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Green Policies release and their impact on the U.S Stock Market

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Master in Management

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ISCTE Business School

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BUSINESS
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Department of Marketing, Operations and General Management

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Resumo

O investimento responsável é a abordagem de investimento que considera questões Ambientais, Sociais e de Governança como critério (ESG). Nos últimos anos, o tema do ESG e da criação de novas políticas sustentáveis tem ganhado bastante relevância e reconhecimento. A inclusão destes fatores tem aumentado também nos mercados financeiros tornando-se mais e mais importante na gestão de ativos.

Este estudo pretende investigar a reação do mercado financeiro, em termos de variação do preço em volta de eventos importantes relativos ao desenvolvimento do tópico ESG e libertação de outras políticas verdes. Para se perceber o efeito que estes eventos causam, é aplicado um estudo de evento, onde, separadamente todos os eventos determinados como relevantes para o tema são analisados, determinando-se, assim, o impacto destes sobre os índices escolhidos.

O estudo sugere que o investidor já demonstra sensibilidade com o lançamento de novas políticas verdes e outros marcos importantes no âmbito de ESG, apesar de, alguns eventos impactarem mais o mercado do que outros. Assim, apesar do esforço em serem criadas regulações e o tópico de ESG estar cada vez a ganhar mais relevância, foi verificado que este tema ainda não causa impacto significativo nos mercados financeiros.

Palavras-chave: ESG, estudo de evento, mercado de valores, decisão de investimento, políticas verdes, regulamentação de sustentabilidade

Classificações JEL: G10 (Mercados Financeiros Geral– Geral), G11 (Mercados Financeiros Geral – Escolha do Portfólio; Decisão de Investimento) , G18 (Mercados Financeiros Geral – Regulação e Políticas Governamentais)

Abstract

Responsible investing is the approach to investing that considers Environmental, Social, and Governance (ESG) criteria. Throughout the last few years, the ESG theme and green policies have been gaining a lot of relevance and attention. The inclusion of this factor in the financial markets is increasing and becoming more and more important to the asset management industry.

This study investigates the stock market reaction in terms of stock price movements surrounding important events regarding the release of green policies and important marks on ESG. To understand the effect surrounding these events, an event study is conducted.

Our findings suggest that investors show some sensitivity to the release of new green policies and other significant marks on ESG, although some events are more impactful than others. Thus, even with the rise of new regulations and ESG gaining more and more relevance, the study shows that this theme still doesn´t generate a significant impact on the financial markets.

Keywords: ESG, event study, stock market, investment decision, green policies, environmental regulation

JEL Classification System: G10 (General Financial Markets – General), G11 (General Financial Markets – Portfolio Choice; Investment decisions), G18 (General Financial Markets – Government Policy and Regulation)

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List of acronyms

AUM- Assets Under Management

CFP- Corporate Financial Performance

CSR- Corporate Social Responsibility

DJSI- Dow Jones Sustainability World Index

EMH- Efficient Market Hypothesis

ESG- Environmental, Social and Governance

ETF- Exchange-Traded Funds

GRI- Global Reporting Initiative

OLS- Ordinary Least Squares

SASB- Sustainability Accounting Standard

SRI- Socially Responsible Investing

UN- United Nations

U.S- United States

1. Introduction

In the past years, there has been a vast growth in the number of companies that report ESG data, being E the environmental component (i.e., water consumption, CO2 emissions…), S the Social component (i.e., employment standards, product ethics…) and G the component for Governance (i.e., anti-corruption position, diversity on the board…) (Amel-Zadeh & Serafeim, 2017).

The perspective of investors on social factors is evolving constantly. It began with socially responsible investment (SRI) funds, which are usually based on the negative screening reflecting the values of the institutional investor, like avoiding alcohol, gambling, and fossil fuels. Nowadays, we observe a growing importance of the environmental, social, and governance (ESG) approach, which surfaced in the past decades. This approach is further linked to economic performance, since a company's environmental footprint, work conditions, and board supervision can influence financial results (Porter, Serafeim, & Kramer, 2019).

The performance of sustainable investments, according to an analysis conducted with the Dow Jones Sustainability World Index (DJSI), from 2013 to 2018, can yield good risk-adjusted returns from the perspective of different investment profiles and promote corporate ESG standards for invested companies. When managers consider sustainability, it has a positive reflection on the stock market (De Souza Cunha et al., 2019). Sustainable indexes to benchmark active ESG investments are still in development, facing huge demand from society, especially with the climate change urgency, but the impact of these investments over time is still a big question among professional investors (Durand et al., 2019).

To get a better understanding of how ESG and especially green policies are affecting the stock market and investors' behavior, the main focus of this dissertation is to understand the impact of important marks on ESG evolution and of the release of green policies has on the U.S stock market.

In the study, an event study is the methodology applied, and three different U.S stock indexes will be under analysis. The S&P 500 that is the benchmark considered in the model, to represent the overall market, the Dow Jones Sustainability U.S Composite Index that reflects the general evolution of sustainable driven stocks, and lastly, the Dow Jones U.S Oil and Gas Index, which reveals the evolution of stock prices of significantly less sustainable companies.

The sample analyzed, spans the period from 13 December 2010 to 5 January 2022, with daily stock prices extracted from Bloomberg and Yahoo Finance.

With the use of an event study, which is an appropriate methodology to understand the impacts that certain events have on the stock market, applied to the data previously mentioned, the hypotheses tested are: (i) Investors are sensitive to green policies release and mandatory ESG regulation; (ii) Different releases of green policies are more impactful than others, affecting the choice for higher ESG assets; (iii) Green policies and mandatory ESG regulation release are below the effectiveness needed to mitigate the effects of climate change on the U.S stock market.

Understanding the behavior of the stock market is undoubtedly necessary to minimize investment risks and maximize profit margins. Stock market decision-making is challenging given its volatility and complexity (Tuarob et al., 2021). The present study is important to understand how and if non-financial information related to ESG and the release of green policies can influence the reaction of the market. The scientific community can benefit from this information since it provides a different perspective on the ESG topic. For investors, this can be very interesting also, when they have ESG concerns and for them to have an overview of the last 10 years.

The dissertation explores the role of the investor, how the stock market absorbs sustainability-related news, and the impact that the announcements of environmental-related regulation and news impact stocks, with high ESG and with lower ESG, using an event study methodology. Our findings suggest that investors show some sensitivity to the release of green policies and ESG regulations, although some events are more impactful than others. Thus, even with the rise of new regulations and ESG increasing in relevance, the study shows that this theme still doesn´t generate a significant impact on the financial markets.

The remainder of the dissertation is organized as follows, chapter 2 reviews the main literature, chapter 3 explains the data and relevance of the events, chapter 4 describes the methodology that supports our investigation, chapter 5 presents the empirical results and a discussion of the findings and to finalize, chapter 6 concludes and shows the main limitations of the study.

2. Literature review

2.1. Contextualization of the theme

The concept of sustainable development emerged in the early 1970s. The theory created an encounter for the unlimited production and consumption owed to limited resources and climate damage. In the report of the United Nations on "Our common Future", sustainable development is defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987, p.37).

Elkington (1997) created the concept of Triple Bottom Line, which included the profit measures, the consideration for economic, social, and environmental factors, and the importance that these new measurements have when keeping companies' stakeholders informed.

Environmental, social and governance has been denominated as a socially responsible investment. When thinking about an ESG strategy, investors typically have three goals in mind: integration, values, and impact. These are known as common investor objectives or motives. Investors may use a variety of strategies, such as ESG integration, negative or exclusionary screening, or thematic investment, to accomplish these goals (MSCI, 2017).

ESG comprises three pillars of principles: Environmental (E), Social (S), and Governance (G). Within these, there are several factors to be measured, that depend on subjects such as the enterprises or industries. The E component can range from water and energy consumption to biodiversity, and conservation. The S aspect includes topics such as diversity in employees, human rights, and safety conditions. For the G component, the focus is on risk management, and board members' compensation. The objective of having this important non-financial information disclosed is to complement the financial indicators (Simonek et al., 2021).

Severe climate change and environmental pollution problems have been attracting attention from countries around the world. Transforming traditional economic growth patterns, effectively improving environment quality, while maintaining original levels of economic development, and making good use of resources to achieve sustainable development, have become important development initiatives for many countries.

Initiatives have been taken by the stock exchanges to increase the degree of disclosure of ESG. Growing interest has centered on the influence of ESG on the economic and financial results of business (Du et al., 2019).

A report released by PwC (2020) concluded that investors have a desire to understand the companies' long-term plans for how they can support and provide support in future risk, but companies will not provide the right information to the investors which widens the gap creating an asymmetric relation.

The relationship between ESG indexes and investors is clearly interconnected, but it is asymmetric, and it is impacted by extreme market conditions (Dhasmana et al., 2023). Financial markets noticeably have increased the adoption of the ESG concept, since firms that perform well in terms of ESG also have better positioning and are able to easily adapt their products and services to a global consumer base (PwC, 2020).

According to Bloomberg, many investors consider ESG performance and its impact on corporate operations and profitability. ESG assets have projections to exceed 53 trillion (USD) by 2025, which represents more than a third of the 140.5 trillion global assets under management (AUM) (Figure 2.1), as in for ESG exchange-traded funds' assets, there is a big expansion accounting for 13% of global ETF asset growth (Figure 2.2) (Bloomberg Professional Services, 2021).

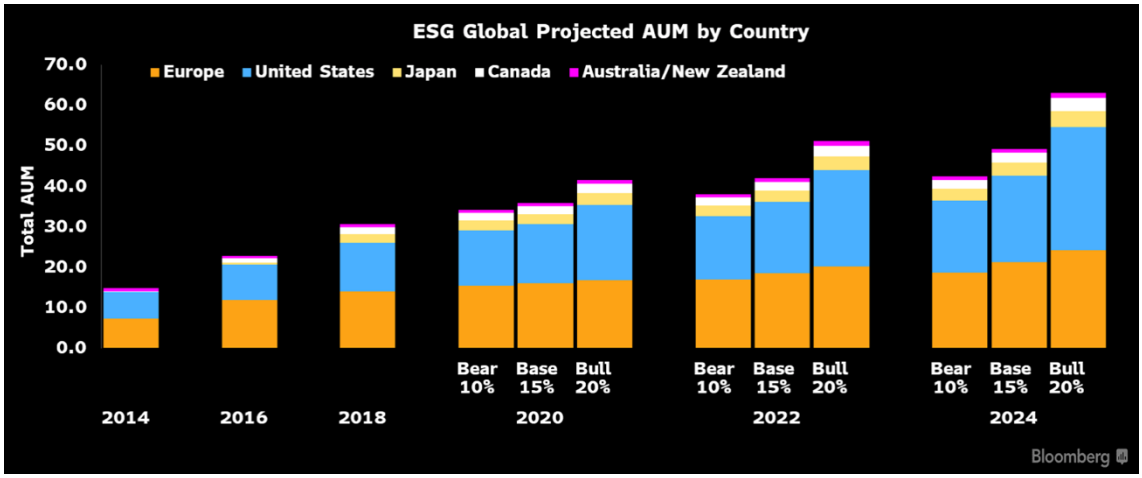

Figure 2.1. ESG global projected assets under management by Country. Source (Bloomberg Professional Services, 2021)

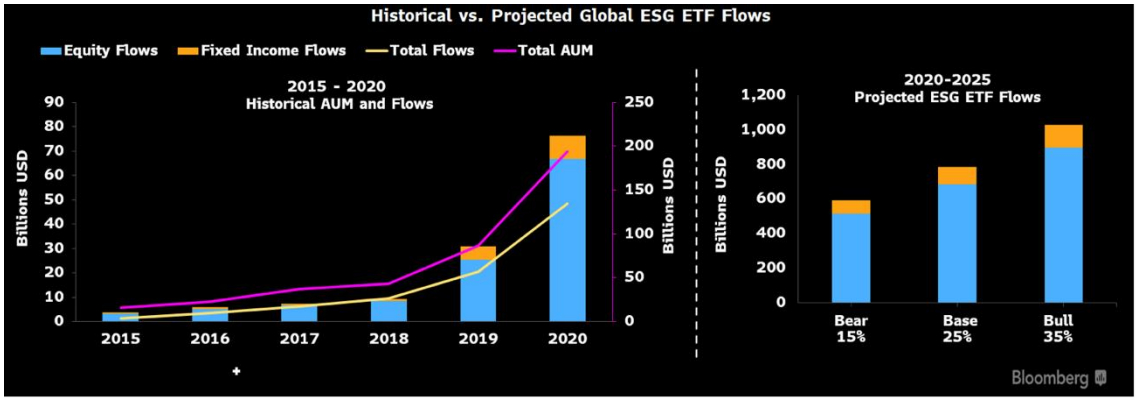

Figure 2.2. Historical vs. Projected Global ESG ETF Flows. Source (Bloomberg Professional Services, 2021)

In a constantly changing world, companies have started operating in a turbulent environment, and their strategic management has been required by the new market specific to a sustainable economy. However, there are powerful pressure groups that claim that social and environmental indicators are still largely ignored by companies in their reporting (Oncioiu, et al., 2020).

2.2. ESG and Sustainability and its inclusion in investment decisions

ESG investing started to appear in the literature, focusing on three components: environmental, social, and governance (Daugaard, 2019). The interpretation of all three components is heterogeneous, difficult to standardize, and consequently harder for investors to interpret (Friede, 2019). The development of academic research has become important for the study of the relationship between corporate financial performance (CFP) and the rise of Economic, Social and Governmental (ESG) concerns.

The global economic crisis, which resulted from unethical company practices and subpar risk management, was a driving force behind ESG. Businesses came to the realization that they needed to maximize social value, embrace stakeholder-oriented initiatives, and integrate sustainable practices. Businesses must incorporate ESG principles into their operations to gain a competitive edge, credibility, and operational performance (Alsayegh et al., 2020).

The inclusion of ESG has become important since it enables investors to seek investments that have social value, environmental value, and governance concerns included in them. Most likely these types of investments can bring long-term financial returns due to a reduction of potential risks, such as the risk of litigation, compliance, tax, and honor (Chen et al., 2021).

The most significant ESG issues for investors regarding the environmental topic are the inclusion of carbon emissions, climate change, air, and water pollution; for the social topic, health, safety, human rights, labor practices, and employee commitments are the most cared for and finally; for governance, the most important are digital transformation of the business, executive compensation, board diversity and anti-corruption practices (Amel-Zadeh & Serafeim, 2017b).

Progresses on the disclosure of non-financial information are being achieved including the development of non-financial reporting standards like the GRI (Global Reporting Initiative), sustainability reporting standards, the IR (integrating reporting) as well as the sustainability accounting standards boards or SASB standards, which regulate the companies listed in the American Stock Exchange. The Focus on creating a standardization of non-financial information plays a huge role in making investment decisions (Efimova et al., 2021).

The stock market allows investors to trade a variety of financial assets that allow them to receive returns. Market fluctuation dictates the behavior of investors and their decisions. The capacity to allocate financial resources, increase financial development, and facilitate economic growth depends on the stock market's variations in efficiency and its volatility (Adeyeye et al., 2018).

The need for sustainable investments in the financial market has had a massive increase since they contribute to the rising need to address global environmental, social, and economic challenges (Krosinsky & Robins, 2012). Investors need constant updates on robust information for them to make sustained decisions on their investments. the concept of "sustainable investment" can be defined as an investment approach that considers ESG factors in portfolio selection and management (GSIA, 2020). Other concepts like "sustainable investments" are ethical investments, socially responsible investments (SRI), green investments, impact investments, and ESG investments, where the aim for these last ones is the integration of ESG components.

Some investors do not invest in companies that harm society, thus the need for the creation of equity indexes that have as focus the ESG integration is very important. Thus, socially responsible investing (SRI), indicate the investments made in companies that pursue ethical practices, making them advantageous for companies, investors, and society at large (Sudha, 2014).

In recent years, investors' fear of the disadvantageous performance implications of ESG investing has declined significantly (Amel-Zadeh & Serafeim, 2017b.; Friede et al., 2015; Khan et al., 2016). Still, there are issues particularly in the quality of ESG data due to the nature of

often voluntary, potentially biased, disclosed measures without rigorous external assurance. Consequently, a lot of investors and analysts typically disregard the reported ESG data and have little confidence in the quality of ESG information provided (Amel-Zadeh & Serafeim, 2017b).

A study by Arnold, Bassen, and Frank (2017) indicates that a separate disclosure of ESG reports from traditional financial reports leads to inefficient ESG information processing for investors. Also, sometimes the error ranges of the ESG data are too high to be accepted by investors or risk managers. Concerns on the financial materiality of ESG factors are raised because some perceive them to be designed to inform a wide set of stakeholders instead of investors, so the information may not identify value drivers or performance opportunities and can be therefore ignored because it is perceived as not having any financial implications.

There is a rising need to understand the market´s behavior to avoid investment risks while maximizing investment profit margins. Decision-making in the stock market is difficult due to its complex behavior and instability environmental, social and governance (ESG) is becoming more and more important over the years. Different marks have been important for its evolution and importance. ESG provides non-financial information to the market, which allows risk mitigation between companies and the capital market and, consequently, its partakers (e.g., government, investors) (Tuarob, et al., 2021).

There is a common perception that investors consider stocks with better ESG rankings to be safer during market turmoil, and they expect them to exhibit a greater potential for future recovery from the crisis (Lööf et al., 2021). Research on the 2008–2009 financial crisis reveals that firms with high social capital, as measured by corporate social responsibility (CSR) intensity, were substantially less affected than firms with low social capital (Lins et al., 2017). Contrary to traditional ESG approaches, a higher score reflects higher ESG risk exposure. Although there is support in the literature that investments with lower ESG risks can be considered safer during strong stock market turmoil, the overall evidence is somewhat ambiguous (Bruna & Lahouel, 2021). Some studies found that stocks with higher ESG ratings have less downside risk, but also less upside potential; during the Covid-19, this was pronounced. This suggests that investors who invest in companies with superior CSR can reduce their risk exposure, non the less they reduce the likelihood of getting higher upside returns. ESG investing is then more suitable for risk-averse investors (Lööf et al., 2022).

In the research conducted by Schiemann and Tietmeyerc (2022) they found that forecasting errors by analysts are higher when analyzing companies that are more involved in ESG controversies. ESG disclosure can be considered as a moderator that helps to mitigate the connection between ESG controversies and analyst forecast errors. ESG controversies can turn

into financial risks, affecting investors' expectations. Investors use ESG disclosure as a screening tool to make their investment decisions (Amel-Zadeh & Serafeim, 2017b).

The position of institutional investors regarding responsible investing is evolving. A new stage of understanding investment performance and social impact is being reached, and evidence from certain companies suggests that strategies implemented to create shared value provide greater shareholder return. For a more complex understanding of the delivery of alpha for investors regarding investments with high ESG scores, there is a need to analyze the company's social impact and its bottom line (Alsayegh et al., 2020).

Sustainable Investing encompasses different strategies that can be used in combination: Negative /exclusionary screening (eliminating companies in industries or countries deemed objectionable); Norms-based screening (eliminating companies that violate some set of norms, such as the Ten Principles of the UN Global Compact); Positive/best-in-class screening (selecting companies with especially strong ESG performance); Sustainability-themed investing (such as in a fund focused on access to clean water or renewable energy); ESG integration (including ESG factors in fundamental analysis); ESG integration (including ESG factors in fundamental analysis); Active owner (engaging deeply with portfolio companies); Impacting investing (looking for companies that make a positive impact on an ESG issue while still earning a market return).

In a study conducted by Eccles and Klimenko (2019), they responded to the question "What are the drivers for investors to care about ESG?". The conclusions they reached were that, first, the investment industry is highly concentrated, and large investment firms are now so big that the modern portfolio theory (investors can limit volatility and maximize returns in a portfolio by combining investments from asset classes with varying levels of risk) cannot be used to mitigate system-level risk. Large asset owners, such as pension funds, are forced to take a long-term view because they have long-term liabilities. Secondly, the key to the new generation of sustainable investing is that it focuses only on "material" ESG issues that impact a firm's valuation, for example, greenhouse emissions are material for an electric utility company but not for a financial services firm. Finally, asset owners are aware that sustainable investing improves return, but many of them are also focused on nonfinancial outcomes.

In a survey conducted by Amel-Zadeh and Serafeim (2017b), the prime reason investors consider ESG data when making investment decisions is that they find that these types of investments are financially material to the investment's performance. They find that ESG information can deliver information on risk rather than its competitive positioning, it is

associated with economic effects such as lower capital constraints, cost of capital, forecast errors, and stock price movements.

The materiality of ESG information falls mostly on the company´s reputational, legal, and regulatory risk. This information serves as a *proxy* for management quality and not so much as competitive positioning. As for the financial materiality for investment decisions, anticorruption, climate change, and energy management-related information, is what is mostly considered material. Nevertheless, financial materiality varies systematically across sectors. Key qualitative characteristics that provide useful information are comparability, timeliness, and reliability. So, the biggest challenges when integrating ESG information fall under those key characteristics, especially when there is a lack of reporting standards. The costs of collecting and examining ESG data are also a major barrier, and the same difficulty in qualifying the reliability of the reported information (Amel-Zadeh & Serafeim, 2017b).

2.3. Barriers to using ESG data for investment decision

The new ESG generation, originally developed by Sustainalytics, is explicitly designed to help investors identify and understand financially relevant ESG risks at the security and portfolio level and how they might affect the long-term performance of equity and fixed income investments (Gaussel & Le Saint, 2020).

The pressure for companies to improve their efficiency to obtain a higher level of ESG has led to many improvements and consequently to higher profitability. The Sustainability Accounting Standards Board (SASB) is very important for the creation of industry standards. The rise of improved and reliable ESG data availability has enabled SASB to progress toward the identification of specific metrics.

But what is still holding back ESG Investing? Despite the incentives for ESG investing, there are still barriers to overcome. In many cases, the problem is the materiality of the ESG factors, because they are not particular to the performance of a specific area where the business carries the greatest impact on society. A materiality analysis on ESG metrics can allow investors to identify measures on an industry level and better analyze price risks to shield portfolio value. In some cases, these material ESG considerations can be misleading to some investors who lack an understanding of different business model differences.

There is a risk that when investors are not considering shared value when making investment analysis, corporations only focus on checking ESG levels that are not material to its performance or social progress. To minimize this, communication from corporations, on

the economic value of their impact when checking ESG factors, is key for investors to meaningfully integrate ESG factors into their analysis and decisions. When investors choose to contribute to a more sustainable community, they can pressure managers to become accountable for their decisions (Porter et. al., 2019).

Institutional investors, who consider significant the integration of ESG into their future investments, require high-quality levels of ESG data. When there is a lack of quality in ESG data, investors, are reluctant to use it for their future investment acquisitions.

According to Jonsdattir et.al. (2022), when analyzing where the quality concerns on ESG data emerged, it was shown that the main causes were the deficiency in materiality, accuracy, and reliability. Data collection on the ESG reporting process, displayed in Figure 2.3., leads to understanding why concerns about the quality of the data emerge.

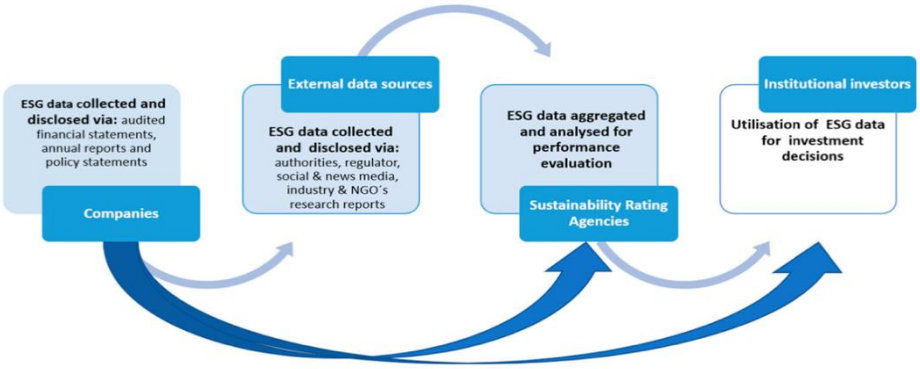

Figure 1.3. ESG reporting process. Source (Jonsdottir et al.,2022)

Since institutional investors require quality ESG data to make their decisions, there is a rise in companies that report on the sustainability performance, specifically on: (1) environmental sections, such as carbon emissions, waste of resources, and water consumption; (2) social aspects, that can include, employee working conditions, equality, diversity; (3) governance segment, that entitles, diversity in leadership, shareholder rights, anticorruption plans. The other sources of information for the institutional investor are the publicly available information provided such as audited financial statements, company reports and statements, industry reports, and social media (Makhija & Chacko, 2021).

Although there is a rise in the information disclosed, institutional investors, still find it challenging to effectively determine its quality, since the vast variety of ESG data is still voluntarily released. The lack of quality regarding ESG is due to materiality, accuracy, reliability, and comparability (Jonsdottir et al., 2022).

Jondottir et. al (2022), when analyzing the lack of materiality, according to an interview conducted with a pension fund, the information that they consider the most relevant, is the information, covering environmental and social impacts on the actions related to the core businesses of the firms. Other findings in the study suggest that companies, when under pressure to have a good ESG score, tend to gravitate towards a “tick-the-box” strategy. The lack of accuracy is also a complex matter that institutional investors face since they require companies to access ESG data from outside sources, and also, the complexity of the reports sometimes does not bring the most clarifying information on the applicability of resources on sustainable matters. The Lack of Reliability was also pointed out in the study.

From the institutional investor's view, whitewashing, or greenwashing are prevalent in ESG reports. Sustainability reports from companies can be good but are not the most solid foundation, since the information is disclosed by themselves, so there is an inherent risk to greenwash and being the ESG data not audited (ESG data is not considered financial information) that complies with the risk of greenwashing. So, the solution found is for the companies when issuing green bonds, the investors can offer loan agreements with beneficial interest rates to allow the companies to achieve ESG performance goals. Finally, the Lack of Comparability, institutional investors when analyzing similar companies questions the performance evaluation on ESG reports and the methodology behind it since sometimes different evaluations are given to similar companies (Jondottir et. al, 2022).

Information plays a huge part in the investor decision, there is evidence that shows that integrating ESG factors in traditional investment decisions can produce higher returns and sequentially lower risks. The investment process is then largely fueled by the information required by investors to assess future opportunities. A truly fundamental analyst may require access to raw ESG factors in addition to financial reports. However, in most cases, investors are time-constrained, therefore ESG ratings are the most used form of information (Cellier & Chollet, 2016).

A lot of ESG information is applied market-wide, for example, changes in regulation on environmental and social conditions. Nevertheless, individual conditions applied specifically to the company regarding ESG are also important (Berry & Junkus, 2012. The stock market offers investors different information on a variety of financial assets, especially by creating and receiving returns on their portfolios, the market behavior, performance, and uncertainty dictate how investors make their choices (Adeyeye et al., 2018).

2.4. Financial markets reactions to Green Policies

Financial markets are often inefficient, mainly in developing countries. Therefore, investors must consider extra factors in the enhanced indexation, such as ESG factors, to get better performance evidence (X. Li et al., 2022).

The study conducted by Flammer (2021) showed that the stock market response is very positive to green bonds. Especially the ones certified by the third party and are first time issuers. Since the commitment to environmental concerns is materialized, companies become more attractive to investors sensitive to these matters.

In developing markets, the release of green policies is key to catalyzing market activity. ESG investing becomes more profitable after the release of policies in these markets, so green policies deliver a strong signal to the market, increasing the stock values of firms rated with high ESG (Zhang et al., 2021). Media releases announcing future ESG measures lead to positive stock market reactions (Zhang, 2022).

There are mixed standing points regarding market reaction to the disclosure of ESG and CSR information in the literature, how investors analyze the trade-off between the long- and short-term gain of ESG investment inclusion it is an important question (Wang et al., 2022). Numerous studies confirmed that the stock market is news-driven, and depending on the news, its impact on the markets varies, positive news tends to improve the performance of the stock, whereas negative news inhibits stock trading.

Another important point is that government-related sourced news has a superior effect on the stock market than other sources, but academic news has an even greater effect than governmental and industrial news (Li, 2018).

The efficient market hypothesis says that the arrival of new information through events and news reproduces changes in the stock market. The sentiment that the markets have towards the news is considered unpredictable, so the movement of the market would not follow a foreseeable pattern (Malkiel & Fama, 1970). As soon as new relevant information becomes public, it usually spreads fast and is efficiently incorporated into the stock prices, so the volatility of the stock price on the event day is usually evident (Assis et al., 2023).

Behavioral finance postulates that market participants adjust at a slower passe to the news release, which leads to delayed reaction of the stock market, so it is important to also observe the consecutive days of the event release since it can also show relevant information on the stock market returns (Ramiah et. al., 2013).

The study conducted by Ramiah et. al (2013) regarding the impact that green policies have on the Australian stock market concluded that its announcement had a major impact on stock returns. Different industry sectors displayed different reactions, some presented negative abnormal returns (beverages, construction, mining, oil and gas, personal goods) and others positive abnormal returns (media, banks, environmental-friendly industries in engineering). In line with the previous study, Borghesi et al. (2022) also perpetuated the information that the release of green policies has an impact on the stock market. The "green portfolios", which were considered intertreatment portfolios made by the top best-performing companies in terms of ESG, got more benefits from the stock market after the announcement.

The stock market is more responsive regarding statements that include planned environmental statements. High levels of internet posting on financial websites are stated to have a positive abnormal return and increased trading volume, and these posts help predict the volatility of the stock markets. As public awareness intensifies the response, the stock market reacts similarly in matters such as environmental concerns. With the release of a new environmental policy, the consequences of highly polluting industry-related stocks may reflect a negative response and eventually reduce stock prices (Guo et al., 2020).

2.5. Overview of related research and Hypothesis definition

According to the previous studies, we define the following hypothesis in order to generate a different approach to the topic of ESG. So, the hypothesis we are analyzing is the following:

Hypothesis 1: Investors are sensitive to green policies release and mandatory ESG regulation.

In the study conducted by Zhang (2022), it was shown that stock prices respond negatively to apparent climate risk changes, green firms are "rewarded", and "brown" firms are "punished" by the market, being investors sensitive to climate questions.

In other studies, it was verified that the release of green policies has an impact on the stock market, since the examined "green portfolios", which are portfolios that are constituted by top performing companies in ESG, show a better stock performance, after the release of these policies (Borghesi et al., 2022).

Financial regulators seem to have a growing concern over the matter of which environmental risks are being reflected in the prices of financial assets and also, the investor's reaction to the same risks. There is a clear consensus on the urgency of reducing climate change

impacts, but there is still some resistance from investors to include stocks of firms with high ESG in their investment processes (In et al., 2017).

Following the first hypothesis, it seems interesting to understand how the sensitivity varies depending on the green policies or mandatory ESG regulation, surging the second hypothesis.

***Hypothesis 2*:** Different releases of green policies and mandatory ESG regulation are more impactful than others affecting the choice for higher ESG assets.

With the creation of mandatory reports and policies, innovation, and constant changes in consumer preferences. Investors become aware of the immediacy to act relating fossil fuels with the Paris Agreement, however, there are still two scenarios regarding oil demand, the first scenario is that the demand for the commodity will peak between 2020 and 2035, and the second scenario is the consumption for oil will rapidly decrease. So, the uncertainty regarding the choice for higher ESG assets still stands.

In a study conducted by Diaz-Rainey et al. (2021), it is stated that the most important climate policy event was the signing of the Paris Agreement, which had an important impact on the performance of the U.S. oil and gas industry. Contrary to the previous study, Mukanjari and Stender (2018) state that the Paris Agreement had only moderate impacts on the oil and gas industry. Also, the uncertainty of the impact that different release has on the stock market is still a question to be answered, Guo et al. (2020), explains that for environmental policy is releases, investors usually foresee that such information harms highly polluting firms.

Concerning government-related sourced news it was verified that these have a superior effect on the stock market than other sources, but academic news have an even greater effect than governmental and industrial news (Li, 2018).

With the information from the previous hypothesis, we can get conclusions about sensibility and the impact each event has on the market but, another interesting point is to understand how much or how little the market moves. With that information, we could understand if the release of green policies and ESG regulation is being effective and so the third hypothesis surges.

***Hypothesis 3*:** Green policies and mandatory ESG regulation release are below the effectiveness needed to mitigate the effects of climate change on the U.S stock market.

Investors have a very important role in ESG, as they can mobilize the necessary resources, contributing to overcoming the most important sustainability challenges worldwide (Miralles-Quirós et al.,2019; UN, 2015).

The current set of measures falls well short of what is required to lessen the worst effects of climate change, but in the study conducted by Diaz-Rainey et al. (2021), it is interesting to observe how investors are factoring in the influence of current legislation when choosing their investments. The negative performance consequences of ESG investment continue to worry investors (Amel-Zadeh & Serafeim, 2017b.; Friede et al., 2015; Khan et al., 2016).

Still, there are issues particularly in the quality of ESG data due to the nature of often voluntary, potentially biased, disclosed measures without rigorous external assurance. Consequently, a lot of investors and analysts typically disregard the reported ESG data and have little confidence in the quality of ESG information provided (Amel-Zadeh & Serafeim, 2017).

Some literature found that the disclosure of this new non-financial information is beneficial, boosting its value and performance (Flammer, 2021). Nevertheless, other studies demonstrate the contrary, that higher ESG/CSR scores can lead to poorer stock return (Hwang et al., 2022).

3. Methodology

3.1. Event study

To analyze the response of the U.S stock market to important marks on green policies and ESG releases, an event study methodology is applied. The methodology measures the effect of a particular event, on a specific variable, using financial data. It is essential to assume that information is rapidly impounded into prices, being the abnormal return key for these types of studies.

To measure the impact of an event it is important to control unrelated factors, so the selection of the benchmark to measure the normal returns is very important. Event studies are an important tool for the research in capital market since they can test market efficiency.

For the research, the analysis structure followed is in line with Campbell et al. (1997) that listed five steps to conduct an event study, the event definition, the data description, the returns (normal and abnormal), the estimation procedure and the testing procedure.

3.2. Data

To achieve the results of the research three different stock markets will be under analysis, the S&P 500, which will be the benchmark, Dow Jones Sustainability U.S Composite Index, which will be the reference for a sustainable driven stock, and lastly the Dow Jones U.S Oil and Gas Index, that is considered significantly less sustainable.

Stock market data is defined as the daily closing price, of the three-stock mentioned above. The sample spans the period from 3 January 2011 to 31 December 2021, with daily stock prices extracted from Bloomberg.

Created in 1957, the S&P 500 index comprises a total of 500 leading companies, so it is used as the market benchmark, being one of the best t to assess the large-cap U.S equities, with total indexed assets of USD 7.1 trillion (Dec.31, 2021). By analyzing this market, we can see whether the largest U.S stocks are gaining or losing value, hence my choice, to use it as a proxy for describing the overall health of the stock market. The Dow Jones U.S Oil & Gas Index is designed to measure the stock performance of U.S. companies in the oil and gas sector. As for the index to track sustainability concerns, we choose The Dow Jones Sustainability U.S. Composite Index, this is designed for investors who are looking for an index that tracks U.S. securities that apply a sustainability best-in-class selection practice. It tracks the performance of the top 20% of the largest 600 U.S. companies in the Dow Jones Sustainability North America Index, selected by the S&P Global ESG Score.

3.2.1 Green policies and historical impactful ESG occurrences

For the period between 2010 to 2021, the following dates indicate important marks for the rise of ESG concerns. These marks will be under analysis to understand their impacts on the selected stock markets.

The first event is on 13 July 2011, when the Sustainable Accounting Standards Board (SASB) was created to develop standards both for sustainability and financial metrics, the standards identify the subset of environmental, social, and governance issues sectored by industry (1st event) (About Us, 2022b).

Following, on 7 December 2015, Michel Bloomberg created The Task Force on Climate-Related Financial Disclosure (TCFD), an organization to develop deliberate disclosure on climate-related non-financial information, the organization issues recommendations to companies to assist in the release of pertinent information regarding climate-related financial risks, the first was released in June 2017 (Task Force on Climate-Related Financial disclosures (2^{nd}event) (TCFD, 2022).

A very important mark, The Paris Agreement, a legally binding international treaty, was adopted by 196 Parties at the COP 21 in Paris, on 14 December 2015, vigorous on 4 November 2016. The goal of the Paris Agreement was to limit global warming to a temperature below 2 degrees Celsius, compared to pre-industrial levels. It was considered a landmark since it was the first time all nations came together to achieve this climate goal (3rd event) (The Paris Agreement | UNFCCC, n.d.).

On 4 January 2016, the 17 Sustainable Development Goals (SDGs) were adopted. Under these Goals, nations will make an effort to end all forms of poverty, and inequality and deal with climate change. Countries have the responsibility to create sustained economic growth and address a scope of social considering environmental protection (4rd event) (United Nations, 2018).

On 20 February 2018, the Institutional Shareholder Services created the Environmental and Social Quality Score. This is a data-driven methodology to quantify the quality of a company's disclosure on environmental and social issues (5th event) (Sanchez, 2022).

At the Davos World Economic Forum, on 24 January 2020, it was decided with the contribution of the International Business Council (Chairman Brian Moynihan, the CEO of Bank of America) along with The Big Four accounting firms the development the creation of a set of standardized measurements on important metrics provide a structured framework for

companies reports, taking into special account the inclusion of sustainable development goals (SDG) that are based on four pillars, government, planet, people and prosperity (6th event) (*World Economic Forum Annual Meeting Davos 2020*, 2022).

On 26 January 2021, Larry Fink, CEO of BlackRock, one of the world's leading providers of investments, advisory, and risk management solutions, released a letter to the CEOs stating the immediate need for action emphasizing the ESG theme, and the need for companies to report on the topic (7th event) (*Larry Fink CEO Letter*, 2021).

On 7 July 2021, U.S. Securities and Exchange Commission (SEC) released ESG recommendations, given by The Asset Management Advisory Committee (AMAC), to improve the data and disclosure for ESG. It was created to have transparency and verifiability for investment products with ESG strategies and practices. Regarding the recommendations, they advised for SEC to foster consistent and comparable metrics for ESG disclosure in addition to acquiring relevant subject matter expertise from third-party ESG frameworks (8th event) (*SEC.gov* |2021).

On 22 November 2021, the United Nations Climate Change Conference COP27 happened, resulting in countries delivering decisions to reaffirm the importance of the Climate commitment, limiting the global temperature to rise to 1.5 degrees Celsius above pre-industrialization values, cutting gas emissions, and helping boost developing countries financially and technologically (9th event) (*COP27 Reaches Breakthrough Agreement on New "Loss and Damage" Fund for Vulnerable Countries | UNFCCC*, n.d.).

3.3. Event definition

Firstly, in an event study, it is important to delineate the events of interest (previously defined in section 3.2.1). After that, the event window must be defined as being the time frame in which the value of the indexes for the events will be under examination.

Since the assessment of green policies release and impactful moments for ESG development on the stock market is the main focus of the paper, the events are, important marks regarding the theme.

Concerning the event window, it is expressed by the model that usually it is greater than the specified period of interest and includes at least the day of the announcement, for the study, the event window chosen is in total 61 days, 30 days pre-event, the day of the event (t_0) and 30 days pos-event. For the estimation window, it comprises 120 days before the period considered for the event window, as presented in the Fig.3 below. The different dates of the marks selected are defined as day-zero, because the release of the information is considered to occur at time zero (Afonso, Furceri and Gomes, 2012).

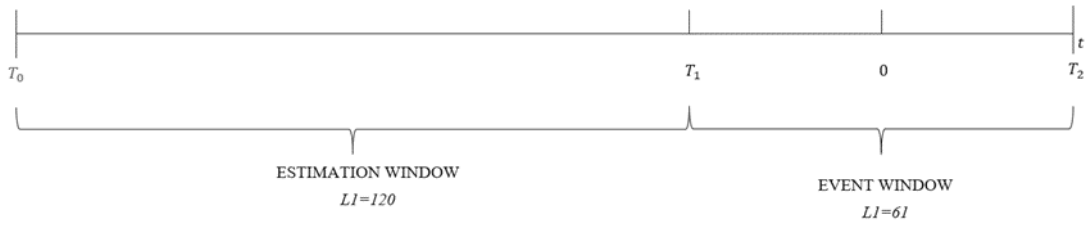

Figure 3. 4. – Timeline

3.4. Normal and abnormal returns

To assess the event's impact on the market, the computation of the abnormal returns is meant to understand, in an event study, the reactions of the market to certain occurrences.

To compute the returns on the Dow Jones U.S Oil & Gas Index, on the Dow Jones Sustainability U.S. Composite Index, and on the S&P500, the *"continuously compounded returns"* were used. Therefore, the observed compounded return for the stocks Dow Jones U.S Oil & Gas Index and Dow Jones Sustainability U.S Composite Index (*i*) and for S&P500 (*m*) at day t is expressed as:

$$R_{it} = Ln\left(\frac{P_{i,t}}{P_{i,t-1}}\right) \tag{1}$$

where, P_{it} is the official closing price of the stock *i* at time *t and* $P_{i,t-1}$ is the official closing price, at time *t*-1 for the same stock *i*.

Following, to calculate the expected returns or normal returns for each individual stock, market model regression[1] is used

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \tag{2}$$

[1] Usually applied in event studies [Cowan, 1992; Brown & Warner, 1985]

where, R_{im} represents the rate of return for the market index on day t and ε is a zero-mean error term with constant variance not auto correlated nor correlated with R_{im}.

The correspondent expected return is:

$$\hat{R}_{it} = \hat{\alpha}_i + \hat{\beta}_i R_{mt} \tag{3}$$

where, $\hat{\alpha}_i$ and $\hat{\beta}_i$ are ordinary least squares (OLS) estimates of α and β for each stock *i*.

Having the expected return, abnormal returns (AR) for the stock *i* on the day *t* is determined by

$$AR_{it} = R_{it} - \hat{R}_{it} \tag{4}$$

Finally, aggregating the abnormal returns is necessary, to infer the impact of the event under study. The aggregation is usually done in time, so for stock *i*, during the event window, or of the stocks under study. It is important for us to analyze one stock at a time, to understand its reaction to the event. So, to this aggregation, we shall refer to it as CAR, this presented by

$$CAR_{it} = \sum_{t-30}^{t+30} AR_{it} \tag{5}$$

and the corresponding variance is the following,

$$Var(CAR_{it}) = \sigma_{it}^2 \tag{6}$$

where, CAR_{it} is the sum of abnormal returns (AR) of stock *i* on day *t*.

3.5. Estimation procedure

The parameter of α and β are estimated by the OLS, over a specific estimation window. Regarding the estimation window, there is no consensus, however, in the literature, Fama et al (1969) use an estimation window of 24 months, (Mikkelson & Partch, 1986) used a period of 24 months, Campbell et al., (1997), suggested that when daily data is used, the parameters of the model can be estimated over a 120-day window prior to the event window.

In our study, considering nine different events, the estimation windows will also be different in time, but keeping the same length of days, the estimation window will consist of 120 days prior to the event window. So, the event windows for all nine events under analysis are:

- First event on 13/07/2011
- Second event on 07/12/2015
- Third event on 14/12/2015
- Fourth event on 4/01/2016
- Fifth event on 20/02/2018
- Sixth event on 24/01/2020
- Seventh event on 26/01/2021
- Eight events on 07/07/2021
- Nineth event on 22/11/2021

3.6. Testing procedure

On an event methodology, a test statistic is usually performed and compared to its assumed distribution under the null hypothesis (Kothari & Warner, 2004).

For the statistic test, usually, the null hypothesis is validated when Abnormal Returns are equal to zero, meaning the event does not have an impact on the price of the stock.

The null hypothesis to be tested for the stock *i* on day *t* is:

$$H_0 = E[SCAR_{it}] = 0 \tag{7}$$

against the alternative hypothesis

$$H_1 \neq E[SCAR_{it}] = 0 \tag{8}$$

Having,

$$CAR_{it} = \sum_{t=t-30}^{t+30} AR_{it} \sim N(0, \sigma_{it}^2) \tag{9}$$

To test the hypothesis that the abnormal returns are equal to zero, for each event on each stock, the standardized CAR (SCAR) must be defined

$$\widehat{SCAR}_{it} = \frac{CAR_{it}}{\widehat{\sigma_{it}}} \tag{10}$$

where, $\hat{\sigma}_{it}$ is calculated on an estimator non skewed of the variance where

$$\widehat{\sigma_{it}^2} = \frac{(\sum_{t=t-30}^{t+30} AR_{it})^2}{61-2} \tag{11}$$

Under the null hypothesis, the distribution of $\widehat{SCAR}_{it}$ is a *t Student* with L-2 degrees of freedom. According with the properties of the t Student it is expected to get $\widehat{SCAR}_{it} = 0$.

There is a rejection of the null hypothesis if the test value is in the critical region. However, the null hypothesis is never accepted, even if it is not rejected, it does not mean that it should be accepted. If the test value is in the critical region, there is statistical evidence question about the veracity of the null hypothesis, so there is a need to test the significance level and it is usually between 0.01 and 0.05. The critical value, from which the absolute test value is rejected, depends on the significance level.

4. Empirical results

Considering the Hypothesis on section 2.4, we will assess the following: “Investors are sensitive to green policies release and mandatory ESG regulation”; “Different releases of green policies and mandatory ESG regulation are more impactful than others, affecting the choice for higher ESG assets”; “Green policies and mandatory ESG regulation release are below the effectiveness needed to mitigate the effects of climate change on the U.S stock market.”.

When performing the event study to verify the impact the events chosen had on the stock indexes under analysis, The Dow Jones U.S Oil & Gas Index and on The Dow Jones Sustainability U.S Composite Index, we can outline conclusions that allow the validation or invalidation of the proposed hypothesis.

To evaluate the results, the rule was that H_0 is rejected if the p-value of the test is less than or equal to α=0,05, so if our significance falls under the significance level proposed, we can assume the relevance of the cumulative abnormal return (CAR), felt by the stock index, was statically significant.

When overviewing the events, we can conclude that investors seem to be sensitive to green policies and mandatory ESG regulation. For the first event (information regarding CAR and significance in the table 4.1. below for the first event), when SASB was created to develop important standards both for sustainability and financial metrics, we can see that for The Dow Jones Sustainability U.S Composite Index, the event generated negative cumulative abnormal returns, for t*(CAR= -0,01554), for [t-3;t[(CAR= -0,445), for [t-30;t[(CAR= -0,1376) and for the [t-30;t+30] (CAR= -0,1494) that were statistically significant (p-value=0,0543, p-value=0,0009, p-value=0,0011, p-value=0,0122, respectively). Even though the impact was negative, this reaction still shows sensitivity from the market.

Dow Jones U.S Oil & Gas Index						
First Event						
	Period					
	[t-30;t+30]	[t-30,t[	[t-3,t[	t*	]t,t+3]	]t,t+30]
CAR	-0,0177	-0,008	0,0022	0,0032	0,0257	-0,013
t-statistics	-0,2357	-0,1509	0,132	0,384	1,538	-0,2466
Sig.	0,8141	0,8803	0,8952	0,7017	0,127	0,806

The Dow Jones Sustainability U.S. Composite Index						
First Event						
	Period					
	[t-30;t+30]	[t-30,t[	[t-3,t[	t*	]t,t+3]	]t,t+30]
CAR	-0,1493	-0,1376	-0,0445	-0,01554	0,0257	-0,013
t-statistics	-2,545	-3,344	-3,4164	-1,9437	1,538	-0,2466
Sig.	0,0122	0,0011	0,0009	0,0543	0,127	0,806

Table 4.1. CAR and the respective statistics for The Dow Jones U.S Oil & Gas Index and for The Dow Jones Sustainability U.S Composite Index regarding the first event.

Other events also show sensitivity from investors, for event number two (values regarding CAR and significance in Table 4.2. for the second event), the event where Michel Bloomberg created The Task Force on Climate-Related Financial Disclosure (TCFD), there is a significant negative impact on the Dow Jones U.S Oil&Gas Index on the day of the event (t*) (CAR= -0,02928, p-value= 0,005), and for The Dow Jones Sustainability U.S Composite Index previous to the event ([t-3;t[) there was also negative abnormal return, considered statistically significant (CAR= -0,0506, p-value= 0,0095) which also indicated sensitivity from investors, validating hypothesis one.

Dow Jones U.S Oil & Gas Index						
Second Event						
	Period					
	[t-30;t+30]	[t-30,t[	[t-3,t[	t*	]t,t+3]	]t,t+30]
CAR	-0,4228	-0,0364	0,0022	-0,02928	0,02512	0,0235
t-statistics	-0,3899	-0,4793	0,132	-2,8605	1,0446	-0,3084
Sig.	0,6973	0,63261	0,8952	0,005	0,2983	0,7584

The Dow Jones Sustainability U.S. Composite Index						
Second Event						
	Period					
	[t-30;t+30]	[t-30,t[	[t-3,t[	t*	]t,t+3]	]t,t+30]
CAR	-0,0306	-0,0679	-0,0506	0,001	0,0082	0,0363
t-statistics	-0,3535	-1,1185	-2,6372	0,089	0,4244	0,5979
Sig.	0,7244	0,2656	0,0095	0,9292	0,672	0,5511

Table 4.2. CAR and the respective statistics for The Dow Jones U.S Oil & Gas Index and for The Dow Jones Sustainability U.S Composite Index regarding the second event.

For event five, when Institutional Shareholder Services created the Environmental and Social Quality Score (Table 4.3), and for event number six, the Davos World Economic Forum (information about CAR and significance of Table 4.4 use regarding the sixth event) we can see that, for both, there is a statically significant reaction. On the fifth, prior to the event ([t-30;t[) there is a negative reaction on the Dow Jones U.S Oil & Gas Index (CAR= -0,0923), that is statically significant (p-value= 0,0061) also for The Dow Jones Sustainability U.S Composite Index the overall event period ([t-30;t+30]) there is a negative reaction show in the results (CAR= -0,0936), statistically significant (p-value= 0,0085). For the sixth event, for the Dow Jones U.S Oil & Gas Index, the overall event period ([t-30; t+30]), there is a negative reaction (CAR= -0,3251) statically significant (P-value= 0,0003), and also for period post event (]t, t+30]) there is also a negative statically significant reaction from the market (CAR= -0,2922, P-value= 0). On The Dow Jones Sustainability U.S Composite Index for the overall period of the event ([t-30; t+30]), and also for the post event period (]t, t+30]) there is a statistically significant negative reaction (CAR= -0,3374, p-value= 0; CAR= -0,3542, P-value= 0, respectively for the periods previously mentioned).

Dow Jones U.S Oil & Gas Index						
Fifth Event						
	Period					
	[t-30;t+30]	[t-30,t[	[t-3,t[	t*	]t,t+3]	]t,t+30]
CAR	-0,0541	-0,0923	-0,0126	0,0007	0,0061	0,0379
t-statistics	-1,1432	-2,7939	-1,2045	0,1049	0,577	1,1419
Sig.	0,2553	0,0061	0,2308	0,2553	0,5651	0,25581

The Dow Jones Sustainability U.S. Composite Index						
Fifth Event						
	Period					
	[t-30;t+30]	[t-30,t[	[t-3,t[	t*	]t,t+3]	]t,t+30]
CAR	-0,0936	-0,0497	-0,0186	-0,0005	-0,0118	-0,043
t-statistics	-2,6747	-2,0248	-2,0248	-0,1048	-1,5236	-1,7682
Sig.	0,0085	0,0451	0,0451	0,9167	0,1303	0,0796

Table 4.3. CAR and the respective statistics for The Dow Jones U.S Oil & Gas Index and for The Dow Jones Sustainability U.S Composite Index regarding the fifth event.

Dow Jones U.S Oil & Gas Index						
Sixth Event						
	Period					
	[t-30;t+30]	[t-30,t[	[t-3,t[	t*	]t,t+3]	]t,t+30]
CAR	-0,3251	-0,0323	-0,028	-0,0008	-0,0239	-0,2922
t-statistics	-3,7347	-0,5269	-1,4454	-0,0798	-1,2359	-4,7855
Sig.	0,0003	0,5993	0,151	0,9365	0,2189	0

The Dow Jones Sustainability U.S. Composite Index						
Sixth Event						
	Period					
	[t-30;t+30]	[t-30,t[	[t-3,t[	t*	]t,t+3]	]t,t+30]
CAR	-0,3374	0,0043	0,0037	0,0124	0,0042	-0,3542
t-statistics	-5,3475	0,0972	0,2665	1,5386	0,3002	-8,0036
Sig.	0	0,9227	0,7903	0,1266	0,7646	0

Table 4.4. CAR and the respective statistics for The Dow Jones U.S Oil & Gas Index and for The Dow Jones Sustainability U.S Composite Index regarding the sixth event.

Finally, the last event that shows significance and verifies the hypothesis the event number nine (Table 4.5), referencing the United Nations Climate Change Conference COP27, there is a positive abnormal reaction on the Dow Jones Sustainability Index (CAR= 0,10069) compared with the market benchmark, S&P500, is statistically relevant (p-value= 0) and the null hypothesis is accepted, on the day of the event (t*). This reaction shows that the investor is becoming more sensitive to "green policies" release, since the event had a positive impact on the stock with high ESG levels. Also, in the period prior to the event ([t-3; t [for The Dow Jones U.S Oil & Gas Index, the negative abnormal return (CAR= -0,0558) is statically significant (p-value= 0,0232), considering the level of significance of 0,05. This can be another proof that investor is becoming more sensitive since approaching an event as important as COP27, the stock considered to have a lower ESG underperformed compared to the S&P500.

Dow Jones U.S Oil & Gas Index						
Nineth Event						
	Period					
	[t-30;t+30]	[t-30,t[	[t-3,t[	t*	]t,t+3]	]t,t+30]
CAR	-0,1005	-0,1141	-0,0558	0,0192	0,0209	-0,0559
t-statistics	-0,9188	-1,4877	-2,3007	1,191	0,8637	-0,0728
Sig.	0,3601	0,1395	0,0232	0,2361	0,3895	0,9421

The Dow Jones Sustainability U.S. Composite Index						
Nineth Event						
	Period					
	[t-30;t+30]	[t-30,t[	[t-3,t[	t*	]t,t+3]	]t,t+30]
CAR	0,1534	0,0468	-0,0111	0,1069	-0,0115	-0,0003
t-statistics	2,8231	1,2282	-0,9228	15,6739	-0,9537	-0,0087
Sig.	0,0056	0,2218	0,358	0	0,3421	0,9931

Table 4.5 CAR and the respective statistics for The Dow Jones U.S Oil & Gas Index and for The Dow Jones Sustainability U.S. Composite Index regarding the ninth event.

To test the second hypothesis, we take the conclusion based on the same tables previously mentioned, since these events are the ones that show statistically significant results from the abnormal return that the stocks had compared to the benchmark, the S&P 500.

We can verify the second hypothesis since only five out of the nine events seem to cause alteration to the stocks, we can understand that some events are more powerful than others, especially for event number nine, the event that shows the clear impact that the event had on the indexes.

Analyzing all events, we can state that, even though some show sensibility from investors, the release of green policies and the release of mandatory ESG regulation, the impact is still not sufficient, since a lot of reactions to the chosen events are not statistically significant (remaining tables of the events under analysis on annex 1). Hence, Green policies and mandatory ESG regulation release are below the effectiveness needed to mitigate the effects of climate change on the U.S stock market, verifying the third hypothesis.

5. Conclusions and recommendations

5.1. Discussion and conclusion

The inclusion of ESG has become important since it enables investors to seek investments that have social value, environmental value, and governance concerns included in them. Most likely these types of investments can bring long-term financial returns due to a reduction of potential risks, such as the risk of litigation, compliance, tax, and honor (Chen et al., 2021).

There is a clear growing acceptance of ESG in general, from inclusion in companies reports to mandatory regulation on the topic and a change towards investments meeting ESG standards across industries. However, it is still not clear that investors meaningfully use ESG in their investment choices. Since it is still not clear, the study conducted had the purpose of contributing to the existing research on the topic, examining three hypotheses: "Investors are sensitive to green policies release and mandatory ESG regulation"; "Different releases of green policies are more impactful than others, affecting the choice for higher ESG assets" and "Green policies and mandatory ESG regulation release are below the effectiveness needed to mitigate the effects of climate change on the U.S stock market."

From 2010 to 2021, applying an event study methodology, we analyzed different events to verify or not the hypothesis previously mentioned regarding the U.S stock market, more specifically, The Dow Jones U.S Oil & Gas Index, which was meant to represent, an index composed with lower ESG stocks, The Dow Jones Sustainability U.S. Composite Index, that represented stock with higher ESG and has the benchmark, S&P500.

This paper suggests that investors are sensitive to green policies and ESG regulation release, it also shows that depending on the release, the impact on the market differs and that the market is still below the effectiveness needed to mitigate the effects of climate change.

5.2. Research limitations

In the study, we encountered some limitations. Since only two stocks were under analysis, even though they were index stocks, to compare abnormal returns with the benchmark when there are more stocks, the results could be more precise, and perhaps increase the relevance of the study conducted.

The other limitation is on the methodology applied, an event study methodology, even though it is quite reliable, able to detect abnormal returns, and easy to interpret, it still has some limitations regarding its application, for example, the assumptions used in this type of

methodology are not valid in some circumstances, because, due to market inefficiency observed in the stock prices may not reflect information right away. And there is a difficulty in isolating the impact that a single event may cause.

5.3. Contributions to the theory

This study purpose was to get a clearer understanding and contribute to ESG-related studies and its impact on the stock market, in this case, more specifically the U.S stock market.

Since our study analyses a 10-year span and includes nine different events, it provides a good understanding of how ESG is affecting the U.S stock market. The thesis adds to the existing literature and continuous debate is whether ESG/CSR evidence can affect stock performance (Meng-Tao et al., 2023). Complementing some of the literature that found that the disclosure of this new non-financial information is beneficial when reducing corporate costs and boosting its value and performance (Flammer, 2021). Nevertheless, other studies demonstrate the contrary, that higher ESG/CSR scores can lead to poorer stock returns (Hwang et al., 2022).

5.4. Recommendations for future studies

For future research, it would be interesting to have more stocks under analysis and compare the impact green policies had on their development and ESG criteria performance since ESG has been rising rapidly in the last few years.

Economic sustainability performance comprehends financial costs and benefits, mirroring the long-term profitability and financial sustainability of a company. It is normally disclosed by financial indicators on the financial statements of a company, represented by the return on equity (ROE), return on assets (ROA), and economic value added (EVA). These key performance indicators (KPIs) help investors to better assess the risks and returns associated with their investments. Therefore, a fair disclosure of economic sustainability performance supports investors and other stakeholders to properly assess the long-term profitability, earnings quality, and cash flows of companies (De Souza Cunha & Samanez, 2012). It would be curious to integrate these KPIs when developing new studies to understand the impacts of ESG and green policies.

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Appendices

Appendix A- Tables resulting from the Event Study methodology.

Appendix A.1.1. – 1^{st}Event- Excel output

Dow Jones U.S Oil & Gas Index						
First Event						
	Period					
	[t-30;t+30]	[t-30,t[	[t-3,t[	t*	]t,t+3]	]t,t+30]
CAR	-0,0177	-0,008	0,0022	0,0032	0,0257	-0,013
t-statistics	-0,2357	-0,1509	0,132	0,384	1,538	-0,2466
Sig.	0,8141	0,8803	0,8952	0,7017	0,127	0,806

The Dow Jones Sustainability U.S. Composite Index						
First Event						
	Period					
	[t-30;t+30]	[t-30,t[	[t-3,t[	t*	]t,t+3]	]t,t+30]
CAR	-0,1493	-0,1376	-0,0445	-0,01554	0,0257	-0,013
t-statistics	-2,545	-3,344	-3,4164	-1,9437	1,538	-0,2466
Sig.	0,0122	0,0011	0,0009	0,0543	0,127	0,806

Appendix A.1.2. – 2^{nd}Event - Excel output

Dow Jones U.S Oil & Gas Index						
Second Event						
	Period					
	[t-30;t+30]	[t-30,t[	[t-3,t[	t*	]t,t+3]	]t,t+30]
CAR	-0,4228	-0,0364	0,0022	-0,02928	0,02512	0,0235
t-statistics	-0,3899	-0,4793	0,132	-2,8605	1,0446	-0,3084
Sig.	0,6973	0,63261	0,8952	0,005	0,2983	0,7584

The Dow Jones Sustainability U.S. Composite Index						
Second Event						
	Period					
	[t-30;t+30]	[t-30,t[	[t-3,t[	t*	]t,t+3]	]t,t+30]
CAR	-0,0306	-0,0679	-0,0506	0,001	0,0082	0,0363
t-statistics	-0,3535	-1,1185	-2,6372	0,089	0,4244	0,5979
Sig.	0,7244	0,2656	0,0095	0,9292	0,672	0,5511

Appendix A.1.3. – 3^{rd}Event - Excel output

Dow Jones U.S Oil & Gas Index						
Third Event						
	Period					
	[t-30;t+30]	[t-30,t[	[t-3,t[	t*	]t,t+3]	]t,t+30]
CAR	0,0352	-0,0259	0,0187	0,0023	-0,0113	0,0588
t-statistics	0,3229	-0,3393	0,7724	0,2225	-0,4659	0,7693
Sig.	0,7474	0,735	0,4414	0,8243	0,6422	0,6422

The Dow Jones Sustainability U.S. Composite Index						
Third Event						
	Period					
	[t-30;t+30]	[t-30,t[	[t-3,t[	t*	]t,t+3]	]t,t+30]
CAR	0,0149	-0,0721	-0,0212	-0,0001	-0,0109	0,0871
t-statistics	0,172	-1,1905	-1,1476	-0,008	-0,5703	1,4373
Sig.	0,8638	0,2534	0,2534	0,9935	0,5695	0,1533

Appendix A.1.4. – 4^{th}Event- Excel output

Dow Jones U.S Oil & Gas Index						
Forth Event						
	Period					
	[t-30;t+30]	[t-30,t[	[t-3,t[	t*	]t,t+3]	]t,t+30]
CAR	0,016	-0,0559	0,0076	0,019	-0,0126	0,0529
t-statistics	0,1411	-0,7031	0,3028	1,7424	-0,5021	0,6665
Sig.	0,888	0,4833	0,7626	0,084	0,6165	0,5064

The Dow Jones Sustainability U.S. Composite Index						
Forth Event						
	Period					
	[t-30;t+30]	[t-30,t[	[t-3,t[	t*	]t,t+3]	]t,t+30]
CAR	0,0586	-0,0413	-0,0127	0,0062	-0,0256	0,0937
t-statistics	0,6551	-0,6593	-0,6421	0,5225	-1,288	1,4947
Sig.	0,5137	0,5109	0,5221	0,6023	0,2003	0,1377

Appendix A.1.5. – 5^{th}Event - Excel output

Dow Jones U.S Oil & Gas Index						
Fifth Event						
	Period					
	[t-30;t+30]	[t-30,t[	[t-3,t[	t*	]t,t+3]	]t,t+30]
CAR	-0,0541	-0,0923	-0,0126	0,0007	0,0061	0,0379
t-statistics	-1,1432	-2,7939	-1,2045	0,1049	0,577	1,1419
Sig.	0,2553	0,0061	0,2308	0,2553	0,5651	0,25581

The Dow Jones Sustainability U.S. Composite Index						
Fifth Event						
	Period					
	[t-30;t+30]	[t-30,t[	[t-3,t[	t*	]t,t+3]	]t,t+30]
CAR	-0,0936	-0,0497	-0,0186	-0,0005	-0,0118	-0,043
t-statistics	-2,6747	-2,0248	-2,0248	-0,1048	-1,5236	-1,7682
Sig.	0,0085	0,0451	0,0451	0,9167	0,1303	0,0796

Appendix A.1.6. – 6^{th}Event - Excel output

Dow Jones U.S Oil & Gas Index						
Sixth Event						
	Period					
	[t-30;t+30]	[t-30,t[	[t-3,t[	t*	]t,t+3]	]t,t+30]
CAR	-0,3251	-0,0323	-0,028	-0,0008	-0,0239	-0,2922
t-statistics	-3,7347	-0,5269	-1,4454	-0,0798	-1,2359	-4,7855
Sig.	0,0003	0,5993	0,151	0,9365	0,2189	0

The Dow Jones Sustainability U.S. Composite Index						
Sixth Event						
	Period					
	[t-30;t+30]	[t-30,t[	[t-3,t[	t*	]t,t+3]	]t,t+30]
CAR	-0,3374	0,0043	0,0037	0,0124	0,0042	-0,3542
t-statistics	-5,3475	0,0972	0,2665	1,5386	0,3002	-8,0036
Sig.	0	0,9227	0,7903	0,1266	0,7646	0

Appendix A.1.7. – 7^{th}Event - Excel output

Dow Jones U.S Oil & Gas Index						
Eight Event						
	Period					
	[t-30;t+30]	[t-30,t[	[t-3,t[	t*	]t,t+3]	]t,t+30]
CAR	-0,2116	-0,0476	-0,0308	-0,0215	0,0056	-0,1425
t-statistics	-1,6973	-0,5446	-1,1477	-1,1029	0,2027	-1,623
Sig.	0,0922	0,5871	0,2672	0,2723	0,8398	0,106

The Dow Jones Sustainability U.S. Composite Index						
Eight Event						
	Period					
	[t-30;t+30]	[t-30,t[	[t-3,t[	t*	]t,t+3]	]t,t+30]
CAR	-0,0127	-0,0149	-0,0149	0,008	-0,0035	-0,0114
t-statistics	-0,191	-1,0159	-1,0159	0,9761	-0,231	-0,2453
Sig.	0,8488	0,8419	0,3117	0,331	0,8111	0,8066

Appendix A.1.8. – 8^{th}Event - Excel output

Dow Jones U.S Oil & Gas Index						
Seventh Event						
	Period					
	[t-30;t+30]	[t-30,t[	[t-3,t[	t*	]t,t+3]	]t,t+30]
CAR	0,2869	0,0211	-0,0462	-0,0192	0,0145	0,285
t-statistics	1,7746	0,1863	-1,2893	-0,8347	0,404	2,514
Sig.	0,0785	0,8524	0,1998	0,4056	0,6869	0,0133

The Dow Jones Sustainability U.S. Composite Index						
Seventh Event						
	Period					
	[t-30;t+30]	[t-30,t[	[t-3,t[	t*	]t,t+3]	]t,t+30]
CAR	0,0139	-0,0324	-0,029	0,0117	0,017	0,0346
t-statistics	0,1608	-0,5326	-1,508	1,08	0,883	0,5696
Sig.	0,8725	0,8725	0,1342	0,2823	0,379	0,57

Appendix A.1.9. – 9^{th}Event - Excel output

Dow Jones U.S Oil & Gas Index						
Nineth Event						
	Period					
	[t-30;t+30]	[t-30,t[	[t-3,t[	t*	]t,t+3]	]t,t+30]
CAR	-0,1005	-0,1141	-0,0558	0,0192	0,0209	-0,0559
t-statistics	-0,9188	-1,4877	-2,3007	1,191	0,8637	-0,0728
Sig.	0,3601	0,1395	0,0232	0,2361	0,3895	0,9421

The Dow Jones Sustainability U.S. Composite Index						
Nineth Event						
	Period					
	[t-30;t+30]	[t-30,t[	[t-3,t[	t*	]t,t+3]	]t,t+30]
CAR	0,1534	0,0468	-0,0111	0,1069	-0,0115	-0,0003
t-statistics	2,8231	1,2282	-0,9228	15,6739	-0,9537	-0,0087
Sig.	0,0056	0,2218	0,358	0	0,3421	0,9931