazil, China and South Africa the falls of the indices after their maximums in the period were greater in the ESG than in the broad ones, while in India the opposite occurred and the broad indices had a greater loss than the ESG indices of the respective countries. Another discrepant regarding the drawdown are the years in which these biggest drops occur in the period under study, in India and South Africa it occurs between 2017 and 2018, while in Brazil it happens between 2019 and 2021 and in China from 2020 to 2021.

Table 3. Sensitivity of the MSCI ESG leaders index in relation to the MSCI broad (Beta).

	Brazil	India	China	South Africa
Beta(β) MSCI ESG leaders	0.96	0.89	0.92	1.02

Analyzing Table 3, we notice that the sensitivity to variation of the ESG index in relation to the broad index is less than 1 in Brazil, India and China, inferring that companies in the ESG index portfolio are more resilient to market variations than companies in general in these countries. While in South Africa, with each market variation of 1%, companies in the ESG portfolio of the index tend to vary by 1.02%, confirming the greater volatility of the ESG index in relation to the broad index. Even with a beta lower than 1 in most countries belonging to the BRICS, the values are very close to 1, which shows a tendency for the ESG index to follow very close to the broad index.

Finally, we will analyze how the ESG indexes of each country correlate with their equivalent broad indexes and also how the MSCI ESG Leaders indexes relate to each other, through the correlation matrix presented in Table 4.

Table 4. Correlation matrix referring to the ESG and broad indices of the BRICS.

	Brazil ESG	India ESG	China ESG	S. Africa ESG	Brazil broad	India broad	China broad	S. Africa broad
Brazil ESG	1.0000							
India ESG	0.8006	1.0000						
China ESG	0.9050	0.9075	1.0000					
S. Africa ESG	0.7551	0.7440	0.7856	1.0000				
Brazil broad	0.9217	0.7897	0.8196	0.6058	1.0000			
India broad	0.7580	0.9830	0.8554	0.7526	0.7786	1.0000		
China broad	0.9174	0.9064	0.9824	0.7912	0.8713	0.8771	1.0000	
S. Africa broad	0.6044	0.6009	0.5991	0.9307	0.5292	0.6581	0.6583	1.0000

Analyzing the table, all BRICS countries show a high correlation (above 0.92) between their broad indices and ESG indices, especially in India and China with percentages above 0.98. When we examine the correlations of the ESG indices with each other (correlation between countries), it is visible that China has the highest correlations with the other BRICS countries, with its correlation with Brazil and India reaching values above 0.90, leading to the inference that China is a kind of leader in the bloc in this regard. The least correlated among the indices is South Africa, not only with the ESG indices but also among the other broad indices.

In summary, Table 5 shows an overview of the measures calculated in this work, through which it is possible to see which index had the best performance and in which BRICS countries.

Table 5. Summary of performance measures of performance and risk of indices in the BRICS.

	Brazil	India	China	South Africa
Average return	MSCI ESG leaders	MSCI ESG leaders	MSCI ESG leaders	MSCI ESG leaders
Beta(β)	MSCI ESG leaders	MSCI ESG leaders	MSCI ESG leaders	MSCI broad
Variance	MSCI ESG leaders	MSCI ESG leaders	MSCI ESG leaders	MSCI broad
Dev. pattern	MSCI ESG leaders	MSCI ESG leaders	MSCI ESG leaders	MSCI broad
Volatility	MSCI ESG leaders	MSCI ESG leaders	MSCI ESG leaders	MSCI broad
VaR (1%)	MSCI ESG leaders	MSCI ESG leaders	MSCI ESG leaders	MSCI broad
VaR (5%)	MSCI ESG leaders	MSCI ESG leaders	MSCI ESG leaders	MSCI broad
Drawdown	MSCI broad	MSCI ESG leaders	MSCI broad	MSCI broad
Correlation	MSCI ESG leaders	MSCI ESG leaders	MSCI broad	MSCI ESG leaders

5. CONCLUSION

In this study discuss, test and compare the most varied measures of profitability, performance and risk between ESG and broad indices (of the largest companies in each country) that are part of the BRICS. The main contribution of this article is to present whether companies engaged with the environmental, social and corporate governance footprint really have the characteristics presented by some authors regarding greater resilience to systematic (non-diversifiable) crises, lower risk with regard to volatility and also regarding its higher returns in the long term, in developing countries specifically in Brazil, India, China and South Africa, a block called BRICS (Russia is also a participant, but was not considered due to the discontinuity of its data), by through the analysis of secondary data obtained through Morgan Stanley Capital International – MSCI, in which there is a need for studies in these countries given the scarcity on the subject.

If we analyze Table 5, we confirm the theory of potential earnings of ESG companies in the long term since in the 14-year period the average profitability of ESG indices were higher in all countries compared to the broad index. As for measures of risk and volatility, our study confirmed the hypothesis that the risks of the largest companies are greater than those of ESG companies, given that their values fluctuate less, given that in most measures in Brazil, India and China. It is worth mentioning that in South Africa, ESG companies, represented by the MSCI ESG Leaders index, despite having a higher average profitability than large corporations, were more risky, which may demonstrate that ESG guidelines in the country are not yet developed enough to present broad results in environmental, social and governance issues. On the opposite side, India was the only BRICS country to outperform ESG on all measures compared to its broad index.

Such a document is limited mainly by the difficulty of providing standardized data from these countries with a longer time frame free of charge, more robust data are made available both by MSCI and by other companies, however they are made available upon payment. Another issue is that some measures used in this study are derived from the standard deviation (σ), and may present the same broad results, differing only in terms of their intensities, which may limit the interpretation.

There is a need for more research, as there are disparities between different research studies and in these specific countries this type of study is almost non-existent. For future studies, it is advisable to deepen these studies exclusively with a focus on a specific developing country, also using other measures of profitability, risk, volatility that reinforce the hypotheses of ESG performance or refute it. It is also necessary to use a database with a longer period of time and daily, weekly or monthly intervals.

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