# Analysis of the Impact of ESG Controversies on the Valuation of Shares in the Mexican Market

## *Análisis del impacto de las controversias por factores ASG en la valuación de acciones en el mercado mexicano*

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## Abstract

*There is extensive literature on the motivations of various investors to integrate environmental, social, and corporate governance (ESG) factors into their strategies. However, studies on this subject focus on developed markets. They do not explain with evidence whether these factors, if absent, significantly affect the valuation of financial instruments, such as stocks or bonds issued by companies. Thus, the study analyzes and demonstrates with statistical evidence that the controversies associated with ESG factors and related to shares in the Mexican market are yet to be integrated into the corresponding valuations.*



***Keywords:*** *Investments, ESG, controversies, environmental, social, corporate governance.*
***JEL Classification:*** *C16, G10, Q59.*



## Resumen

*Existe una amplia literatura sobre las motivaciones que llevan a diversos inversionistas a integrar factores ambientales, sociales y de gobierno corporativo (ASG) en sus estrategias; sin embargo, los estudios sobre esta temática se centran en los mercados desarrollados y no detallan con evidencia si estos factores, a través de las potenciales controversias que generan en su ausencia, tienen efectos significativos en la valoración de instrumentos financieros, por ej., acciones o bonos emitidos por empresas. Por esta razón, el presente estudio analiza y demuestra con evidencia estadística que las controversias asociadas a factores ASG y relacionadas con las acciones en el mercado mexicano aún no se encuentran integradas en las valuaciones correspondientes.*



***Palabras clave:*** *inversiones, ASG, controversias, ambiental, social, gobierno corporativo.*
***Clasificación JEL:*** *C16, G10, Q59.*

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# 1. Introduction

The inclusion of environmental, social, and governance factors—ESG factors—has become increasingly relevant to companies, organizations, societies, and investors. Particularly for the latter, since decision-making becomes more relevant through their investments and risk mitigation processes.

The entire global community has also recognized the "new" mindset. For example, the World Economic Forum (WEF) Global Risks Report 2024 states that seven out of ten of the global most severe risks over the long term belong to environmental or societal related risks—five environmental and two societal (WEF, 2024, p. 8).

Another example is Krueger et al. (2020), who carried out a survey focused on identifying the relevance of climate factors for institutional investors in five key areas:

1) The role of climate risks in investment decisions.

2) Climate risk management.

3) Shareholder engagement related to climate risks.

4) The implications of climate risks for asset pricing, and

5) Investors' opinions on companies' disclosure of climate risks.

They concluded that for investors, reputation, moral or ethical considerations, legal or fiduciary duties, as well as financial motives, are the motivations that justify the incorporation of these factors.

Likewise, one of the revelations in that study—which will support part of the results of our analysis—is that respondents believe that stock valuations do not fully reflect the risks of climate change. Failing to include ESG factors like sustainability and corporate responsibility properly can affect financial performance in such a way that this could ultimately damage the value of companies and the financial instruments associated with them, i.e., bonds or stocks.

The literature refers potential benefits associated with investing in sustainable instruments or including practices of this nature. To cite an example: more than 20 years ago, market practice (mainly in Europe) regarding sustainability was limited to generating exclusion lists. This practice, which some asset managers maintain, excludes companies, sectors, or countries from the investment universe if they involve certain activities with defined criteria.

Among the most common exclusion criteria are activities related to weapons, pornography, and tobacco. In this context, the first studies on sustainable investment attributed higher capital costs associated with companies without "green" practices than those that did (Heinkel et al., 2001).

Another factor considered in the literature that could affect returns and, therefore, company valuations is the pricing power of some companies for being socially responsible. According to studies, this is due to the feeling of loyalty generated among customers (Albuquerque et al., 2020). Alternatively, some studies have determined that economic agents can receive different non-monetary benefits from simply holding or including assets with green characteristics in their investment strategies (e.g., Baker et al., 2022; Fama & French, 2007).

Some other studies, such as Cornell and Damodaran (2020), have tried to generate frameworks to determine the correct way to integrate ESG factors within the valuation of financial instruments. The above considering the growing pressure from politicians, regulators, interest groups, and even investors who commonly sugarcoat their speeches of inclusion of these factors with the promise that it will be good for their results and their shareholders.

In that same sense, we find a broad consensus in the literature on investors' sustainability preferences (Bauer et al., 2021; Ceccarelli et al., 2023; Heeb et al., 2023, among others). Empirical studies indicate that economic agents support sustainable investments, even if this implies sacrificing returns. Barber et al. (2021), Hartzmark and Sussman (2019), and Ceccarelli et al. (2023) document that investors find value in strategies associated with sustainability in different ways. The studies highlight the importance of interest in pension funds for sustainability issues, such as the Sustainable Development Goals (SDGs). Significantly, Bauer et al. (2021) provide evidence that support for sustainable investments is driven by strong social preferences of investors such as pension funds.

However, the studies cited, and others available in the current literature have focused their research on the economies of developed countries that, in addition to having much more solid economies, have more solid financial systems and more and better-quality information for all participants. All this allows the market to consider more variables and make more accurate decisions. Likewise, the evidence of preferences is still far from showing the impact of these decisions, so it is essential to analyze the effects they could have on measurable characteristics such as valuations.

Given the above, the objectives of this study are, on the one hand, to collect information on controversies associated with ESG factors in some Mexican companies that are listed on the stock exchanges in the country and, on the other hand, to identify whether said controversies have had significant effects in the share prices of these companies.

## 2. Description of the Methodology

A quantitative experimental research approach was adopted to conduct this study using historical data on Mexican stock prices and controversies related to ESG factors.

Based on these data, we used the Student's *t*-test with a 5% significance level to analyze the relationship between the returns associated with the shares before and after the ESG controversy and, in this way, verify if there were significant differences in the average of the returns obtained from the generation of the controversy. The methodology considers the following stages:

1) *Data Description and Collection.* We collected quantitative and qualitative data for this analysis. For quantitative data, we used historical stock price data for Mexican companies listed in Mexican stock exchanges (106 issuers with information from January 2013 to January 2024); historical index data for the "MEXBOL Index," which represents the all-cap index for Mexican capital markets, and "S&P/BMV Sovereign MBONOS 10-20 Year Bond Index," designed to measure the performance of the Mexican fixed income nominal-rate market—the constituents of the index must be Mexican government securities with maturities between 10 and 20 years and denominated in Mexican pesos).

   Regarding the qualitative data, controversies in ESG factors were collected, which include events such as strikes due to inadequate working conditions, corruption cases, environmental controversies (pollution, waste management, water stress, etcetera), criticism by communities, adverse data related to the corporate governance of companies, among others.

   It is essential to mention that platforms such as Bloomberg terminal and Morningstar Direct (through Sustainalytics) (Morningstar, n.d.) collect and disclose specific information on ESG factors. Considering that the databases, sources, and even the methodologies of the platforms could change, to obtain this informa-

tion, the recommendation is to use the workspace with datapoints associated with ESG controversies within the Morningstar Direct terminal, as well as the "ESG controversies" section in the description of assets within the Bloomberg terminal. In any case, checking with specialists on each platform for specific queries will be necessary.

2) *Selection of Companies and Controversies.* We selected Mexican companies[1] involved in controversies verified by an information platform specialized in ESG matters to guarantee the sample's representativeness. Also, the controversies were classified within the three pillars: environmental, social, or governance. In addition, the dates of the controversial ESG events were identified to determine the *a priori* and *a posteriori* differentiating effect.

3) *Statistical Analysis.* The Student's *t*-test was used to compare the means of the returns associated with stock prices before and after the controversial event. The tests were carried out at three time periods to avoid potential biases due to the temporal dilution of the events with daily observations[2]:

   a) 60 daily observations (approximately quarterly periods).

   b) 126 daily observations (approximately semiannual periods). And

   c) 255 daily observations (approximately annual periods).

   The construction of these statistical models to evaluate the impact of ESG controversies on stock returns allows us to isolate other possible determinants of the value of these stocks by using the controversial event as the epicenter and excluding it from the samples. Likewise, establishing these temporalities allows us to identify whether the impact of ESG factors can prevail in the short, medium, or long term.

   It is important to highlight that, to confirm the validity of the exercise, different checks were carried out, mainly to verify that systemic market movements did

[1] The names of the issuers are masked because the objective of the study is not to whistleblow on these issuers and their lack of consideration of ESG factors within their valuations. Also, the naming of the issuers could be interpreted as an assertion that the controversies should have affected the valuation and/or a recommendation for investment decisions, which is not the objective of this study.

[2] The shorter period is equivalent to 60 days to preserve the normality assumption necessary to perform the test. And although it could be assumed that the effect of the controversy would be diluted, it is argued that the effect on valuation should be structural and not only seen as short-term speculation.

not affect the exercise. The same statistical test was carried out, affecting the series of returns to generate some type of daily alpha. That is, a benchmark's performance discounted each stock's daily returns.

The two most relevant exercises correspond to the benchmarks: the MEXBOL Index and the S&P/BMV Sovereign MBONOS 10–20 Year Bond Index. Although we will focus on the baseline exercise in the study, the results of these additional tests will be available in Annex B of the study (see Annex B). Additionally, tests with a market beta—corresponding to stock market movements or the average risk-free rate—were discarded since they were considered constant. This would only shift the distribution of returns (down or up), reaching the same result as the statistical tests.

An alternative hypothesis test to the one proposed in this study could be to ensure that the returns a posteriori to the controversy are lower than the returns a priori to that event, i.e., a one-tailed Student's *t*-test. However, since it is impossible to determine what effect the controversies have on valuation, determining a downward trend in returns can be understood as a value judgment of the controversy itself and its effect. Nevertheless, Annex C of this document contains the test, and the results are consistent with the initially proposed test to strengthen the exercise (see Annex C).

4) *Control of Variables.* Stocks that:

a. Did not comply with at least one period of the required observations.

b. Did not have associated and verifiable controversies through the information platforms used. Or,

c. Did not have a public history of daily prices.

Likewise, in the case of associated disputes that lasted more than one day, the first day of the dispute was taken as the epicenter.

5) *Interpretation of Results.* The probabilities associated with the two-tailed Student's *t*-tests of comparison of means were analyzed, with a null hypothesis that aims to determine that the means of both samples, *a priori* and *a posteriori* of the controversy, are similar. This indicates that they do not contain a significant change. With this, we can identify if there is a significant relationship between controversies associated with ESG factors and stock valuations. Likewise, the strength and direction of this relationship were evaluated, revealing the implications for investors, companies, and the market.

# 3. Methodology Development

Initially, it was necessary to determine a pool of issuers that could be analyzed in terms of their daily valuation and potential controversies. Therefore, all capital issuers (shares) listed on the Mexican Stock Exchanges were selected as an initial set, resulting in 202 issuers. We stress the omission in our study of the capital of private companies due to the small amount of information available and the lack of homogeneity of said information. These requirements are considered essential to identify changes in market valuations.

The Bloomberg information platform provided the basis for the issuers' database. Subsequently, issuers with a broad historical range of publicly available prices were identified and selected for the following steps of the study. The selected history range ensures that comparability can be established between the prices of the instruments at different times, allowing for the construction of a consolidated information base of historical prices of Mexican capital issuers. It is important to mention that this database resulted in 106 issuers with information from January 2013 to January 2024.

Subsequently, using data from two information platforms—Bloomberg terminal and Morningstar Direct—ESG controversies were identified for Mexican capital issuers whose information was verifiable. We related this to the original base of issuers. For the relationship of ESG controversies with the different issuers, it was necessary to generate a dispute classification process where:

1) Those controversies or news that did not have clear and/or sufficient information or evidence were eliminated, and, on the contrary, those that could represent an impact finding would be given priority in the analysis, resulting in 10 issuers with 26 associated controversies[3].

2) The different controversies were classified according to each of the factors, which could be environmental, social, or corporate governance controversies, resulting in the following distribution: one environmental controversy, eight social controversies, and 17 corporate governance controversies. And

[3] Classified in 7 types of controversies related to the 3 ESG pillars: 1) labor accusations, 2) environmental impacts, 3) cyber-attacks and impacts on customer information, 4) monopolistic practices and competition, 5) strikes, 6) money laundering,7) bribery cases.

3) The "epicenters" of each ESG controversy were identified within the historical database, with the epicenter being the initial date of creation or generation of the controversy or the first moment in which the investing public had access to the controversy information. After screening out the information, of the 26 epicenters, only 14 were considered for eight issuers with the distribution shown in Table 1 (see Table 1).

**Table 1.** Distribution of Epicenters per Issuer

| ISSUER | Number of epicenters |
|---|---|
| **ISSUER 1** | 2 |
| **ISSUER 2** | 3 |
| **ISSUER 3** | 2 |
| **ISSUER 4** | 1 |
| **ISSUER 5** | 1 |
| **ISSUER 6** | 1 |
| **ISSUER 7** | 3 |
| **ISSUER 8** | 1 |
| **Total** | 14 |

Source: Prepared by the authors.

For an initial analysis, localization of epicenters in the historical prices chart was done; nevertheless, no further information was obtained from this review. The resulting graphs will be available in Annex A of this study (see Annex A).

Regarding classifying controversies within each ESG pillar, we identified that, in the first analysis, the most significant number of controversies fell within the governance pillar.

Once the epicenters were identified, the following hypothesis test was proposed.

$H_0$: $\mu_i = \mu_j$

$H_1$: $\mu_i \neq \mu_j$

Such that:

$\mu_i$ : the average returns before the epicenter or ESG controversy

$\mu_j$ : the average returns after the epicenter or ESG controversy

The Student's *t*-test is appropriate for the exercise since the comparison of performance, in the case of our analysis, is a typical exercise for comparing statistical parameters of populations or samples (Department of Statistics and Data Science, n.d.). Likewise, to carry out this statistical procedure, the three necessary characteristics are determined as true (normality, independence, and heteroskedasticity), taking into account the following:

- *Normality*: The return associated with the price of each share in public markets is assumed to have a normal distribution.
- *Independence:* For each of the Student's t-tests, two returns samples are compared, and although they are from the same stock, they correspond to exclusive periods, such that there is no dependence between the samples, and they can be determined independently.
- Finally, in the case of *homoscedasticity:* When talking about the same action and the data population corresponds to the same series from which two samples are taken, it is assumed that the variance is constant among the observations.

Once the requirements were met, the statistical analysis was generated through the significance test, and it was determined that 95% would be the most appropriate confidence level to justify the analysis.

Student's *t*-tests were used to compare the means of the returns associated with the stock prices before and after the controversial event and, additionally, to avoid potential biases due to the temporality dilution of the events, the tests were carried out at three temporalities with daily observations: The periods are the following:

1. Quarterly periods (60 daily observations).
2. Semiannual periods (126 daily observations).
3. Annual periods (255 daily observations).

# 4. Analysis of the Results

From the proposed statistical model, information is derived at different levels, the most relevant for the study being the significance level with which the null

hypothesis is not rejected in most cases (95%) as can be observed in Table 2. Taking this parameter into account, only for epicenter 1 of Issuer 5 it is possible to reject the null hypothesis, so we would not have enough information to say that the difference between the means of the *a priori* and *a posteriori samples* of that epicenter are significantly similar, meaning that in this case, the controversy affected in particular the average returns between both periods (see Table 2).

The event in which the null hypothesis was rejected corresponds to shareholder demands towards the company for an alleged bribery case, a controversy associated with the corporate governance classification. From the above, it is clear that the event, in addition to being controversial, had legal implications, and the materialization of the revaluation and its "permanence" to a medium temporality in the study is presumed to be due to this.

The second relevant result is associated with the different temporalities analyzed, so no trends are identified for the same event in different periods. This could be interpreted as the fact that the effects of controversies lack "permanence" within the behavior of asset valuations, in addition to not being significant. It should be noted that this result may be affected by "other" variables since other additional factors that could directly impact the valuations are not isolated. Nevertheless, even in the benchmarking-alpha analysis, there was no evidence of any trends or permanence among the different periods (for details, see Annex B).

**Table 2.** Probabilities of Non-Rejection of $H_0$ Associated with each Issuer for the Different Epicenters and Different Temporalities

| Probability | EPICENTER 1 | | |
|---|---|---|---|
| | 60 | 126 | 255 |
| ISSUER 1 | 92.37 % | 93.20 % | 89.25 % |
| ISSUER 2 | 56.30 % | 20.18 % | 41.63 % |
| ISSUER 3 | 46.89 % | 65.76 % | N/A |
| ISSUER 4 | 72.35 % | N/A | N/A |
| ISSUER 5 | 13.22 % | 4.38 % | 44.40 % |
| ISSUER 6 | 42.69 % | 69.97 % | 51.14 % |

| | | | |
|---|---|---|---|
| **ISSUER 7** | 13.95 % | N/A | N/A |
| **ISSUER 8** | 90.54 % | 36.61 % | 95.77 % |
| **Probability** | **EPICENTER 2** | | |
| | **60** | **126** | **255** |
| **ISSUER 1** | 52.30 % | N/A | N/A |
| **ISSUER 2** | 79.23 % | 62.93 % | 75.32 % |
| **ISSUER 3** | 31.67 % | 9.38 % | N/A |
| **ISSUER 4** | N/A | N/A | N/A |
| **ISSUER 5** | N/A | N/A | N/A |
| **ISSUER 6** | N/A | N/A | N/A |
| **ISSUER 7** | 69.90 % | 47.80 % | 58.63 % |
| **ISSUER 8** | N/A | N/A | N/A |

| **Probability** | **EPICENTER 3** | | |
|---|---|---|---|
| | **60** | **126** | **255** |
| **ISSUER 1** | N/A | N/A | N/A |
| **ISSUER 2** | 8.61 % | 20.55 % | 46.03 % |
| **ISSUER 3** | N/A | N/A | N/A |
| **ISSUER 4** | N/A | N/A | N/A |
| **ISSUER 5** | N/A | N/A | N/A |
| **ISSUER 6** | N/A | N/A | N/A |
| **ISSUER 7** | 83.41 % | N/A | N/A |
| **ISSUER 8** | N/A | N/A | N/A |

Source: Prepared by the authors with data from Bloomberg L.P. (n.d.).

# 5. Conclusions

Based on the study results, we can infer that current controversies due to ESG factors have not been included substantially in the valuations of financial assets in

public companies in the Mexican financial system. However, the growing global and local pressure from regulators, investors, and the market to include these factors in determining investment strategies should end up affecting the valuations of these assets, so it will be worth continuing to carry out this type of analysis, given that ESG factors have a significant presence within the Mexican financial system.

From the above, the following potential areas of opportunity are identified: the creation of approved databases on controversies and the development of clear and detailed methodologies to incorporate ESG factors into the valuation of different financial assets.

The latter is relevant because although this study focused on capital instruments, the steps to follow for other asset classes and types of instruments will need to be determined.

Finally, it is observed that for the local market, the issues related to the governance of companies are much more pressing, but without leaving aside social and certainly environmental issues. This phenomenon is attributed to the fact that Mexico is still a country classified as "emerging" by, for instance, the International Monetary Fund (IMF, 2024) and must adapt to the best international practices, so the adoption of ESG factors would allow a more orderly transition and, therefore, faster development into a developed economy.

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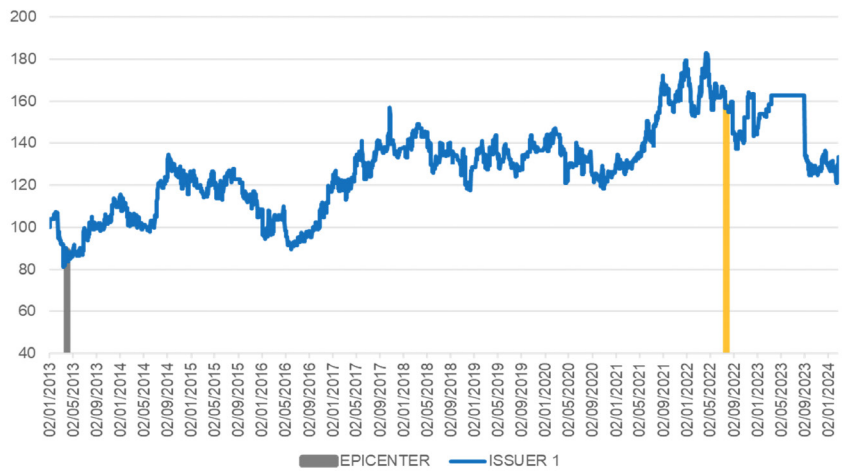
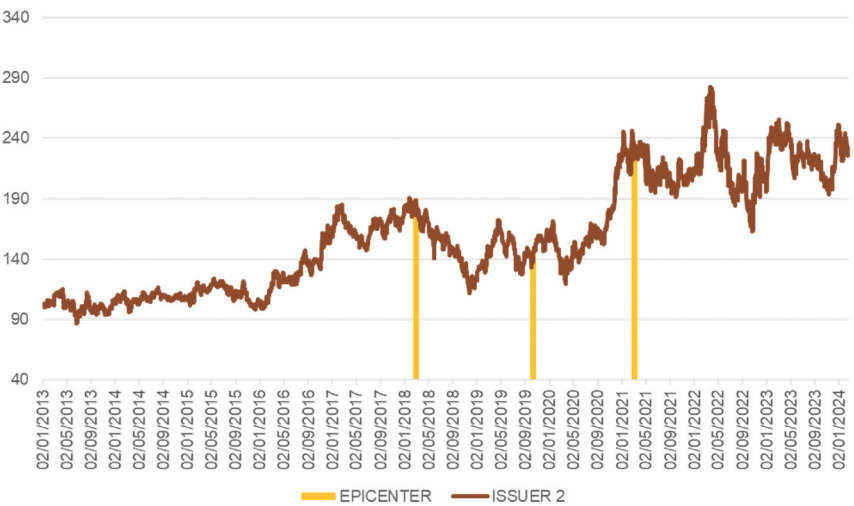
# Annex A

**Graph A1**. Daily Returns Index (issuer 1) Showing its ESG Epicenters



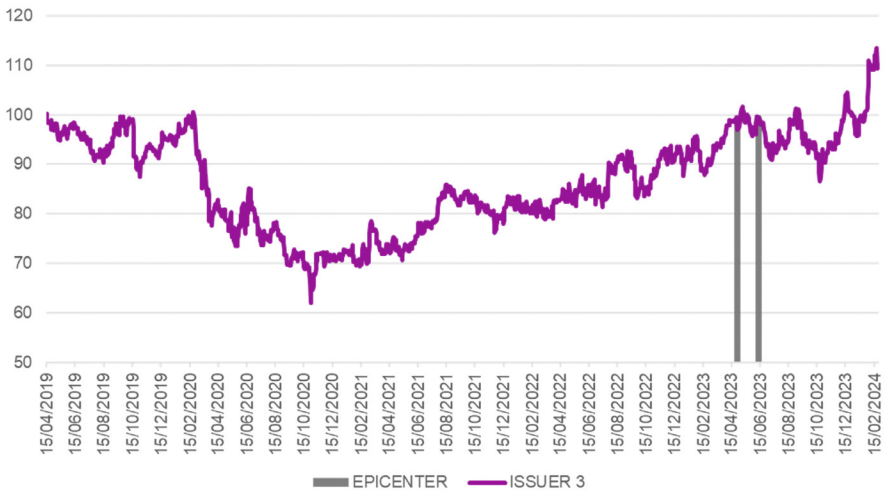

Source: Prepared by the authors with data from Bloomberg L.P. (n.d.).

**Graph A2.** Daily Returns Index (issuer 2) Showing its ESG Epicenters




Source: Prepared by the authors with data from Bloomberg L.P. (n.d.).

**Graph A3.** Daily Returns Index (issuer 3) Showing its ESG Epicenters

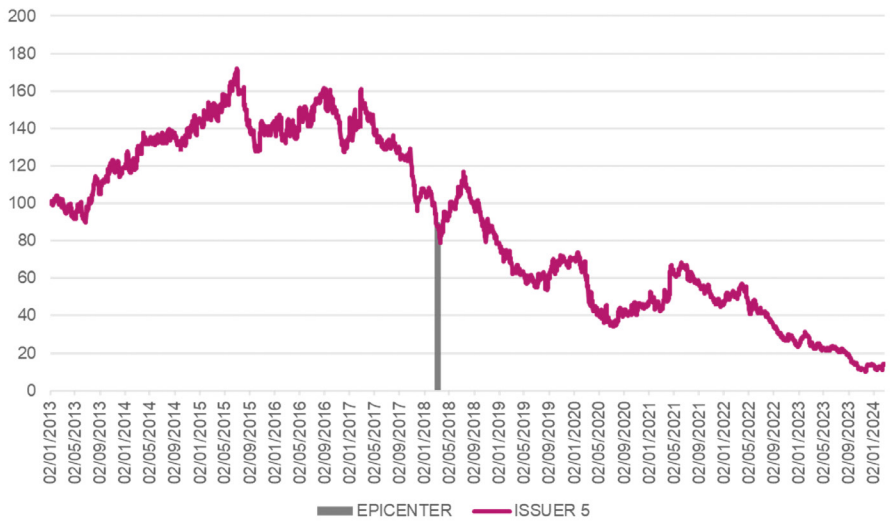



Source: Prepared by the authors with data from Bloomberg L.P. (n.d.).

**Graph A4.** Daily Returns Index (issuer 4) Showing its ESG Epicenters


Source: Prepared by the authors with data from Bloomberg L.P. (n.d.).

**Graph A5.** Daily Returns Index (issuer 5) Showing its ESG Epicenters

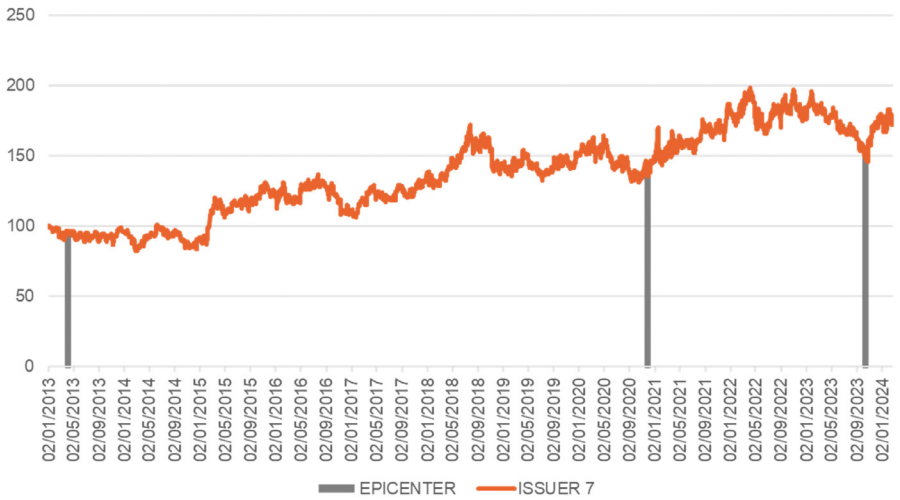



Source: Prepared by the authors with data from Bloomberg L.P. (n.d.).

**Graph A6.** Daily Returns Index (issuer 6) Showing its ESG Epicenters


Source: Prepared by the authors with data from Bloomberg L.P. (n.d.).

**Graph A7.** Daily returns index (issuer 7) showing its ESG epicenters




Source: Prepared by the authors with data from Bloomberg L.P. (n.d.).

**Graph A8.** Daily returns index (issuer 8) showing its ESG epicenters


Source: Prepared by the authors with data from Bloomberg L.P. (n.d.).

# Annex B

**Table B1.** Statistical tests results for alpha analysis—Benchmark MEXBOL Index

| Probability | EPICENTER 1 | | |
|---|---|---|---|
| | 60 | 126 | 255 |
| ISSUER 1 | 61.40% | 49.27% | 64.34% |
| ISSUER 2 | 44.86% | 19.43% | 22.29% |
| ISSUER 3 | 63.39% | 80.94% | N/A |
| ISSUER 4 | 21.12% | N/A | N/A |
| ISSUER 5 | 7.49% | 11.81% | 38.94% |
| ISSUER 6 | 57.75% | 51.04% | 25.90% |
| ISSUER 7 | 69.27% | N/A | N/A |
| ISSUER 8 | 90.63% | 42.80% | 96.29% |

| Probability | EPICENTER 2 | | |
|---|---|---|---|
| | 60 | 126 | 255 |
| ISSUER 1 | 17.39% | N/A | N/A |
| ISSUER 2 | 70.54% | 64.05% | 60.27% |
| ISSUER 3 | 30.17% | 73.21% | N/A |
| ISSUER 4 | N/A | N/A | N/A |
| ISSUER 5 | N/A | N/A | N/A |
| ISSUER 6 | N/A | N/A | N/A |
| ISSUER 7 | 35.09% | 43.30% | 85.17% |
| ISSUER 8 | N/A | N/A | N/A |

| Probability | EPICENTER 3 | | |
|---|---|---|---|
| | 60 | 126 | 255 |
| ISSUER 1 | N/A | N/A | N/A |
| ISSUER 2 | 6.12% | 2.98% | 39.09% |
| ISSUER 3 | N/A | N/A | N/A |
| ISSUER 4 | N/A | N/A | N/A |
| ISSUER 5 | N/A | N/A | N/A |
| ISSUER 6 | N/A | N/A | N/A |
| ISSUER 7 | 72.87% | N/A | N/A |
| ISSUER 8 | N/A | N/A | N/A |

Source: Prepared by the authors.

**Table B2.** Statistical tests results for alpha analysis—Benchmark S&P/BMV Sovereign MBONOS 10-20 Year Bond Index

| Probability | EPICENTER 1 | | |
|---|---|---|---|
| | 60 | 126 | 255 |
| ISSUER 1 | 79.65% | 78.29% | 63.04% |
| ISSUER 2 | 45.98% | 21.90% | 60.96% |
| ISSUER 3 | 86.10% | 71.84% | N/A |
| ISSUER 4 | 37.31% | N/A | N/A |
| ISSUER 5 | 18.85% | 8.37% | 46.89% |
| ISSUER 6 | 35.71% | 60.23% | 40.60% |
| ISSUER 7 | 46.48% | N/A | N/A |
| ISSUER 8 | 77.02% | 50.27% | 77.52% |

| Probability | EPICENTER 2 | | |
|---|---|---|---|
| | 60 | 126 | 255 |
| ISSUER 1 | 26.52% | N/A | N/A |
| ISSUER 2 | 48.61% | 41.59% | 69.87% |
| ISSUER 3 | 31.91% | 43.77% | N/A |
| ISSUER 4 | N/A | N/A | N/A |
| ISSUER 5 | N/A | N/A | N/A |
| ISSUER 6 | N/A | N/A | N/A |
| ISSUER 7 | 54.27% | 31.53% | 28.55% |
| ISSUER 8 | N/A | N/A | N/A |

| Probability | EPICENTER 3 | | |
|---|---|---|---|
| | 60 | 126 | 255 |
| ISSUER 1 | N/A | N/A | N/A |
| ISSUER 2 | 5.14% | 12.38% | 46.33% |
| ISSUER 3 | N/A | N/A | N/A |
| ISSUER 4 | N/A | N/A | N/A |
| ISSUER 5 | N/A | N/A | N/A |
| ISSUER 6 | N/A | N/A | N/A |
| ISSUER 7 | 35.47% | N/A | N/A |
| ISSUER 8 | N/A | N/A | N/A |

Source: Prepared by the authors.

## Annex C

**Student's *t*-test for one tail**

Student's *t*-test, assuming that the mean average returns *a posteriori* are less than the mean average returns *a priori*, with a significance level of 5%.

$H_0$: $\mu_i > \mu_j$

$H_1$: $\mu_i \leq \mu_j$

Such that:

$\mu_i$ : the average returns before the epicenter or ESG controversy

$\mu_j$ : the average returns after the epicenter or ESG controversy

**Results:**

The values for *t-statistic* at a 5% level of significance at the different degrees of freedom for the different periods are as follows:

| **Days** | **60** | **126** | **255** |
|---|---|---|---|
| *t-statistic (5%)* | -1.67064886 | -1.65703698 | -1.65085109 |

Considering these *t*-statistics, we fail to reject H0 according to the following tables:

| **Hypothesis result** | **EPICENTER 1** | | |
|---|---|---|---|
| | **60** | **126** | **255** |
| **ISSUER 1** | H1 | H1 | H1 |
| **ISSUER 2** | H1 | H1 | H1 |
| **ISSUER 3** | H1 | H1 | N/A |
| **ISSUER 4** | H1 | N/A | N/A |
| **ISSUER 5** | H1 | H0 | H1 |
| **ISSUER 6** | H1 | H1 | H1 |
| **ISSUER 7** | H1 | N/A | N/A |
| **ISSUER 8** | H1 | H1 | H1 |

| Hypothesis result | EPICENTER 2 | | |
|---|---|---|---|
| | 60 | 126 | 255 |
| ISSUER 1 | H1 | N/A | N/A |
| ISSUER 2 | H1 | H1 | H1 |
| ISSUER 3 | H1 | H1 | N/A |
| ISSUER 4 | N/A | N/A | N/A |
| ISSUER 5 | N/A | N/A | N/A |
| ISSUER 6 | N/A | N/A | N/A |
| ISSUER 7 | H1 | H1 | H1 |
| ISSUER 8 | N/A | N/A | N/A |

| Hypothesis result | EPICENTER 3 | | |
|---|---|---|---|
| | 60 | 126 | 255 |
| ISSUER 1 | N/A | N/A | N/A |
| ISSUER 2 | H1 | H1 | H1 |
| ISSUER 3 | N/A | N/A | N/A |
| ISSUER 4 | N/A | N/A | N/A |
| ISSUER 5 | N/A | N/A | N/A |
| ISSUER 6 | N/A | N/A | N/A |
| ISSUER 7 | H1 | N/A | N/A |
| ISSUER 8 | N/A | N/A | N/A |

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