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ESG and Firms' Creditworthiness

An Empirical Analysis

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*To my parents and Laura,
the anchors of my life*

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INTRODUCTION

Individual and institutional investors have considerably increased their interest in environmental, social and governance (ESG). In the last decade, the amount of assets under management in socially responsible investment products has grown. Given the ever-growing importance that Millennial and Z generations have posed and are posing on the theme, this trend is intended to accelerate. Nevertheless, a clear understanding of the economic benefits of investing in ESG product is still missing. Several types of research have documented copious positive economic effects related to ESG: lower cost of capital, cost reduction, productivity uplift and profitability are just a few examples. Being factors influencing corporate creditworthiness, these could considerably impact companies' credit risk indicators. The aim of this thesis is to identify empirical evidence of a relationship between ESG parameters and credit default swap spread with reference to corporate fixed income.

In the first chapter, a general overview of ESG world and its principal aspects will be discussed. Different distinctions of sustainability investments will be analysed, by concentrating on the aim they pursue. After that we will focus on the SRI, the latter is a long-term investment approach with the aim to include environmental, social and governance aspect bearing in mind the financial return. Specifically, we will provide an overview of the six categories of strategies that aim to include ESG factor in the decision-making process of the investors. Subsequently, an analysis of the work undertaken by the UN PRI will be taken into consideration. In particular, we will see its evolution, objectives and strategy over the years. At the end of the chapter, the attention will be focused on the reasons why investors should use ESG in their investment decision-making and the myths around the process of environmental, sustainable and governance factors integration.

The second chapter will focus on the relation between ESG and creditworthiness. Initially, it will be centred around the concept of corporate social responsibility and the influencing factors of corporate creditworthiness. Particularly, we will focus on how these factors are influenced by ESG, and how this is reflected by the credit risk indicators. Subsequently, in the second part, a more detailed analysis of ESG and creditworthiness factors will be put under the lens. Indeed, we will focus on those factors which could positively influence corporate creditworthiness, in particular ESG relation to performance and cost of capital will be investigated. Lastly, the examination of Merton model will be viewed. This framework helps understand how factors may influence the probability of default of a company.

The last chapter will be composed of the analysis of the relation between ESG parameters and corporate default swap (CDS) spread. Specifically, we want to test if ESG factors help improve firms' creditworthiness, lowering the CDS spreads. The latter is used as a parameter for the measure of credit risk since it is easily comparable across firms and includes most of the firm-level determinants of default risk. Through ESG consideration, a company could benefit higher and more stable cash flows, which translate into higher asset value and a lower probability of default. This would help investors mitigate risks and make better investment choices; insofar these non-financial metrics allow identifying material risks and growth opportunities. The world is progressively changing: climate change is a reality, energy source are shifting, technology is modifying what people demand, large corporations' value chains are increasingly global and firms' good governance is tremendously important especially after the financial crisis in 2008. The use of ESG could help enclose all these factors contributing to generate a more sustainable and resilient financial system. The analysis is computed on a sample composed of N=56 companies and T=7 years (2010-2016) with quarterly data. Three kinds of models have been developed: the first one only includes ESG combines scores, the second one will be focused on the three pillars taken individually, while the third one will include both ESG combined score and E, S and G taken individually. Each model includes different control variables to take into account the credit risk and the financial structure of a firm. For this purpose, market size and leverage, as well as liquidity and profitability indicators, are used. In addition, all the three model are characterized by the use of fixed effects for time, area and sector to eliminate any kind of heterogeneity among individuals. In this way, we can understand the effect of ESG on creditworthiness or, more precisely, on credit default swap (CDS) spread, independently of geographic area, time-period and sector. If a negative relation between ESG and CDS spread exists, ESG could effectively represent a tool for make investment decision managing better risk.

CHAPTER 1

An introduction to ESG World

The term sustainability, particularly in the financial world, began to develop during 1997, when two German Universities issued the “Frankfurt-Hohenheimer Guidelines.” The latter matured more than 850 criteria for evaluating companies’ corporate responsibility towards three main areas: cultural, social and environmental sustainability. Nevertheless, only in 2004, as reported in “Who Cares Wins” (The Global Compact, 2004), the ESG term was coined. The former, thanks to the joint initiative of several financial institutions, developed several guidelines in order to better integrate environmental, social and governance issues in asset management. They further asserted “Companies with better ESG performance can increase shareholder value by better managing risks related to emerging ESG issues, by anticipating regulatory changes or consumer trends, and by accessing new markets or reducing costs”.

1.1 Is ESG a Label?

The acronym ESG denotes three different fields, which in turn enclose as many distinct sections of social sensitivity. The term aims to outline a set of metrics in order to measure the investment level sustainability. The letter E stands for Environmental, which includes risks as climate change and carbon emission, air and water pollution, and water scarcity. Particularly, climate crisis has become increasingly important: in fact, in 2015 during the United Nations Climate Change Conference (COP21), the first-ever universal and legally binding agreement for climate change was set out. A key element of this agreement is represented by the long-term goal, which concerns limiting the increase of the global average temperature below 2°C¹. The S conveys social issues as gender and diversity, employee engagement and customer satisfaction. Lastly, the third capital embodies the corporate governance matters such as management of corruption and bribery, board structure and accountability, and executive compensation. The Governance factor has increased its relevance, especially after the economic crisis of 2008. As a

¹ https://ec.europa.eu/clima/policies/international/negotiations/paris_en

matter of fact, in 2009 the EU issued the directive 2009/138/EC, also known as Solvency II Directive, which brought attention on governance and risk management issues².

Therefore, there is no one inflexible list to classify ESG, it varies across regions and sectors. Table 1 shows some examples of ESG issues:

Table 1. Example of ESG Issues

Environmental Issues	Social Issues	Governance Issues
■ Climate change and carbon emissions	■ Customer satisfaction	■ Board composition
■ Air and water pollution	■ Data protection and privacy	■ Audit committee structure
■ Biodiversity	■ Gender and diversity	■ Bribery and corruption
■ Deforestation	■ Employee engagement	■ Executive compensation
■ Energy efficiency	■ Community relations	■ Lobbying
■ Waste management	■ Human rights	■ Political contributions
■ Water scarcity	■ Labor standards	■ Whistleblower schemes

Source: CFA Institute (2015)

Essentially, the ESG issues constitute screening parameters that aim to assess the sustainability of investment (Barclays, 2016). Their consideration in investing is not a new phenomenon, actually many investors deal with them in investment decision by integrating reputational risk and regulatory developments, for instance (CFA Institute, 2015). The early use was principally guided by investors undoubtedly driven by ethical and social motivation while others looked at them with a critic eye (Barclays, 2016). Indeed, according to the survey of BNP Paribas Securities, the 66% of respondents denounced problem with ESG data, citing it as the main barrier for a broader adoption of environment, social and governance issues across investment portfolio³. Despite this, the potential use of ESG data to build a more resilient financial system has attracted the attention of the Bank of England Governor Mark Carney. During a sustainable finance conference in 2019⁴in Brussels, the latter said that “in the future, climate and ESG considerations will likely be the heart of mainstream investing”, adding also

² Directive 2009/138/EC

³ <https://www.environmental-finance.com/content/analysis/the-esg-data-files-part-one-introduction.html>

⁴ <https://www.bankofengland.co.uk/speech/2019/mark-carney-speech-at-european-commission-high-level-conference-brussels>

that ESG data can help identify firms with improved earnings stability and lower share price volatility.⁵

The basic idea of integrating sustainable factors into investment decision is principally driven by personal matters which look beyond traditional financial measures. Nevertheless, the incorporation of ESG-related aspects into investment process has often led to tremendous confusion. In fact, Environmental, Sustainable and Governance factors are often in the habit of being used as a catchall label for all the sustainable investments. While understanding that a truly necessary for a shorthand label is generally required, there are several terms which specified different and sophisticated approaches of sustainability investments (Hill, 2020). In the following list, there is a long and nearly complete schedule of different categories of sustainable investments:

1. Responsible investing (RI): the term describes the investment decision based not only on financial performance, but also on reaching positive effects on society avoiding negative ones. This approach passes the investment process through the severe lens of the ESG pillars, gazing at long-term financial returns and a stable social and environmental system.⁶
2. Socially Responsible Investment (SRI): this type of investment focuses on the impact of firms in specific fields of interest. The most accepted investment method in this area comprises the negative screen, which excludes companies involved in ventures considered undesirable by the investors. Some examples of this approach foresee excluding firms in the business of tobacco, alcohol, and guns (Hill, 2020). To give an illustration of the negative screen functioning, let us consider the divestment strategy operating during the Apartheid Era in South Africa. After 1980, more than 100 US colleges and universities have closed their position on several companies operating in South Africa from their portfolios (Kaempfer, Lehman & Lowenberg, 1987). The decision was taken after several influencing events which has condemned Apartheid: in 1962, the United Nation decided to officially denounce the racist regime of apartheid and invited the member states to interrupt diplomatic and economic relations with South Africa (Hill, 2020). In 1977, the drafting of the Sullivan Principle (a code of conduct for U.S. firms for ethically operating in South Africa) guided several firms to change

⁵ <https://www.environmental-finance.com/content/analysis/the-esg-data-files-part-one-introduction.html>

⁶ <http://www.eurosif.org/responsible-investment-strategies/>

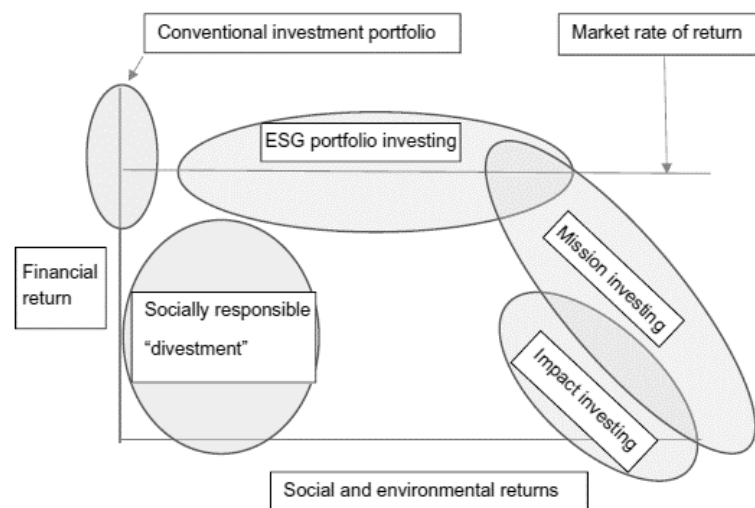
behaviour over their South Africa investments. After that, different worldwide pension funds also decided to adopt those divestment rules (Kaempfer *et al.* 1987). The result of this process, along with sanctions, boycotts and internal resistance, led to the end of this era (Hill, 2020).

3. Sustainable investment (SI): it is an investment strategy that aims to preserve its value over time. In fact, in addition to economic and financial factors, other extra-element such as environmental, social and governance issues are taken into account (Staub-Bisang, 2012). In practice, it combines fundamental analysis with ESG issues in order to get better returns for investors, to improve society influencing the company behaviour (Eurosif, 2016). Sustainable investing is increasingly used interchangeably with ESG investment (Barclays, 2016).
4. Ethical Investing: it describes a type of investment that guarantees that ethical or religious belief is considered during the investment process. The procedure, likewise to Socially Responsible Investing, tends to exclude different controversial sectors (Barclays, 2016).
5. Impact investing: the term was first coined by The Rockefeller Foundation in 2007, which enjoys one hundred years of experience in the field (Hill, 2020). In particular, it defines a type of investment focused on social and environmental influence, in which investors seem to be willing to accept earnings below the market with the aim to help finance causes they believe valuable (Barclays, 2016).
6. Mission investing: the term is often used for those activities of charitable foundations or religious funds that want to pursue social, environmental, or spiritual purposes (Hill, 2020). For example, an investment which improves healthcare or educational opportunity for children is used to be considered a mission investment. These investments are conceived for having a positive social externality and earning to maintain the institution's financial stability (Hill, 2020). The area of interest of such investments is focus on Criminal Justice, Health, Education and Public finance.

7. Sustainable and Responsible Investing (SRI)⁷: it is often utilized as an umbrella for some of the above approach. The latter definition seems to be the most accepted, because it places greater emphasis on issues that are financially important for investors (Barclays, 2016).

In order to better understand the various social investment styles, the following table provides a summary: it examines the financial return on the vertical axis, while social and environmental returns are on the horizontal axis. Conventional investments portfolios tend to have a distribution of profit around the median market rate, but a social and environmental return that is almost minimal. On the other hand, it is possible to shape a portfolio which respects ESG factors that could have financial returns nearly similar to the conventional one (Hill, 2020). As far as divestment portfolio is concerned, the performance on financial return coupled with social and environmental yield tends to be very poor, with rare exceptions. For what concerns impact investing and mission investment they have shown to be linearly similar and often overlapping each other. Mission investing displays to receive a higher rate of return at least to support the continuing operation of the organizational structure. Instead, impact investing often includes some organizations willing to accept below the market yield, as long as environmental and social return is high (Hill, 2020).

Table 2. Financial Returns Compared to Social and Environmental Issues for Different Investments Styles



Source: Hills, 2020

⁷ Although “Socially Responsible Investment” and “Sustainable and Responsible Investing” are both identified as SRI, they are different: the first focuses on the impact of firms in specific fields of interest, while the second one identifies an umbrella for some approaches of sustainable investments.

To sum up, we can say that various labels are employed to describe investments that consider ESG factors. Nevertheless, there are several dimensions which discern one type of investment to another one.

1.2 Sustainable and Responsible Investment

Sustainable and Responsible Investment (SRI) is a long-term investment approach with the aim to include environmental, social and governance aspect bearing in mind the financial return (Eurosif, 2016). According to Eurosif, the European Sustainable Investment Forum, it is possible to identify different categories of strategies to include ESG factor in the decision-making process of the investors. Essentially, there are seven methods identified by Eurosif: exclusion of holdings from investment universe, norm-based screening, best-in-class investment selection, sustainability themed investment, ESG integration, engagement and voting on sustainability matters and impact investing. In order to better grasp the approaches used, a comparison with the classification involving other countries is made in table 3.

Table 3. Investment Strategy by Country

Eurosif	GSIA-equivalent	PRI-equivalent	EFAMA-equivalent
Exclusion of holdings from investment universe	Negative/ exclusionary screening	Negative/ exclusionary screening	Negative screening or Exclusion
Norms-based screening	Norms-based screening	Norms-based screening	Norms based approach (type of screening)
Best-in-Class investment selection	Positive/ best-in-class screening	Positive/ best-in-class screening	Best-in-Class policy (type of screening)
Sustainability themed investment	Sustainability-themed investing	Sustainability themed investing	Thematic investment (type of screening)
ESG integration	ESG integration	Integration of ESG issues	-
Engagement and voting on sustainability matters	Corporate engagement and shareholder action	Active ownership and engagement (three types): Active ownership Engagement (Proxy) voting and shareholder resolutions	Engagement (voting)
Impact investing	Impact/community investing	-	-

Source: Eurosif, 2016

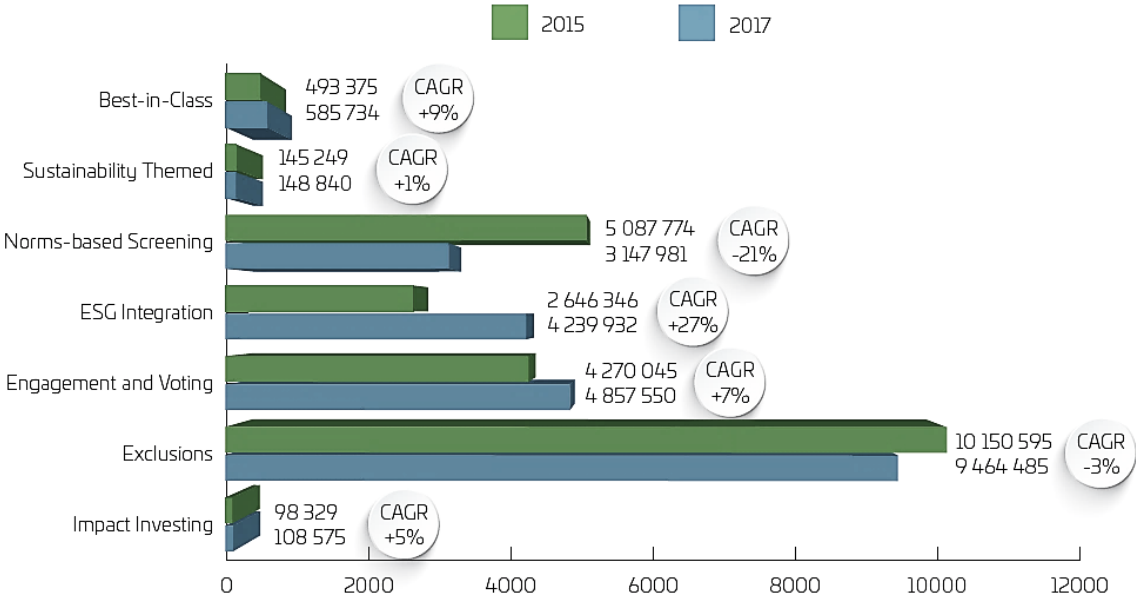
As table 3 shows, the methods used in different countries are generally aligned with Eurosif view, even though some differences still exist (Eurosif, 2016). In addition, it is fundamental to

underline that each of these strategies can be applied simultaneously and with a growing number of combinations.

According to Eurosif, in Europe practitioners apply some form of extra-financial evaluation in their portfolio, nevertheless this is not enough to fall under the category of SRI denomination.

The different approaches of SRI are not mutually-exclusive, for this reason there is not a real delineation of the parameters that constitute an SRI product (Eurosif, 2016). In general, the evolution of SRI continues to grow. In fact, between 2015 and 2017, this kind of investments shows evidence of how they are essential in European fund management.⁸Table 4 underlines this trend:

Table 4. Evolution of SRI Strategies in Europe



Source: Eurosif, 2018

In 2017, the ESG integration was the preferred strategy, growing by 27% respect to 2015, with over 4 trillion of dollars of asset under management. As far as engagement and voting approach is concerned, more and more individuals relied on it. One should consider that it has grown by 7%, giving proof of the commitment that investors have when they interface with the companies in their portfolios. Despite the slight decrease of 3%, the relevant and predominance

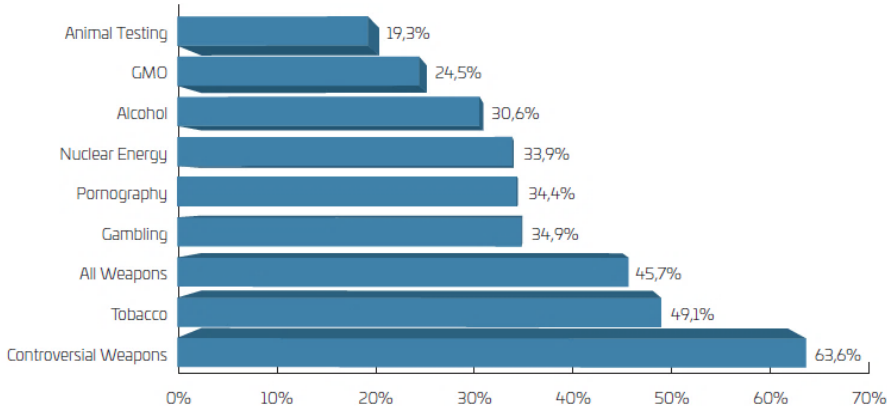
⁸<http://www.eurosif.org/2018sristorylaunch/>

procedure as consider asset under management were still the Exclusions with 9.4 trillion of dollars⁹. For what concern impact investing, from 2015 to 2017 a growth of 5% has been registered reaching 108 billion of dollars in asset. These trends show not only that the appetite for SRI in continuously increasing, but also the willingness of the investors to aligned with Sustainable Development Goals (SDGs).

1.2.1 Exclusion of Holdings from the Investment Universe

The Exclusion approach represents the oldest SRI strategy. In fact, its use is dated back to the beginning of 18th century (Eurosif, 2018). Exclusion procedure tends to exclude business sectors that violate fields, such as environment, ethics or the social one, from the investment portfolio. This activity is pursued as a part of investors’ risk-management or value-based approach (Eurosif, 2016). The strategy systematically excludes those companies inside specific sectors, such as weapons, pornography and tobacco. At European Level, the weapons industry represents one of the largest exclusions from investment portfolio. Moreover, the business of tobacco is generally rejected from the choices of investors. This demonstrates how the social and health repercussion deriving from that industry is seriously take into account by the investors, recognizing that tobacco business does not represent a sustainable investment. Table 5 shows the most excluded industries in Europe:

Table 5. Most Excluded Industries in Europe



Source: Eurosif, 2018

⁸ <http://www.eurosif.org/2018sristorylaunch/>

In table 5, it is possible to see not only the most excluded sectors such as controversial weapon, tobacco and all weapons, but also other cases as gambling, pornography, nuclear energy, alcohol, GMO and animal testing.

According to Eurosif (2018), the Exclusion approach alone does not represent a real SRI, indeed:

For everyone who divests from an industry, there will be another willing to buy such that the investee company suffers no impact (Eurosif, 2018: 22).

For an effective Exclusion strategy, the latter must be applied jointly with some effort at engagement voting (Eurosif, 2018). This activity engages to hold an amount of stock of the company excluded in order to be able to exercise right properly of the ownership, thereby the active investors could demonstrate their commitment in making a positive impact on the company (Eurosif, 2018).

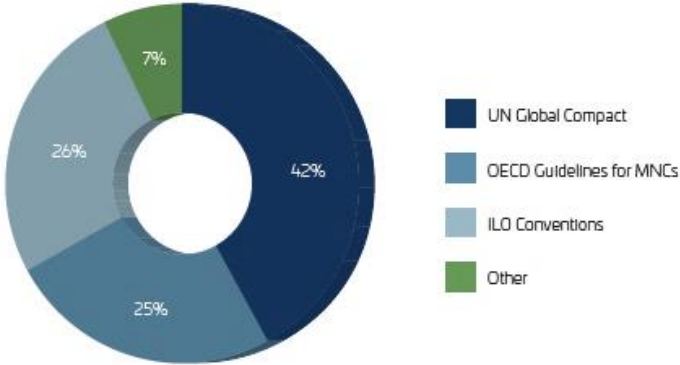
In conclusion, the Exclusion approach represents a cornerstone for integrating ethical preference into investment decisions. Moreover, the latter offers an opportunity to create a clean portfolio for those institutional investors whose investments strategy implies complete transparency (Staub-Bisang, 2012). However, the restriction of this approach may cause a negative effect from a risk/return point of view (Staub-Bisang, 2012).

1.2.2 Norm-based Screening

Norm-based screening enables investors to assess if the company in their portfolio complies with the level of international standards and norms (Eurosif, 2018). The principles referred are those ones whose areas focus on environmental protection, human rights, labour standards and anti-corruption rules (Eurosif, 2018). These norms could be those ones set out by the OECD guidelines for Multinational Enterprises, the ILO tripartite declaration of principles concerning Multinational Enterprise and social policy, the UN Global Compact and the more recent Guiding Principles on Business and Human Rights. Norm-based screening could be used alone or in conjunction with other strategies such as engagement and exclusion (Eurosif, 2018). Norm-based screening, between 2015 and 2017, registered a decreased of 21% partly due to the slight decrease of exclusion (Eurosif, 2018). According to Eurosif (2018) in 2017, the most recognized norm was the UN Global Compact, while OECD guidelines and ILO convention were at *ex-*

aequo. Instead, a 7% of respondents declared their preferences towards other guidelines. Table 6 summarizes this trend:

Table 6. Most Applied Norms Concerning Norm-based Screening in Europe



Source: Eurosif, 2018

Violations of international norms could be those whose sphere touches human right, as for example breaches of Principle 1 and 2 of UN Global Compact¹⁰. These include involvement in abuses regarding civil and political liberties, in particular, human right abuses, support for controversial regimes, freedom of expression and censorship (CFA Institute, 2015). Other cases could be represented by the infraction of norms concerning working conditions embodied in Principles 3, 4, 5 and 6 of the UN Global Compact¹¹. Such violation includes all forms of forced labour, child labour, employment discrimination, and failure to respect employee rights of freedom of association¹².

1.2.3 Best-in-class

The aim of the Best-in-class approach is to verify whether or not environmental, social and governance factors are met by the company or the country that issues securities (Staub-Bisang, 2012). Essentially, this method allows investors to select those companies with the best ESG score in a sector (Staub-Bisang, 2012). In practice, investors choose some standards and the result attained will be linked to the weighting of the standards that probably depend on the sector

¹⁰ <https://www.unglobalcompact.org/what-is-gc/mission/principles>
¹¹ <https://www.unglobalcompact.org/what-is-gc/mission/principles>
¹² <https://www.unglobalcompact.org/what-is-gc/mission/principles>

(Eurosif, 2018). The Best-in-class portfolio normally covers companies that satisfy both ESG and financial evaluation, other similar approaches include Best-in-universe and Best-effort (Eurosif, 2018). Generally, this approach is also referred to as positive selection or positive screening (CFA Institute, 2015).

For a better understanding, the application of the Best-in-class approach by NN Investment Partners¹³ will be discussed (CFA Institute, 2015). Firstly, the asset manager assesses the position of companies in their industry by applying ESG score, funded on both the opportunities and risks that companies face. Then, analyst evaluates if a company implement ESG policies and management system, if it has adhered to international initiatives and eventually the actual conduct of the company. For each industry, the analyst of NN Investment Partner will focus on the top 50% of companies with reference to ESG rating in each sector. After that, the portfolio construction depends only on the features and characteristic thereof (CFA Institute, 2015). According to CFA (2015), NN Investment Partners holds that the Best-in-class could improve the risk and return features of a portfolio. In fact, a stronger ESG policy could help the company tackle different risk and improve transparency. Furthermore, always in accordance with NN Investment Partner, firms that exhibit better management of ESG issues, thus having a higher score, face environmental costs in a more efficient way, obtaining higher productivity and stronger reputation (CFA Institute, 2015).

It is also important to notice that Best-in-class approach need to be continuously check on eventually ESG controversies, so that probable misleading claims or “greenwashing” can be staved off. For that reason, it is important not only to consider ESG scores over times but also to examine the change of the latter (CFA Institute, 2015). One example of Best-in-class companies could be ASICS: through constant research, together with continuous innovation, it provided services and products, which improved people physical and mental health. ASICS attempted to combine sustainability in the design of the process and along the value chain. According to NN Investment Partners, ASICS’ ESG score based on Sustainalytics data was 68.4, while the industry average was 52.7. In all the three fields, the company showed rating well above the industry and strong policies, outlining a positive commitment to mitigate risks and impact ESG area (CFA Institute, 2015). The ASISCS attitude provides a considerable proof of how a company can pursue a corporate behaviour in line with ESG factors.

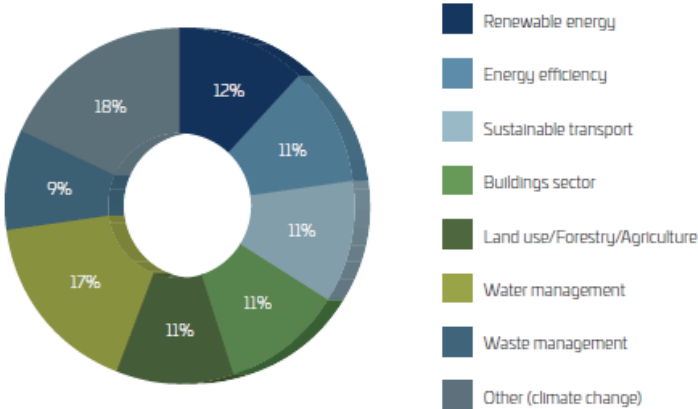
¹³<https://www.nnip.com/it-IT/private/>

The use of Best-in-Class criteria for investment has carried several benefits, as for example the fact that, in addition to economic aspects, all sustainability factors are taken into account during investment decision-making. Furthermore, contrary to the exclusion method, this approach includes all the sectors promoting competition among them, facilitating the incorporation of sustainability aspects. Nevertheless, the greater drawback of this approach lies in the excessively rigorous standards that could overly restrict the investment universe (Staub-Bisang, 2012).

1.2.4 Sustainability Themed

This method helps in the selection of single- or multi-themed funds related to sustainability (Eurosif, 2018). The progressive change in themes also helps measure the investors’ appetite towards specific areas of sustainability. In fact, it is important to notice, especially in recent years, how the preference in particular themes has shifted over time, as for example climate change and water-theme funds (Eurosif, 2018). The freshly attention that international institutions are giving to climate change and sustainability topics has unleashed an even growing use in this strategy, especially between 2009 and 2017 with an increase of 25% compounded (Eurosif, 2018). Up to 2017, with a 17% of investment, the main theme was represented by the water management: the water scarcity threatens 1.2 billion of people, who live in water shortage areas. Right after water management, renewable energy symbolizes the second fund with a 12% of investment. Then, it is possible to recognize other themes such as energy efficiency, sustainable transport, building transport, land use/forestry/agriculture and waste management (Eurosif, 2018). Table 7 resumes the trend in different themes:

Table 7. Sustainability Themed Investments in Europe



Source: Eurosif, 2018

1.2.5 Engagement and Voting on Sustainability Matters

At the end of 2017, engagement and voting registered above 4.8 trillion of asset under management, with an increase trend between 2009 and 2017 of 14% compounded. For this reason, this approach represented the second most popular strategy after the one concerning the exclusion (Eurosif, 2018). This strategy aims to exert a direct influence in the management of a company. Particularly, it has also a strong link with the concept of fiduciary duty, as it is driven by the relation between steward of asset and their accountability with regard to beneficiaries (Eurosif, 2016). It is worth mentioning how Eurosif underlined the different motivations behind the use of ESG engagement: the maximization of risk-adjust return, the improvement of business conduct, the advancement of ethical or moral consideration, and the participation to sustainability development (Eurosif, 2016). In practice, the process implies a strong and actively influence by the investors to better guide companies towards better practice in respect to ESG criteria (Barclays, 2016).

Engagement and voting strategy have both advantages and disadvantages: on the one side, one benefit concerns raising awareness of companies' management around issues of sustainability development, encouraging them to operate according to those practices (Staub-Bisang, 2012). Furthermore, the investment universe is not restricted from the outset; however, an investor might decide to divest due to the failure of the companies' management to comply with the suggested changes. On the other side, one disadvantage is that there is no immediate impact on returns: still, there could be long-term positive impacts. In addition, it could be costly, time-consuming and could be truly successful if shareholders join (Staub-Bisang, 2012).

1.2.6 ESG Integration

Integration is the direct and unequivocal inclusion of ESG factors by asset managers into traditional financial analysis (Eurosif, 2016). According to Staub-Bisang (2012: 31):

Time and again, financial analysts observe that companies that neglect environmental, social, or governance (ESG) criteria also achieve comparatively poor financial results. Consequently, ESG criteria are increasingly added to traditional financial analysis, mainly to satisfy risk considerations, but only to the extent necessary within financial analysis.

The principal goal of this strategy is to minimize the opportunity costs related with ESG risks such as reputational risks, for instance. It is worth saying that there are research companies or governments which provide information about ESG risks of individual company (Staub-Bisang,

2012). One example of those independent research companies could be RepRisk¹⁴. The latter, born out of credit risk management, has the purpose to systematically identify and assess material ESG risks, by analysing information from public sources and stakeholders¹⁵.

ESG screen is an easy way to embody sustainability consideration on investments, nevertheless some issues exist. This strategy is viewed as a general proxy for the SRI industry, an element which can create information asymmetry for investors since it oversimplifies an industry, which has increased its complexity and sophistication over the years (Eurosif, 2018). For this reason and for the lack of clarity in parameters in integration of ESG factors, it is still very difficult to determine whether a strategy that falls under the same denomination may be comparable. In fact, it is probably impossible to guarantee a comparative analysis able to guarantee that ESG integration is coherently applied in the same manner across investors and investments (Eurosif, 2018). Unlike the Best-in-class approach, ESG integration does not need a peer group benchmarking. However, both of them have in common the fact that there is no requirement of ex ante criteria for inclusion or exclusion (CFA Institute, 2015). Another difference, compared to positive screening such as Thematic investments and Best-in-class approach and negative screening such as exclusion, is portrayed by the no compromise form a financial point of view. In fact, investors have only to select securities that meet sustainability criteria and make it into the sustainable investment universe. This means that investors do not necessarily need to change or alter their investments objectives to maximize risk-adjust return (Staub-Bisang, 2012). ESG criteria are mainly integrated in investment for risk management reasons, thus they are taken into account only if they have positively influenced the financial performance, by handling future risks and related opportunity cost (Staub-Bisang, 2012).

For a better understanding of ESG integration functioning, the valuation of mining companies will be taken into consideration. When the valuation of stock in the mining sector is put under examination, analysts at Citi Research¹⁶ look at the management of ESG issues by the analysed company. Specifically, analysts execute environmental and social impact assessment and a closure planning in order to measure the quality of the process that mining companies employ to evaluate the environmental and social impact of a mine throughout its life and beyond (CFA Institute, 2015). The assessment includes the use of some indicators: the ISO 14001, for what concerns environmental responsibilities and the lost production time due to labour injury

¹⁴ <https://www.reprisk.com/>

¹⁵ <https://www.reprisk.com/approach#why-reprisk>

¹⁶ <https://www.citigroup.com/citi/>

frequency with regard to health and safety. Along this line, analysts put also particular attention on government relation, local economy and community engagement (CFA Institute, 2015). The reason why analyst look at ESG risks is due to the fact that they can appropriately adjust the discount rate for mining companies. In fact, if a company has better ESG management, its discount rate can be adjusted downwards, and this is translated into an increase of the estimated intrinsic value of the company (CFA Institute, 2015).

Another interesting example could be the case of Deepwater Horizon: it demonstrates how a poor management of ESG factors can cause corporate default, price volatility of credit securities, credit rating downgrades and expanding credit default swap (CDS) spread (CFA Institute, 2015). On 20th April 2010, the Deepwater Horizon oil-drilling platform exploded, causing a large oil spill and the death of 11 workers. The fact cost billions of dollars to BP. Before the disaster, some ESG research on BP had pointed out that the company had showed serious violations on safety and environment at its US operations, including fines. At that time, most investors had failed to heed the ESG research reports. Nevertheless, only when the news of the oil spill came to market, causing a jump on BP five-years CDS spread from 100 basis point (bps) to almost 600 bps, investors started to pay attention to the ESG research. In fact, if investors had paid attention to that research, they would have probably taken some action to manage BP's risk profile (CFA Institute, 2015).

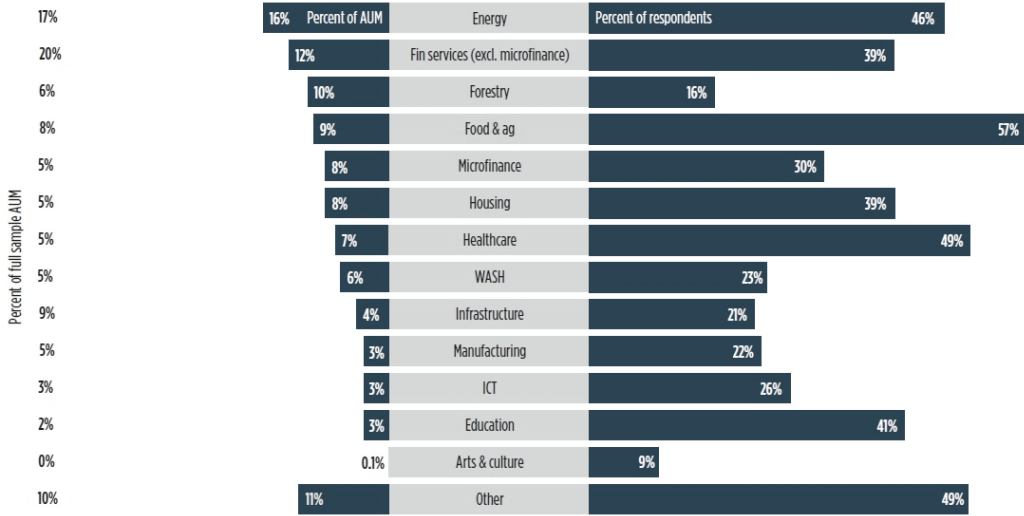
1.2.7 Impact Investing

As already mentioned in chapter 1, impact investing is the combination of a positive impact on social and environment matters connect with the commitment to returns. The key requirement for impact investing could be mainly summarized in three requirements (Eurosif, 2018):

1. **Intentionality:** the intention of investors to produce a positive and measurable social and environmental impact.
2. **Additionality:** realization of a positive impact beyond the provision of private capital.
3. **Measurement:** explain in a transparent matter financial, social and environmental performance of investments.

In 2020, according to the global impact investing network (GIIN), the asset under management in impact investing reached 715 billion dollars¹⁷. The investments involve a wide range of markets: Latin America and the Caribbean, Eastern Europe and Central Asia, East Asia and the Pacific, South Asia, sub-Saharan Africa, Middle East, and North Africa (GIIN, 2020). Moreover, the capital allocation varies across a range of categories, according to the GIIN: the larger sector is energy, which counts for 16% of the Asset under management excluding outlier respondents. Table 8 summarizes the largest fields investors use to invest in:

Table 8. Asset Allocation of Impact Investing by Sector



Source: GIIN, 2020 Annual Impact Investor Survey

The investments size ranges from microfinance to millions of dollars and money is often allocated without any expectation of minimal financial returns (Hill, 2020). Even though financial performance does not represent the key point for impact investors, according to Mudaliar and Bass (2017), the returns across different strategies and assets classes reach a comparable performance of conventional investments. Particularly, the top quartile funds seek market returns at similar levels of conventional markets and in many cases, the median performance is also quite similar.

¹⁷ <https://thegiin.org/research/publication/impinv-survey-2020#charts>

In 2019, the Rise Fund, a recent private equity firm managed by TPG, invested an amount of equity equals to 1.4 billion dollars in impact investments¹⁸. The intrinsic purpose of the fund is driven by social and environmental impact alongside business performance and strong returns. With almost 5 billion dollars under management, the rise fund works with growth-stage, high potential and mission-driven companies with the power to change the world¹⁹. Nevertheless, the measurement of the impact investing is often quite difficult to assess. In order to smooth this problem, the fund created a technique to evaluate the potential impact before a single dollar is invested, this new metric is called the Impact Multiple of Money (IMM)²⁰. Essentially, it allows the fund to handle, measure and track impact results during the course of investment. The six necessary steps for the computation are²¹:

- Assess the relevance and scale: how many people will the product or service touch and how deep will its effect be? For example, Rise fund ascertains that EverFi's programs could reach more than 6 million students over a five-year period.
- Identify the target social or environmental outcomes: in this stage, in computing the IMM, both positive and negative social and environmental externalities have been taken into account. The Rise Fund analyses a selection of peer-reviewed studies to assess if the social outcomes that the company's products chase were achievable and measurable, for instance.
- Estimate the economic value of those outcomes to society: once the target outcome is identified, it is necessary to find research which translates the outcomes of the company into economic terms.
- Adjust for risk: the recognition of the risk in applying academic research to monetize social and environmental benefits, given that there is no link between studies and investment opportunities. For this reason, an adjustment to incorporate the risk into the IMM is needed.
- Estimate the terminal value: the estimation of the probability that the social or environmental value will continue after the investment is concluded.

¹⁸ <https://therisefund.com/news/rises-investments-are-generating-impact-scale-and-demonstrating-impact-ground>

¹⁹ <https://therisefund.com/>

²⁰ <https://therisefund.com/measurement>

²¹ <https://therisefund.com/measurement>

- Calculate social return: the final step is to calculate the IMM for businesses and investors. Then, the estimated value of social and environmental benefit must be divided by the total investment. For example: The Fund invested \$50 million for 50% of EverFi. It adjusted its share of \$500 million in EverFi's in social value to \$250 million and divided that amount by its investment to reach an IMM of approximately 5x.

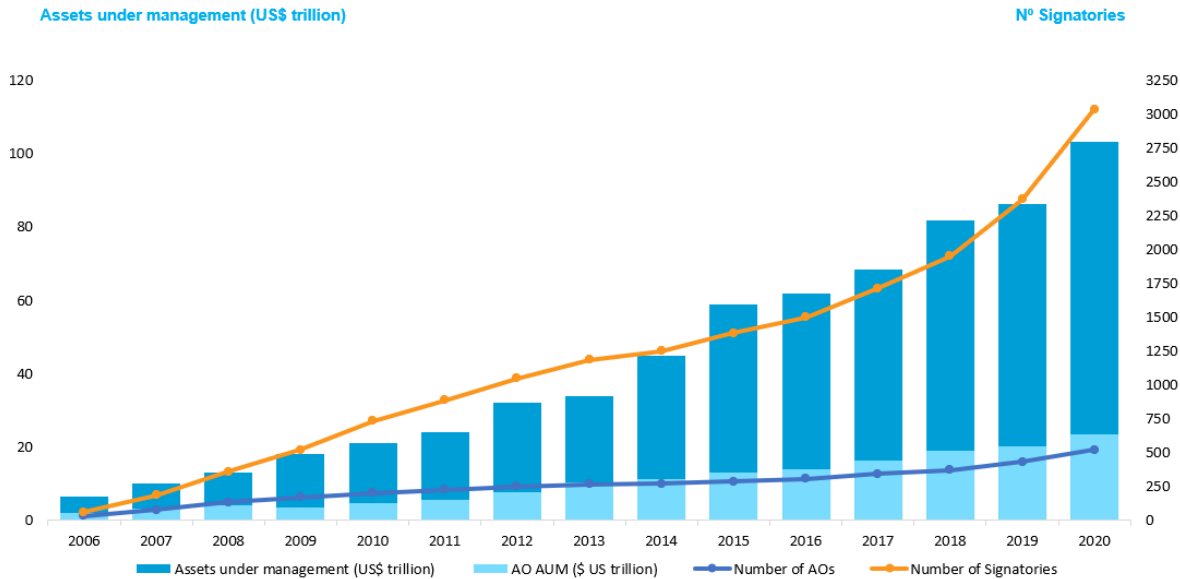
As already mentioned, investors have the possibility to combine strategy to reach their goal and fixing sustainability standards, while they achieve their returns and optimization of risks (Staub-Bisang, 2012). Generally, the grades in which these targets are attained heavily depend on the financial investment objectives and non-financial/ethical considerations of each investors. A rational combination of the different strategies may include (Staub-Bisang, 2012):

- The use of negative screening with the goal to exclude sectors in infringement of environmental, social and ethical criteria.
- The integration of ESG to minimize opportunity costs relate to ESG risks.
- The sustainable theme in order to diversify and profit higher potential return on portfolio investments but taking into account social and environmental development.
- The engagement and voting with the aim to influence the management of the companies.

1.3 UN PRI: The Principles for Responsible Investments

Principles for Responsible Investing (PRI) is an independent non-profit organization developed by investors under the leadership of United Nation (UN) (Hills, 2020). They have drawn up a set of six principles for responsible investment with the aim to provide a series of actions for incorporating environmental, social and governance issues into investment practices (PRI, 2016). Over the years, they have attracted an ever-growing global signatory base principally composed by the majority of the world's professionally managed investments. PRI purpose is to assist its signatories in implementing the Principles. Instead, PRI signers try to understand the contribution of ESG factors on investment performance, the role that these investments have in wider financial markets, and the impact that the investments have on environment and society (PRI, 2016). Since its birth in 2006, UN PRI has attracted an increasing number of investors and assets under management. Indeed, in 2020 it reached nearly 3000 signatures and above 100 trillion of dollars of assets under management. Table 9 shows the evolution of UN PRI from the moment of its launch in 2006:

Table 9. The Evolution of UN PRI Signatories and Their Total Assets Under Management



Source: <https://www.unpri.org/pri/about-the-pri>

The UN PRI aim is to unify responsible investors in order to strive for a sustainable market that contributes to a more prosperous world for all. These objectives could be also caught from the mission of the PRI (PRI, 2017):

We believe that an economically efficient, sustainable global financial system is a necessity for long-term value creation. Such a system will reward long-term, responsible investment and benefit the environment and society as a whole (PRI, 2017).

In practice, UN PRI will strive to properly achieve the goal of the above sustainable financial system through several actions, such as the adoption of the principles, the promotion of good governance, integrity and accountability, and the addressing of obstacle lying in market practices, structures and regulation for a sustainable financial system (PRI, 2016).

The six principles of UN PRI are as follows (PRI, 2017):

1. We will incorporate ESG issues into investment analysis and decision-making processes.
2. We will be active owners and incorporate ESG issues into our ownership policies and practices.
3. We will seek appropriate disclosure on ESG issues by the entities in which we invest.
4. We will promote acceptance and implementation of the Principles within the investment industry.

5. We will work together to enhance our effectiveness in implementing the Principles.
6. We will each report on our activities and progress towards implementing the Principles.

Through the lens of the six Principles, UN PRI elaborated a three-year strategy between 2015 and 2018 and a second one between 2018 and 2021. In particular, the first strategy mentioned focuses on different themes to translate the awareness into impact that culminated with the launch of the Blueprint for responsible investment in 2016. During the commitment period of the above first mentioned three-year strategy, different initiatives that peaked in the following highlights were taken (PRI, 2016):

1. Supporting signatories in the implementation of the principles: UN PRI provides an agenda on ESG implementation across asset classes such as listed equity, fixed income, private equity and real estate.
2. Providing opportunities for signatories to convene, share knowledge and collaboration: UN PRI coordinated 15 collaborative engagement across ESG issues through the PRI Collaboration Platform.
3. Enhancing accountability mechanism: UN PRI issued new articles of association, comprising a single PRI Board, Chair and dedicated Board Committees. But even more important, it issued a new accountability mechanism for the board to signatories and the executive to the Board.
4. Engaging with and facilitating dialogue with key decision-makers: the organization instituted a fiduciary duty, carrying out roadmaps for eight countries backed by an extensive roll-out programme with the aim to clarify investors' obligations and duties.
5. Facilitating collaboration between academics and investors, using PRI knowledge to educate signatories and stakeholders: UN PRI promoted RI-focused academic research and exchanges between academics and practitioners.
6. Strengthening PRI sound and brand: organization tried to intensify and increased articles and social media such as the three annual PRI events in London, Singapore and Berlin
7. Deepening the relationship with UN: UN PRI worked with UN on five key projects, one of these was the sustainable stock exchange.
8. Increasing the representation and participation of asset owners: organizations wanted to increase the growth of asset owners' signatories
9. Strengthening capacity and expertise in key markets: UN PRI sought to extend its networks presence into Australia, China, Canada, France and the Benelux.

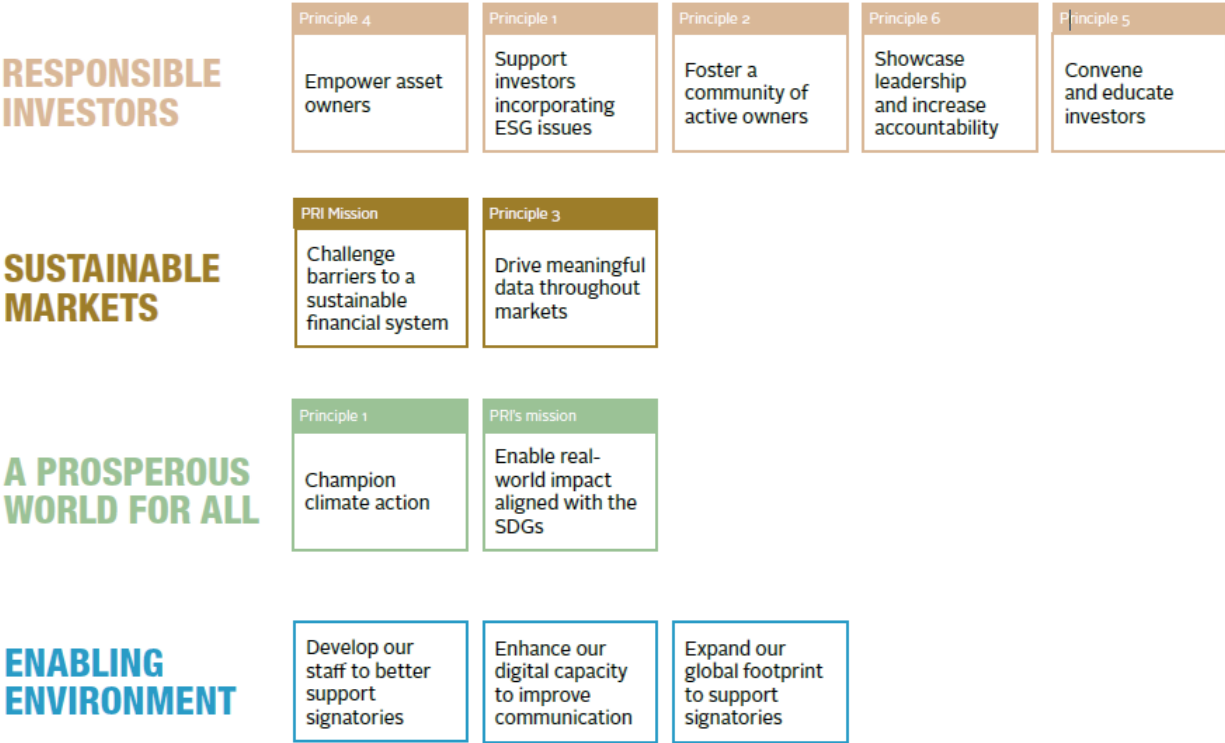
10. Initiating the sustainable financial system (SFS) programme: UN PRI tried to deal with nine key risks and challenges that could threaten a sustainable financial system.

According to the Blueprint for Responsible Investment (2016), it is possible to define three main areas of impact, which are aligned with the previous initiatives put in place by UN PRI (PRI, 2016):

1. Responsible investors: UN PRI will undertake to strengthen, deepen, and expand its core work in order to lead responsible investors to reach their long-term value and improve alignment along the investment chain. This area includes several actions as:
 - 1.1 Empower asset owners
 - 1.2 Support investors incorporating ESG issues
 - 1.3 Foster a community of active owners
 - 1.4 Showcase leadership and increase accountability
 - 1.5 Convene and educate responsible investors
2. Sustainable market: The organization will focus on solving unsustainable aspects of the market in order to attain a sustainable global financial system that investors need. This sphere covers different operations:
 - 2.1 Challenge barriers to a sustainable financial system
 - 2.2 Drive meaningful data throughout markets
3. A prosperous world for all: UN PRI will allow signatories to improve real world by promoting investments that contribute to prosperous and inclusive societies for current and future generations. The action put in place in this case contains:
 - 3.1 Champion climate action
 - 3.2 Enable real-world impact aligned with the SDGs

Along this line, the 2018-2021 strategy has also centralized its attention on the same areas but providing further guidance. The strategy is supported by three important enablers: developing staff to better support signatories, enhancing UN PRI digital capacity to improve communication, and expanding UN PRI global footprint to support signatories (PRI, 2017). Table 10 shows the steps and the actions that the PRI organization wants to follow for this three-year strategy:

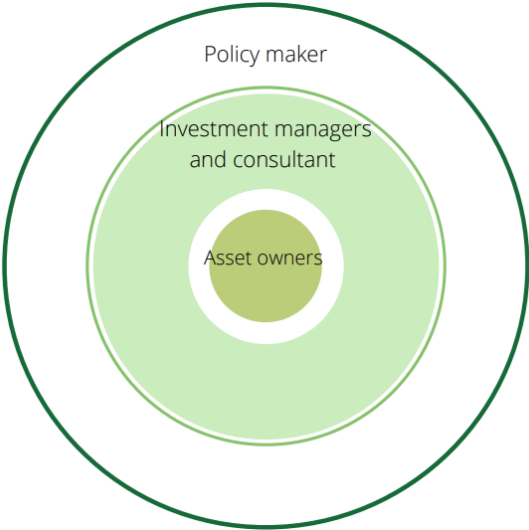
Table 10. Elements of 2018-2021 Strategy



Source: PRI 2017

For what concerns Responsible investors area, the objective is to lead responsible investors to pursue long-term value and increase alignment along investment chain (PRI, 2017). Particularly important is the role played by the first step represented in the table 10: empower asset owner. In fact, asset owners can set the direction of the market: the mandate they assign to investment managers and consultant establishes the objectives that the world’s biggest pools of money are put to. To satisfy their duty to beneficiaries, asset owners will need a strong approach to determine the effect their investments have on real economy and the society where their beneficiaries live (PRI, 2017). Table 11 exhibits how, as the asset owner commitments to responsible investment increase, responsible investments through the investment chain grow as well. Investment managers and consultants must get ready to grasp these signals and to offer more ESG products, services and advice. Consequently, sustainability is already integrated into investment chain. At this point, policy makers just have the role to support the chain with regulatory policy in order to reinforce responsible investment practice (PRI, 2017).

Table 11. The Strong Effect of Asset Owners' Influence



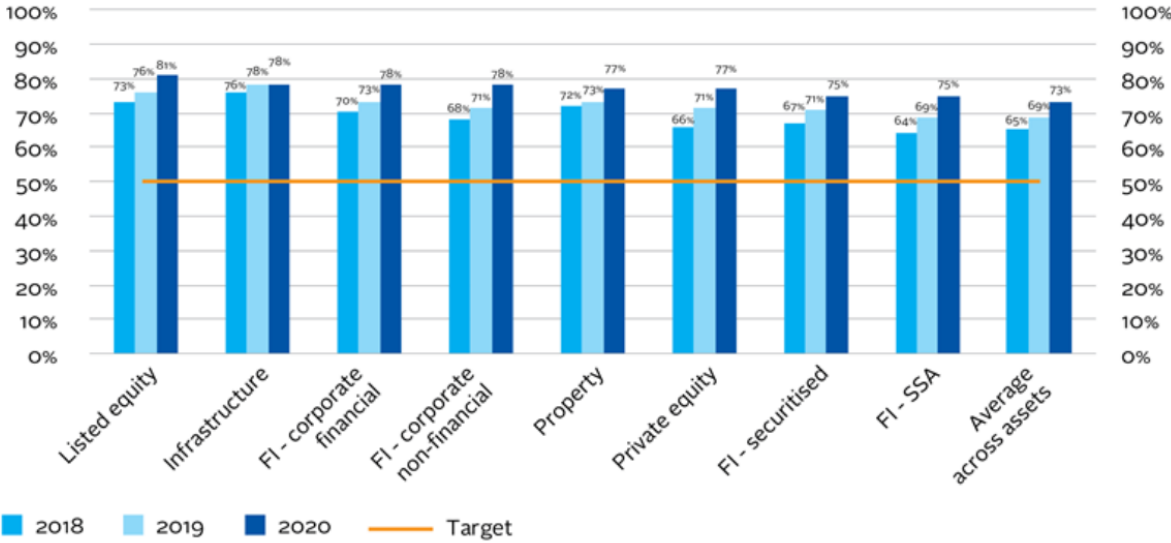
Source: UN PRI (2016)

With the 2018-2021 strategy, the first step contains several fundamental actions, which at best represent the essence of the phase itself (UN PRI, 2017):

1. To supply further guidance, trustee training and support beneficiary-aligned outcomes
2. To develop a dedicated asset owner online resource hub
3. To support global and regional knowledge-sharing groups for asset owners
4. To understand mega trends in order to better inform asset owners on asset allocation
5. To support asset owners' relationship with investment managers
6. To build asset owner trustee network
7. To allow asset owners to engage with investment managers on proxy voting
8. To assist asset owners to implement Task Force for Climate-related Financial Disclosures (TCFD) recommendations

According to UN PRI, in 2020 they assisted to an increase in the number of asset owners reporting to the PRI, including those reporting for the first time and those ones which have been less advanced in their responsible investment practices. This evolution is shown in table 12, in which different asset owners are considered:

Table 12. Asset Owners Considering Responsible Investments and ESG in Contracts in Percentage between 2010-2020



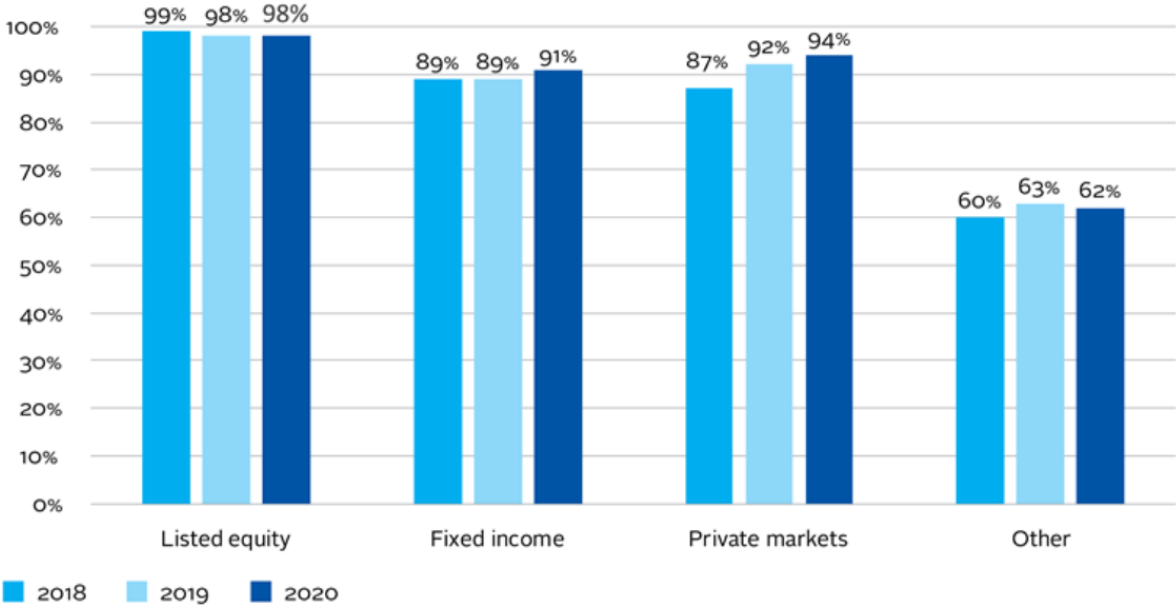
Source: <https://www.unpri.org/annual-report-2020/delivering-our-blueprint-for-responsible-investment/responsible-investors/empower-asset-owners>, 2020

Support investors incorporating ESG issue, which is represented as the second step on table 10, aims to extend ESG integration (UN PRI, 2017). The broadening of the actions includes (UN PRI, 2017):

1. To draw up new and refresh existing ESG integration resources
2. To provide thought leadership where ESG gaps occurred
3. To introduce tool and training target to mainstream investment market

In 2020, according to UN PRI annual report, the 98% of asset owners and investment manager signatories reported that they included ESG factors into their listed equity investments while, respectively, the 91% and 94% reported ESG incorporation in fixed income and private markets. Table 13 shows the increase in these three asset classes between 2018 and 2020, but reporting a slightly decrease of 1% in other asset classes in 2020:

Table 13. ESG Incorporation Throughout All Asset Classes Between 2018-2020



Source: <https://www.unpri.org/annual-report-2020/delivering-our-blueprint-for-responsible-investment/responsible-investors/support-investors-incorporating-esg-issues>, 2020

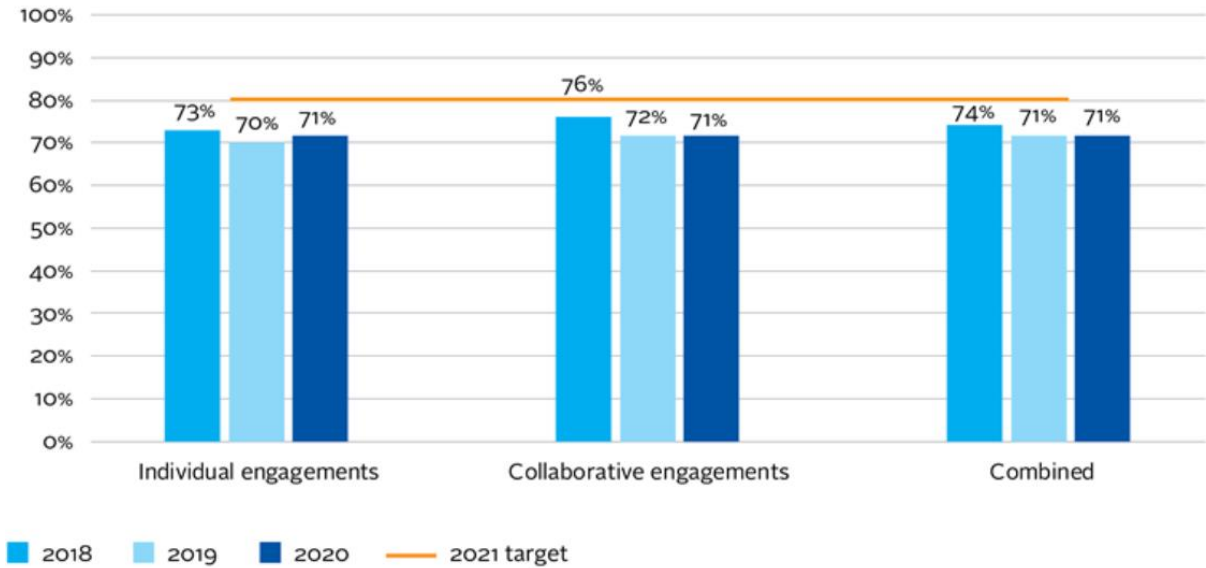
The third phase, which intends to foster a community of active owners, has the objective to increase the quality of active ownership. In fact, investors, who lack active relationship with company, are governed by the risk to hold poorly governed company that are used to hardly perform well on the long-term and usually ignore beneficiaries’ interests (UN PRI, 2016). In this case, the main actions that the new strategy has integrated are as follows (UN PRI 2017):

1. To offer larger guidance and insights on principle 2
2. To rise engagement practices across asset classes
3. To supply guidance in proxy voting in harmony with RI policies
4. To advise on improving the voting chain
5. To deliver a reinforced collaboration platform

UN PRI distinguishes essentially two kinds of engagement: collaborative and individual (UN PRI, 2013). The first one occurs when a group of institutional investors engage in a dialogue with companies on ESG issues. Instead, the second one takes place when someone engages with companies on an individual basis (UN PRI, 2013). Unfortunately, just over 70% of asset owners and investment managers’ signatories has a policy on active ownership and has carried out

organisational measures to adequately execute that policy in their listed equity holdings, as it is shown in table 14²²:

Table 14. Signatories with Policy on Active Ownership Between 2018-2020



Source: <https://www.unpri.org/annual-report-2020/delivering-our-blueprint-for-responsible-investment/responsible-investors/foster-a-community-of-active-owners>, 2020

The fourth stage concerns to showcase leadership and increase accountability: it has the strategy objectives to point out better practices and introduce new accountability mechanisms, at the same time. The number of operations put in place is elevated in this phase (UN PRI 2017):

1. To promote an award programme to celebrate industry best practices
2. To develop minimum requirement introducing a watch list and supporting signatories that do not comply with the criteria
3. To delist signatories that do not comply with the minimum criteria after a two-year period
4. To align reporting framework with international standards

The last phase of responsible investors’ field of interest is represented by the convening and educating investors. The programme in this stage covers the following points (UN PRI, 2017):

1. To increase marker presence

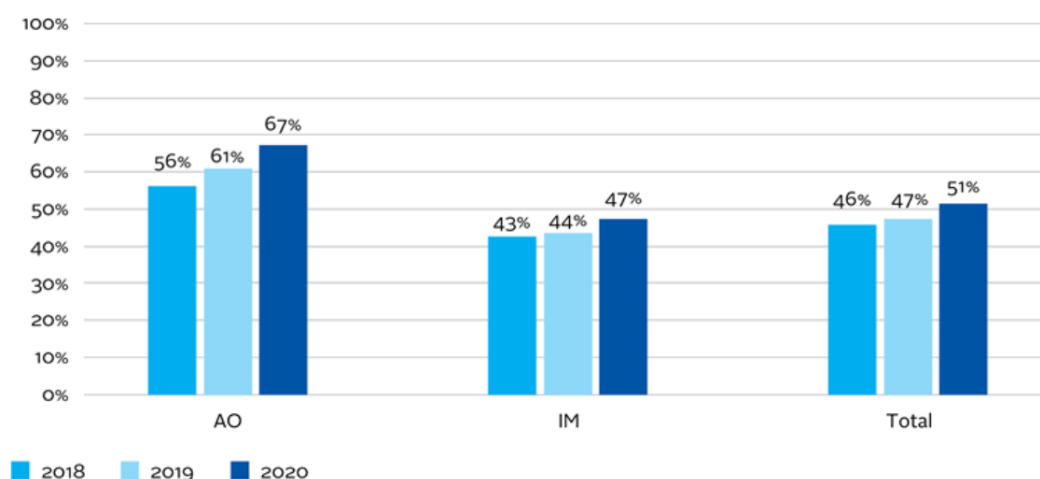
²² <https://www.unpri.org/annual-report-2020/delivering-our-blueprint-for-responsible-investment/responsible-investors/foster-a-community-of-active-owners>

2. To introduce an associate membership category
3. To develop a trustee education programme
4. To train practitioners online through the PRI academy
5. To Introduce investor/academic collaboration to evolve investment theory

Sustainable markets are the second area of interest of the UN PRI programme. In this respect, the steps to follow are principally two: the first one is to challenge barriers to a sustainable financial system, whose goal is to align the financial system in the long-term; instead, the second one is to drive meaningful data throughout the markets enhancing sustainability reporting (UN PRI 2017).

With respect to the first step, the main actions concern: building understanding of the purpose of sustainable financial system, identifying how to better align interests along the investment chain, collaborating with expert reference groups with the aim to align policies with sustainable financial systems (UN PRI, 2017). In particular, the support for these reference groups, which includes partnership of investors and policy makers, represents a key part of UN PRI work to create a more sustainable financial system (UN PRI, 2019). In 2020, above 51% of reporting signatories indicated that they were engaged with policy makers, rather than the 46% in 2018. Table 15 resumes this evolution of the total of signatories between 2018 and 2020²³:

Table 15. Signatories Engaging with Policy Makers between 2018-2020

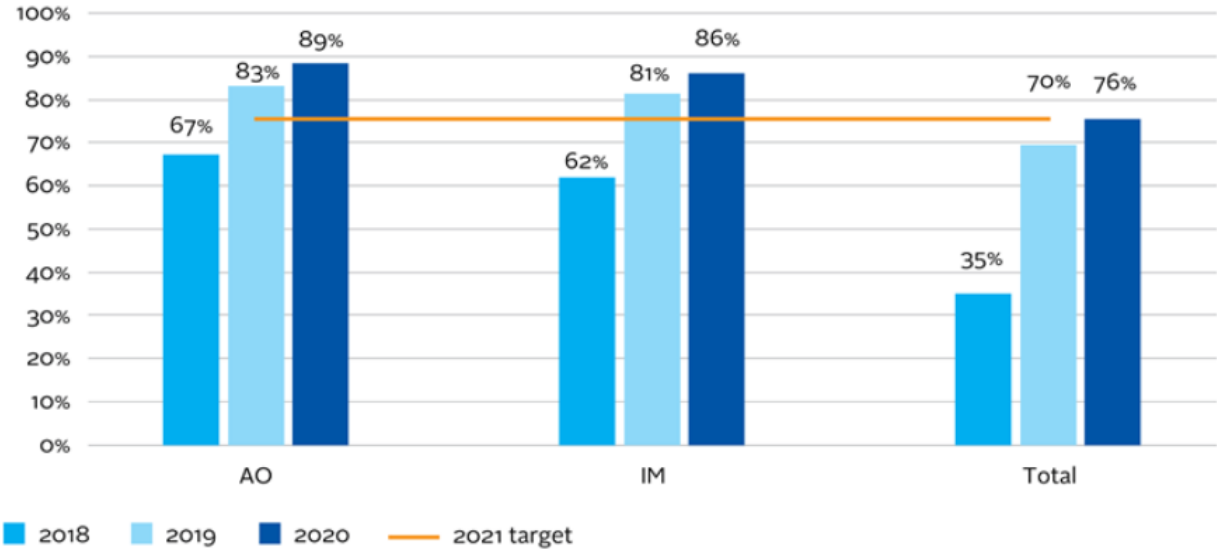


Source: <https://www.unpri.org/annual-report-2020/delivering-our-blueprint-for-responsible-investment/sustainable-markets/challenge-barriers-to-a-sustainable-financial-system>, 2020

²³ <https://www.unpri.org/annual-report-2020/delivering-our-blueprint-for-responsible-investment/sustainable-markets/challenge-barriers-to-a-sustainable-financial-system>

On the other side, the second step includes several actions as follows: building additional transparency and accountability with reporting platform, increasing the sustainable stock exchange initiative and encouraging listing rules that demand ESG factors (UN PRI 2017). According to UN PRI (2020), the 76% of the signatories accessed the data portal in 2020, with a considerable increase of 31% between 2018 and 2020, as it is shown in table 16:

Table 16. Data Portal Usage Among Reporting Signatories between 2018-2020



Source: <https://www.unpri.org/annual-report-2020/delivering-our-blueprint-for-responsible-investment/sustainable-markets/drive-meaningful-data-throughout-markets>, 2020

As we have already mentioned, the third area of interest refers to a well-developed concept of the world and society we live in: a prosperous world for all. The two essential steps at this point are: champion climate change and enable real-world impacts aligned with the SDGs. Even though the two stages remain the same with respect to the previous strategy, some actions have been integrated while other have been continued. The first step, which has the principal objective to secure the commitment on climate change and support the low carbon transition, includes interventions as: educating investors on portfolio transition to a low-carbon economy, encouraging the supply of green investment opportunity, launching the 2020 agenda, increasing climate reporting by supporting the TCFD guidelines. On the other hand, the second step, with the objective to create investment case for the SDGs, contains measures as: helping signatories to incorporate SDGs into investor decision making, building tools to help investors to integrate

SDGs in the selection of managers and providing investors' insight to governments on their national SDG plan.

1.4 Why Should Investors Use ESG?

Individuals and investors have increasingly paid attention on environmental, social and governance (ESG) issues in reference to the company they invest (Hills, 2020). Furthermore, companies in the past 25 years have even exponentially measured and reported environmental, social and governance data. According to PIMCO (2017)²⁴, some elements, which lead to this growth during years, can be articulated in ten points:

- Good governance is important: financial crisis in 2008 stressed the importance towards factors linked to culture and conduct, renewing the central position of corporate governance.
- Public and private cooperation are expanding: public-private partnership have broadened in order to resolve social and environmental issues.
- Climate change is a reality: climate change is now universally understood and recognized as a fact.
- There is a change in energy sources: market dynamics are changing; natural gas has become cheaper and renewable energies are more scalable.
- Technology is influencing what people demand and how people consume: most of the sectors of the economy are facing radical change in business model, witnessing the shifting of their paradigms.
- Social media are conducting to a convergence of social norms: thanks to geographic borderless, social media are able to affect cultural models communicating new values and new norms in responsible consumption and investing.
- Longer life expectancy: according to the United Nations, by 2050 there will be 2.3 billion people over 65 years old in the world.
- Demographics composition is changing: Millennials and Generation X are replacing Baby Boomer in influencing position, modifying corporate, financial and political landscape.

²⁴<https://www.pimco.co.uk/en-gb/insights/blog/10-reasons-esg-investing-is-growing/>

- Regulations constitute a driving force: ESG consideration has led to the introduction of new regulations in a growing list of countries.
- Globally extended value chain: the value chain of large corporations is progressively global.

In general, investors are motivated to invest responsibly for different purposes. One of these is the value alignment, where investors want to assure that the investment decisions, they assign to asset managers mirror their ethical and broad social values. Another one is risk management, as a matter of fact, the consideration of environmental, social and governance (ESG) factors helps investors capture non-financial information that could affect the financial performance. These could be for example the concern for a strong governance, work practice considerations or fear of global warming (Barclays, 2016).

The different investment objectives, such as value alignment and financial performance, require a change especially in the relationship between investor and investee. Accounting statement and others financial data are no longer enough to estimate the nature and the business potential of a corporate investment in a comprehensive manner. Actually, it turned out to be crucial to identify and consider material and non-financial drivers of business as well (Barclays, 2016). It is essential to understand the risks emerged from negative factors, as for example when activities of corporation produced a cost on the broader public through pollution. Nevertheless, this step requires reasoning and empirical work, because negative impact widely depends on the sector: utilities face grater susceptibility to environmental risks than software providers (CFA, 2015). Yet, the careful use of ESG can address the need to fill traditional financial reporting with a wider assessment of sustainability, mirroring a risk management attitude on the long-term (Barclays, 2016).

Generally, investors think that ESG incorporation is directly linked to future business success, yet there may not be enough evidence of such correlation. Often, the ESG used by investors is seen as an act of faith, in the sense that desirable corporate behaviours should be beneficial in the long run (Barclays, 2016). But ESG factors are differentiated in nature and each one can impact in different way on investments: for example, many investors agree that governance has strongly linked to financial performance, while environmental and social factors enjoy fewer consensuses. The nature of ESG could be seen as follows (Barclays, 2016):

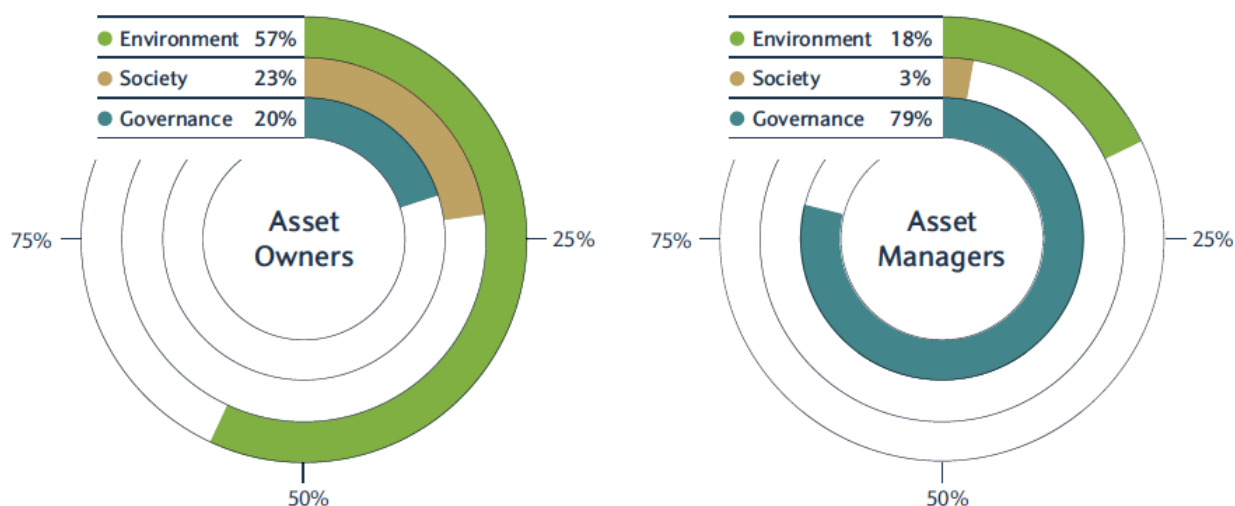
- Governance is an indicator of how good a company is governed and at which extent shareholders' interests are ensured. It can be views as a parameter of management quality.

- On the other side, Environmental and social parameters capture risks and opportunities that often are narrowly related to the industry and activity of the company. The relation between E and S tend to be considered as indirect.

The different views of ESG can be also found along the investment chain. According to a Barclays survey related to fixed income asset, in 2016 asset owners and asset managers placed different importance on three factors: for the first one, factor E is more relevant, while for the second one, governance and social play a central role.

Table 17, concerning fixed income assets, shows that 57% of asset owners view environment as a significant factor; on the other side, 79% place more importance on governance:

Table 17. Asset Owners and Managers Preferences on ESG



Source: Barclays, 2016

According to Becker (1971), social norms shape economic behaviour and may influence market outcomes. Social and environmental responsibility has turned into a societal central point in recent years, and this has overflowed into the financial markets. However, it is still unclear the purpose of investors to use ESG information: whether they use for performance, financial or norm-based motives (Zadeh & Serafeim, 2018).

Zadeh & Serafeim, (2018), to improve the general understanding behind the use of ESG information, surveyed different investment firms with the cooperation of Bank of New York Mellon. Their respondent, on a value-weighted basis, counted the 43% of global institutional

asset under management (AUM) with 31 trillion of dollars as of year-end 2015. The responding organizations can be considered as a part of mainstream investors insofar 70% reported less than 10% of their AUM assign to ESG investments and half of those no ESG allocation at all.

The survey concerned different questions about ESG, such as what motivates investors to use ESG data, the barriers to ESG data use in the investment decision process, how information is used by investors and how investors will use ESG data in the future (Zadeh & Serafeim, 2018). However, in order to understand why investors should use ESG, only the first question will be taken into account. The result obtained by Zadeh & Serafeim (2018) revealed that the large majority of responding investors, about 82%, considers ESG information when it comes to investment decisions. Table 18 summarized the result obtained by the two academics:

Table 18. Investors Motivation for Using ESG Information

Table 2. ESG Information in Investment Decisions								
Response	All (N = 419)	AUM Size			Region			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
		Large	Small	Diff.	US	Europe	Diff.	
<i>Yes, because...</i>	82.1%	85.9%	80.3%		75.2%	84.4%		
1 ... ESG information is material to investment performance	63.1	60.3	64.5		55.7	64.4		
2 ... of growing client/stakeholder demand	33.1	54.3	22.4	**	33.0	39.3		
3 ... we believe such policy to be effective in bringing about change at firms	32.6	31.9	32.9		25.8	40.7	*	
4 ... it is part of our investment product strategy	32.6	43.1	27.2	**	47.4	30.4	**	
5 ... we see it as an ethical responsibility	32.6	25.0	36.4	*	18.6	40.7	**	
6 ... we anticipate it to become material in the near future	31.7	31.9	31.6		29.9	37.0		
7 ... of formal client mandates	25.0	37.1	18.9	**	23.7	30.4		
<i>No, because...</i>	17.9%	14.1%	19.7%		24.8%	15.6%		
1 ... there is no stakeholder demand for such policy	26.7	15.8	30.4		21.9	24.0		
2 ... we lack access to reliable nonfinancial data	21.3	21.1	21.4		18.8	32.0		
3 ... ESG information is not material to investment performance	13.3	5.3	16.1		21.9	4.0	*	
4 ... we believe such policy to be ineffective in inducing change at firms	12.0	15.8	10.7		12.5	16.0		
5 ... it would violate our fiduciary duty to our stakeholders	12.0	5.3	14.3		21.9	8.0		
6 ... such information is not material to a diversified investment portfolio	10.7	5.3	12.5		6.3	16.0		
7 ... including such information is detrimental to investment performance	4.0	5.3	3.6		6.3	4.0		
<i>p-Value of difference (yes vs. no)</i>	<0.001	<0.001	<0.001		<0.001	<0.001		

Source: Zadeh & Serafeim, 2018

A key result in Table 18 is that the 63% of investors considers ESG information as material to investment performance and, among these, Europeans are a little bit higher, even though it is not statistically significant. A distinct cluster is represented by the other choices: a significantly greater percentage of large-firms' respondents than small-firms considers the demand of stakeholder/clients (54% vs 22%, p-value< 0.01) and the development of investment product (43% vs 26%, p-value< 0.01). On the other side, small firms tend to consider more ESG information in other cases, such as ethical responsibility (36% vs 25%, p-value< 0,05). Moreover, a considerable higher percentage of Europeans, than US investors, considers ESG policy effective in bringing change in company behaviour. So, the survey suggests that the use of ESG information is led by financial motives rather than ethical ones, even if this depends on the geographical area taken into consideration.

According to Henisz, Koller and Nuttall (2019) there are five ways in which a strong ESG proposition makes a financial sense. In fact, they state that there is a link between ESG and cash flow, which enhances value creation. The five links propose a way to see ESG systematically, and not assuring that each link will be applied, or that they will be applied to the same degree, they are:

- Top-line growth
- Cost reductions
- Regulatory and legal interventions
- Productivity uplift
- Investment and asset optimization

According to the first one, a strong ESG proposition helps companies enter in new markets and expand in other ones. This is due principally to the fact that governing authorities trust corporate actors and are more willing to award them with access, approvals and licenses that open to new opportunity for growth (Koller, Nuttall & Henisz 2019).

ESG parameters can lead to a cost reduction: they can help curb the rising of operating expenses affecting operating profit. The effectively execution of ESG can be also linked to the resource efficiency of the companies, which in turn seems to be strictly correlated to financial performance (Koller, Nuttall & Henisz 2019).

Another fundamental advantage in ESG is the reducing risk of adverse government actions. In fact, a stronger external-value proposition can facilitate companies to achieve more freedom from regulatory pressure (Koller, Nuttall & Henisz 2019).

A robust ESG proposition can also enable companies to attract and retain quality employees. Furthermore, it can also improve employee motivation and increase productivity (Henisz, Koller and Nuttall, 2019). This aspect is awfully important, because there is a positively correlation between employees' satisfaction and shareholder returns (Edmans, 2011).

The last advantage is represented by investment and asset optimization, indeed, ESG can help better allocate capital into more promising and sustainable opportunities. It may also help companies prevent non-profit making investment because of longer-term environmental issues (Koller, Nuttall & Henisz 2019).

1.5 The Integration of ESG: Myths and Reality

Contrasting opinions on how ESG should be integrated exist, especially considering institutional investors' duties. Some institutional investors are reticent to adapt their governance processes, indeed, they see a conflict of interest between the consideration of ESG parameters and the financial interests of their beneficiaries. ESG are generally seen as non-financial factors, so integrating the latter into conventional financial risks model remains difficult (OECD, 2017). ESG are often perceived to be long-term investment elements, while institutional investment mandates seem to be focused on financial performance characterized by short-termism. In fact, institutional investors, can measure their performance on short-term basis, because of the widespread use of quarterly reporting cycles (OECD, 2017). Furthermore, institutional investors could often fear that a trade-off between the today's interest and beneficiaries of tomorrow exists. For example, a pension fund thinks that a company who is searching for new fund will create environmental damage in the long run, nonetheless its share will perform well in the short run (OECD, 2017).

As already mentioned above, there are different ways to consider ESG factors into portfolio construction. In particular, seven methods have been discussed (OECD, 2017):

- Screening/negative screening: exclusionary screening is the most applied among investors.
- ESG integration: the systematic inclusion of ESG risks in investment analysis.

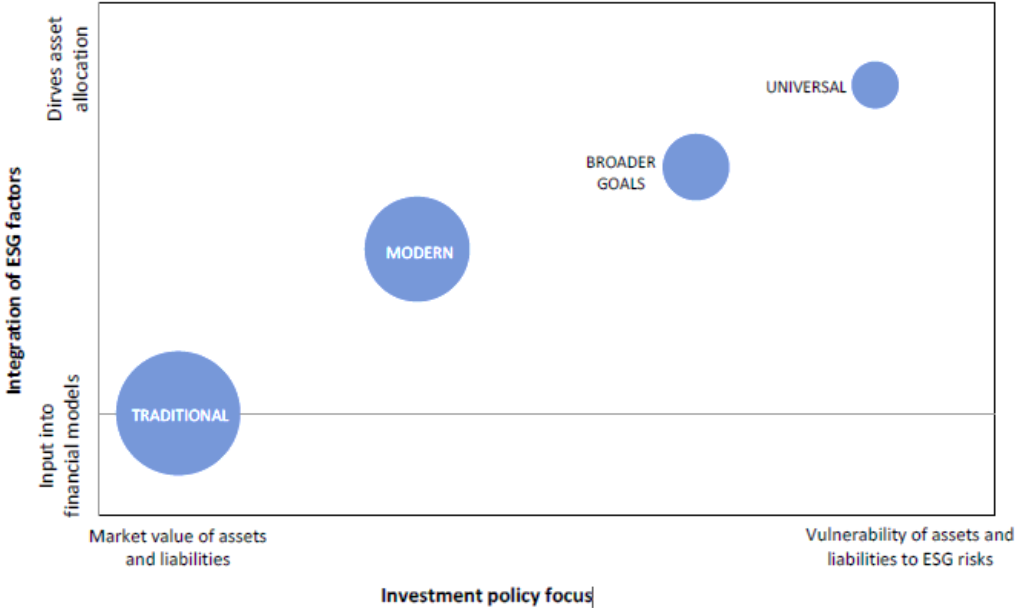
- Best-in-class: a sort of inclusionary screening.
- Thematic investment: in this case the selection of ESG is related to a theme.
- Disinvestment: investors sell holding in particular sectors or industries.
- Engagement: institutional investors attempt to influence company.
- Impact investing: having a positive impact on social and environment matters is connected to the commitment to returns. However, this strategy is not always taken into consideration: organizations as UN PRI and associations as EFAMA do not apply such method (Eurosif, 2016).

Whether institutional investors opt to integrate ESG depends on the extent to which they believe these factors have a true impact on their ability to meet their liabilities in the long-term. What's more, there is a different interpretation of investors' duties and what they involve with ESG integration. In particular it is possible to classify four types of investors compatible with their policy (OECD, 2017):

1. Traditional investors think that ESG elements are irrelevant for meeting their liabilities. In this way, they will not integrate ESG factors into investment decision.
2. Modern investors consider the existence of pricing inefficiencies, in a way that ESG can improve their analytical capabilities, including them to the extent they can have an impact on portfolio returns.
3. Broader goals investors as modern investors think that ESG factors are relevant to portfolio performance. Nevertheless, they also believe that their duties to beneficiaries must compromise an analysis of their long term financial and non-financial well-being. Indeed, they are willing to accept lower financial return with the aim to support ESG-related belief.
4. Universal investors think that they are financial responsible to enhance global economic health using ESG factors as a future systematic risk driver. Consequently, they choose to adjust their portfolios with ESG goals.

Table 19 provides a summary of the four different interpretations, placing on the x-axis the four types of investors according to their investment policy and on the y-axis how they integrate ESG elements in their investment decisions (OECD, 2017):

Table 19. The Different Interpretations of Investors' Duties and ESG Integration



Source: OECD, 2017

According to Kotsantonis, Pinney & Serafeim (2016) great misconception around ESG theme exists. They have drawn up six common myths about the ESG investment and the widespread fallacy that corporate effort to tackle environmental and social issues always implies lower long-run profitability and value. Moreover, they also take into account the major challenge anchored on the consolidation of ESG integration into mainstream investment management.

The first myth states that (Kotsantonis, Pinney & Serafeim, 2016):

The net financial effect of corporate efforts to address environmental and social issues is the reduction of corporate returns on operating capital and, along with them, long-run shareholder value; and so, although ESG makes investors feel good, it effectively asks them to accept lower returns on investment.

One great misconception regarding corporate effort to face environmental and social issues is that they lead to costs to the business, ending up reducing shareholder value. Without a doubt, some social and environmental policies could be very costly for some companies: a firm which tries to struggle against social inequality decides to increase low-skilled worker’s wage. Nevertheless, such an increase could lead the firm to go out of the business and be unable to compete. But the real question is whether such policy could effectively improve employee morale and productivity and, more generally, if all kinds of corporate investments which imply relationship with non-investor stakeholders can succeed in leveraging capabilities. Even though

the possibility of positive-NPV exists, corporate managers have to know when to stop invests in such efforts, in order to be able to generate attractive returns (Kotsantonis, Pinney & Serafeim, 2016). According to Kotsantonis, Pinney & Serafeim's (2016) research, at least some types of companies in some industries can prove that such stakeholder investments can be a root of competitive advantage and value. In this case, two examples can be made: the first one concerns companies that through environmental initiatives often benefits from cost savings, thanks to the waste reduction and energy efficiency; instead, the second example includes the advantage from social practices which enhances company reputation and brand value, increasing P/E multiples and current cash flows returns (Kotsantonis, Pinney & Serafeim, 2016). One notable report by Calvert investments attested the market recognitions of such programs. More generally, it stated that the companies with above-average ESG performance reflect higher expected growth and lower cost of capital, tending to have higher multiples and lower credit default swap spread.

Nevertheless, the myth around ESG integration as a cost and lower returns persists. The answer has to do with the fact that mainstream investors and SRI funds still pursue exclusionary screening as an ESG integration tool. Indeed, this kind of tool is unable to grasp the value-added of sustainability policies activate by certain companies. Yet, even more fundamental, only a small set of ESG material can be classified as value-relevant for each industry (Kotsantonis, Pinney & Serafeim, 2016).

The second myth is reported as follows. It is important to underline that the amount of money mentioned in this quote is referred to the period when the paper (Kotsantonis, Pinney & Serafeim, 2016) was written, i.e. 2016.

ESG is well on its way to being integrated into mainstream investment management and capital markets with over \$60 trillion in assets now subscribed to the Principles for Responsible Investment established by the UN (UNPRI).

Although the growing number of UN PRI signatories seems to underline a step forward on, as a matter of fact, it represents a misleading indicator of the ESG integration in the investments market. In fact, only a percentage of the signatories of UN PRI fully complies with the principles or are at the same point of their ESG integration. Moreover, they are not forced to apply ESG elements to their total asset under management (Kotsantonis, Pinney & Serafeim, 2016).

It is also important to mention that Kotsantonis, Pinney & Serafeim (2016) discovered that the most used ESG integration approach is represented by negative screening, followed by a

combination of ESG integration and corporate engagement. Nevertheless, in the first case, which accounts for the greater portion of AUM, the level of ESG inclusion is awfully minimal.

The third myth cites (Kotsantonis, Pinney & Serafeim, 2016):

Companies have little if any ability to influence the kinds of investors who buy their company's shares. And because the main focus of the vast majority of investors is near term reported earnings, with holding periods—and presumed time horizons—ranging from three months to a year, corporate managers are often forced by market pressures to sacrifice sustainability goals to meet quarterly earnings targets.

Capital markets contain a wide variety of investors, each one with different time horizons and objectives. According to Bushee & Noe (2000), three kinds of investors can be identified: the transients who hold many stocks with high turnover, the quasi-indexers who have lots of stocks but with little turnover, and long holding period and the dedicated holders who hold few stocks, usually for long time. Contrary to the myth, as it was explained by Kotsantonis, Pinney & Serafeim (2016), companies can have an influence on their investors' base. Indeed, different management practices can appeal different types of investors as those ones aforementioned. A real example is the case of Shire: the companies decided to markedly change their shareholder base by leveraging sustainability strategy and integrating reporting to face the pressure of short-termism.

Keeping up with the myths, the fourth one states that (Kotsantonis, Pinney & Serafeim, 2016):

It is nearly impossible to do good fundamental analysis taking into account ESG data because the data infrastructure is really lacking.

Notwithstanding, ESG data are still not at the same grade of financial data, many progresses have been made during the last years in terms of availability and quality. The corporate reporting in ESG data is increased over time: just think that, between the early 1990s and 2014, this activity is raised from 20 to 8499 companies. Furthermore, investors have exponentially increased their interest on ESG data as well as stock exchanges. Especially, the latter ones are in a unique position to facilitate the enhancement of ESG data availability and quality. In the meanwhile, even organizations, regulators, and data providers have played their part in advancing ESG data infrastructure. For example, data providers are fundamental for the broadcasting of ESG information: in 2015 MSCI provided coverage on 6000 companies on the equities side and 9000 issuers on the fixed income one. To sum up, both the availability and

quality of data are exponentially boosting at steady rate. Nevertheless, ESG data are not as prices as financial ones yet (Kotsantonis, Pinney & Serafeim, 2016).

The myth number five cites (Kotsantonis, Pinney & Serafeim, 2016):

ESG is only about managing risk and reducing costs.

Many consider ESG integration to manage risk, protect reputation and perhaps decrease costs. Companies may, however, underperform if they use ESG integration merely as risk management action. In absence of innovation, financial performance may decline as much as ESG issues are considered. ESG integration is a way to reach growth in revenue while both managing risk and improving operational efficiency. One example could be Unilever: the latter introduced an innovative analytics platform that allows line managers to track element related to supply chain efficiency and environmental impact, taking so corrective actions. In this way Unilever was able to reduce the time dedicated to track raw materials by 80% (Kotsantonis, Pinney & Serafeim, 2016).

Lastly, the sixth myth affirms:

Consideration of ESG factors in investment portfolio construction is contrary to fiduciary duty.

According to Kotsantonis, Pinney & Serafeim (2016), a common point of view of investment managers is the possibility that integrating ESG inside their valuation model could be seen as a shortage to support their fiduciary duty. In fact, in order to meet their duty towards their beneficiaries, they only believe to consider traditional elements in their evaluation model, excluding ESG factors because of non-economic factor. Another hardship is the limiting effect of reducing the pool of investment which allows diversifying risk. Nevertheless, ESG factors can direct or indirect impact company financial performance, and for this reason they should be taken into consideration by investment managers. The challenge for the latter ones is to filter those environmental, social and governance elements which are relevant for the industry they invest to. However, this may complicate due to the lack of industry standards to conduct ESG reporting. Yet, in the last years, policy makers and multi-stakeholder initiatives are working to promote reforms in legal interpretation of fiduciary duty. One example was the statement issued by US Department Labour in 2015 with the aim to acknowledge the relevance of ESG issues on economic value (Kotsantonis, Pinney & Serafeim, 2016).

1.6 ESG in Credit Ratings

During the last decade, one of the biggest breakthroughs in the financial market was the introduction of environmental, social and governance information in investment decision-making (Christensen, Serafeim & Sikochi, 2021). In order to catch even more disclosure of ESG information from thousands of publicly listed firms, investors have increased their spending on ESG ratings from 200 million dollars to 500 million dollars between 2014 and 2018 (Gilbert, 2019). ESG as a package of non-financial information could be used as a risk mitigator on credit ratings in two ways: ESG affects borrowers' cash flow and firms' probability of default. As a result, ESG elements should positively impact companies' credit rating, meaning that the higher ESG performance, the more the probability to have higher-level credit ratings (Devalle, Fiandrino & Cantino, 2017). Hence, ESG parameters are important factors in order to determine the creditworthiness of borrowers. For corporate, concerns about stranded assets related to climate change and lack of transparency on accounting practices can induce unexpected losses, inefficiencies, or litigations.

Credit agencies and investors, with the aim to fully face the major market and idiosyncratic risk in the debt capital market, should consider, in a strategic way, the potential of ESG factor as financial material rather than non-financial. Although credit ratings have established a fundamental source of information on risks, little knowledge about their application still exists (Kiesell & Lücke, 2019). According to Christensen, Serafeim & Sikochi (2021), ratings have a high degree of discordance among rating providers: especially, when they measure different ESG providers rate companies in the S& P 500, the overlap is often little. On the opposite, when the same company is scored for their creditworthiness, they are much more in agreement (Sindreu & Kent, 2018). This issue is important principally because, in absence of a general understanding on what good ESG performance constitutes, market participants could be misled by ESG ratings (Christensen, Serafeim & Sikochi, 2021).

In their research, Christensen, Serafeim & Sikochi (2021) suggest that level of a firm's ESG disclosure help explain this discordance. The discrepancy occurs due to different information or interpretation of information (Cookson & Niessner, 2020). They argue that the high subjectivity of interpretation on the nature of ESG information causes higher disagreement, as disclosure increases opportunity for different interpretation of information. In particular, in absence of disclosure, ESG rating agencies are likelier to agree insofar they use comparable rules and computation technique. They also discovered that this effect is strongly driven by environmental and social disclosures rather than governance ones. Nevertheless, over time a consensus, both on

metrics to evaluate a firm's performance on a selected ESG issues and on how to interpret information included in each metrics, is developed. In this way, the relation between disclosure and discordance of rating might decrease (Christensen, Serafeim & Sikochi, 2021).

CHAPTER 2

The Relation between ESG and Creditworthiness

Firstly, in this chapter the corporate social responsibility will be analysed. Particularly, two aspects will be taken into consideration: its change in paradigm during the years and how it can affect company performance. After that, we will focus on corporate creditworthiness and the factors that influence it, we mainly start from ESG aspects, and we will centre on how the latter can impact on corporate creditworthiness factors and consequently affect credit risk indicators. In the third and fourth paragraphs, some factors of the creditworthiness in relation with ESG will be examined: corporate performance and cost of capital. Then, in the last chapter we will put attention on the Merton model approach on corporate bonds.

2.1 Corporate Social Responsibility

During 1950's and 1960's, academic research and theoretical works put attention on the social level of analysis (Lee, 2008) supplying it with practical connotation (Agudelo, Jóhannsdóttir & Davídsdóttir, 2019). These years were most conditioned by the growing awareness in society and social movement of the time, concerns such as population growth, pollution. Resource depletion or social aspects, as labour rights, were at the centre of the attention. According to Davis (1960), who reviewed the role of businessman in social, economic, and political context changes, argued that businessman have an important obligation towards society with respect to economic and human value, adding that social responsibility could have a link to economic returns of a company. Along this line, McGuire (1963) stated that the responsibility of a company goes behind its legal and economic obligations. In his view also politics, social welfare of the community, education and happiness of employees should be taken into consideration by corporations. On the other side, it is relevant to mention the scepticism about the notion of CSR observed by Milton Friedman in 1970. In the article "The Social Responsibility of Business is to Increase its Profits" (Friedman, 1970), Friedman asserted that firm's managers are responsible towards the owner and that, as employees, they are free to support charitable activity with their own incomes, adding that the pursuit of these objective through corporate resources would be inappropriate and unjustifiable. In fact, such an action would take money from shareholder returns or, if funded by raising sale prices, from customers' money (Hills, 2020). The only responsibility of a firm is that towards its shareholders (Friedman, 1970). During 1970's,

Corporate Social Responsibility was strongly affected by social movement and new legislations that covered environmental, product safety and labour right aspects. This was also mirrored in the research of those years which provided companies that looked at how to comply with the new responsibility given by these new legislations (Carroll, 2008). Consequently, in 1980 the most relevant societal concerns and expectations of corporate behaviours, such as environmental pollution, employment discrimination, consumers abuse, employee health and safety, deterioration of urban life and abusiveness practices of multinational corporations, indirectly contributed to the evolution of the CSR concept. According to Jones (1980) CSR should be thought of as a decision-making process that influences corporate behaviours. In fact, during those years the concept of business ethics and stakeholder management entered business vocabulary.

In 1990 with the advent of globalization, through which corporate global reach and capitalism rapidly increased, companies started to be concerned about competitiveness, reputation, global visibility, and stakeholders' network expansion. This opened the road to stakeholder theory, corporate social performance and corporate citizenship creating uncertainty around the definition of CSR (Lantos 2001). By the end of 1990, this implied a lack of an internationally accepted definition of CSR occurred (Carroll, 1999).

According to different academics, such as Husted and Allen (2007), Porter and Kramer (2006) or Werther and Chandler (2005), the 2000's reflected the new role in society of the corporations, they need to be reactive to social expectations and be driven by the pursuit of sustainability. This implied that in these years corporate social responsibility was conceived as a strategic choice for corporations. Particularly, Werther and Chandler (2005) focused on the execution of strategic CSR as an element of brand management with the aim to seek and maintain legitimacy in a globalized brand context. Instead, for Porter and Kramer (2006), firms can achieve a competitive advantage through the Strategic Corporate Social Responsibility. They stated that a company should first consider "inside out" to delineate the social impact of its value chain and identify both positive and negative effects of its activities on society focusing on those with the larger strategic value. After that, the company can look "outside in" in order to understand the influence of their social activity on their productivity and on the implementation of its business strategy. Husted and Allen (2007) reinforced the proposition of creating value through SCSR, stating that both the presence of CSR in the media and positive image of the firm can be associated with the creation of value. They also added that the fundamental channels are represented by customer loyalty and the attraction of new customers.

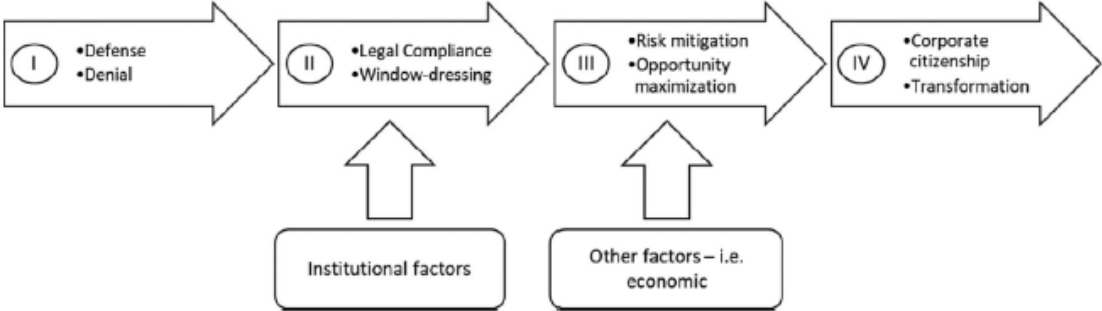
In the decade of the 2010's, the Sustainable Development Goals and Paris agreement have strongly influenced the role of companies in the global context. From there, the CSR has been centred on specific areas of performance which could be related to a certain degree to the SDGs, although CSR comprehension continues to be focused on the share value creation.

It is also important to mention the recent evolution of CSR given by Chandler (2016). The latter underlined the importance of sustainable value as one of the main objectives of SCSR. In the fourth edition of his book “Strategic corporate social responsibility: sustainable value creation” (Chandler, 2016), Chandler gave a slightly different definition of CRS mirroring a new perspective on the generation of value:

The incorporation of a holistic CSR perspective within a firm’s strategic planning and core operations so that the firm is managed in the interests of a broad set of stakeholders to optimize value [emphasis added] over the medium to long term (Chandler 2016: 248).

In the last decade Corporate Social Responsibility has begun to be a strategic concern for companies. Nevertheless, a clear understanding of CSR impacts on firms does not exist yet (Albuquerque, Koskinen and Zhang, 2017). According to Karwowski and Raulinajtys-Grzybek (2021), maturity of CSR actions is a fundamental factor which is paid attention in the literature. Table 20 summarizes the different steps of CSR maturity:

Table 20. The Steps of CSR Maturity



Source: Karwowski & Raulinajtys-Grzybek, 2021

As table 20 shows, in the initial stage companies are defensive towards CSR, indeed, they try to deny or dismiss it. In the second stage, companies display a more mature approach, presenting engagement often related to legal compliance and window-dressing. At this point companies are highly dependent on institutional factors which can guide their performance. The next step

embodies risk mitigation and opportunity maximization. At this stage companies begin to identify their social, environmental, and economic impacts seeking to minimize the material negative impact and maximize the positive ones. The highest level of maturity shifts a company's perspective from their own interest towards the overall corporate citizenship.

The research of Albuquerque, Koskinen and Zhang (2017) is principally focused on the third step. They wonder if a relationship among CSR, risk and value exists. Consequently, they modelled an industry equilibrium where firms can adopt a CSR or a non-CSR production technology and incorporate the choice of technology within a standard asset-pricing framework. They interpret the adoption of CSR technology as a firm's investment for product differentiation.

In that model, a CSR firm deals with less price-elastic demand, arising in higher profits margins and products prices, *ceteris paribus*. Furthermore, higher profit margins mean lower elasticity of profits toward aggregate shocks leading to lower systematic risk and higher firm value. Nevertheless, higher profit margins result in more companies to embrace CSR policies paying higher costs. These higher costs provoke an increase in systematic risks, in this way a contrasting effect with the first partial risk-reduction occurs.

In Albuquerque, Koskinen and Zhang (2017) opinion, the strength of the two effects depends on consumers' expenditure share on CSR goods. A small expenditure share on CSR goods narrows the portion of CSR firms, implying that the marginal CSR firms have lower systematic risk and higher valuation than non-CSR firms.

It is also important to mention the research of Karwowski and Raulinajtys-Grzybek (2021), they analyse which types of risk areas are more influenced by CSR action. They focus on ESG risks together with reputational one. Basically, the two academics want to investigate the role of CSR in risk mitigation focusing on three objectives: the analysis and the categorization of the main areas of CSR actions, the study of the risk profile of companies and the investigation of the impact of CSR on corporate risk.

They categorize two types of risks: the first one, which in turn includes three elements, is the sustainability risk, also named ESG risk. The latter groups include environmental risk, as the potential threat effect on living organism and environment by effluents, emissions, and resource depletion; social risk as a global phenomenon with direct implication for society depending on the cultural, political, and economic context; and governance risk as outcomes from management structures, employee relations, remuneration of relevant staff, tax and legal compliance. ESG risk could also affect other risk spheres as operational, regulatory, and financial. The second risk

is represented by the reputational risk, which relates to the perception of the company by its surroundings and the impact that public opinion has on the company's activity (Karwowski & Raulinajtys-Grzybek, 2021).

In general, it is considered that firm commitment in CSR activities is one of the ways by means of which a company can build its reputation and engagement in CSR activities in order to enhance its image among its stakeholders. A positive reputation not only leads to good evaluation from stakeholders, but it has also a beneficial impact on profitability as generally a socially responsible product is preferred by customers. Furthermore, customers' satisfaction and loyalty due to CSR engagement will help the firm to mitigate risk in economic downturns especially when the firm depends on a loyal customer base (Karwowski & Raulinajtys-Grzybek, 2021).

Karwowski and Raulinajtys-Grzybek (2021) analyse the relation between Environmental, social, governance and reputational risks (ESG& R) and CSR actions. They found a correlation between variables under analysis, likewise consistency between the importance of certain categories of risk and CSR actions. Moreover, for above 60% of companies a high consistency for the ranking of categories of risks and CSR actions have been observed.

2.2 Corporate Creditworthiness: The Influencing Factors

After the global financial crisis, which exposed public finances to the effect of private governance risk mining the structure and operation of the financial market, institutional investors pay cautious attention to corporate governance as a source of risk and opportunity. There were different examples of corporate governance which led to corporate failures: Enron, Parmalat, and Lehman Brothers. Generally, corporate bond performance is defined by several factors, such as bond's payment structure, duration and market risks such as interest rates and liquidity fluctuation. In this sense, the portfolio choices just as diversification and selection are fundamental (Allianz Global Investor, 2017).

Moreover governance, environmental and social issues could represent a considerable risk for investors. The relation between credit quality and a firm's health or energy efficiency is complex. Creditworthiness is considered a function of a company's profitability, productivity, competitive position and, at the same time, the estimated future value and cost of capital (UN PRI 2013). However, all these factors can be connected to the ESG components: regulations on climate

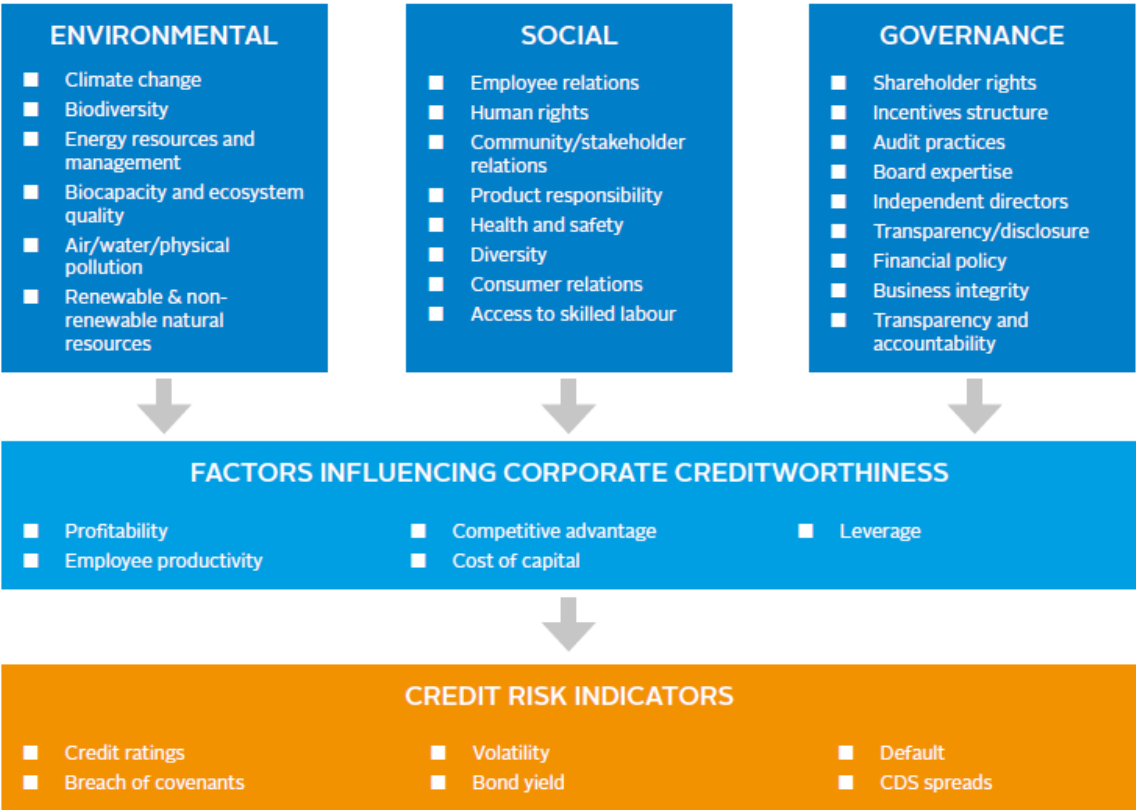
change can affect negatively capital expenditure and undermine energy company’s margins, high fines for polluting can decrease company’s cash flow or child labour scandals can ruin the brand value (UN PRI 2013). In this regard, according to UN PRI (2013) bondholders should take care of these issues and determine whether they are relevant material for creditworthiness and investment performance.

As far as ESG is concerned, the director of corporate governance at F& C investment in London stated:

This can raise issues of risk that have not been raised by traditional analysis (UN PRI, 2013).

Table 21 provides a resume about relationship between ESG factors, credit elements and creditworthiness.

Table 21. ESG, Credit Factors and Credit Risk Indicators



Source: UN PRI, 2013

There are several academic papers (see Bauer and Hann, 2011; Chava, 2011; Bauer, Derwall and Hann, 2010) which explored the relations between ESG and share prices. Nonetheless, these studies also provide convincing evidence that a correlation between ESG elements and credit quality exists.

Bauer and Hann (2011) conducted research with the aim to analyse environmental management and its effect on bond investors. According to their view, poor environmental practices negatively influence creditworthiness through legal, reputational and regulatory risk. In particular, they devised environmental performance information from an independent rating agency, and analysed bonds issued by 582 US corporations between 1996 and 2005. The cardinal hypothesis under Bauer and Hann (2011) research is that environmental concerns and poor environmental management affect the solvency of borrowing, putting firms at legal, regulatory and reputational risks. They developed their study starting from the measure of environmental strength and concerns of firms and tested their link with the bond yield spread bond rating and long term-issuer ratings. The result shows that firms with environmental concerns typically pay higher cost on debt financing, lower bond rating and lower issuers rating. On the contrary, firms with active environmental management present lower cost of debt and a weak link to higher credit rating. Furthermore, they found out that the firm's attempt to decrease its impact on climate change and air pollution through the help of clean energy, energy efficiency or commitment to climate friendly practices and the supply of innovative products and services with environmental benefits are linked to lower bond spread. In short, they discovered that environmental concerns coupled with poor environmental management had higher cost of debt, lower bond ratings and lower issuer ratings.

Along the line of Bauer and Hann (2011), Chava (2011), who carried out a study on US firms between 1995 and 2007, discovered that lenders charge on average 20% higher interest rates toward those companies which manage environmental risks poorly compared to those which perform better in this field.

Another study performed by Barclays (2016) helps answer the question if ESG factors can contribute to lower credit risk, performing a spread attribution analysis. Particularly, they found out that a positive ESG inclination in bond portfolios led to a small but steady performance advantage, with no evidence of negative effect. Furthermore, they saw that ESG attributes did not considerably affect the price of corporate bonds with no evidence that performance advantage varies as the study period changes. After that, the study also took into consideration separately the E, S and G tilts, assessing that the positive effect was strongest for governance elements and weakest for social ones.

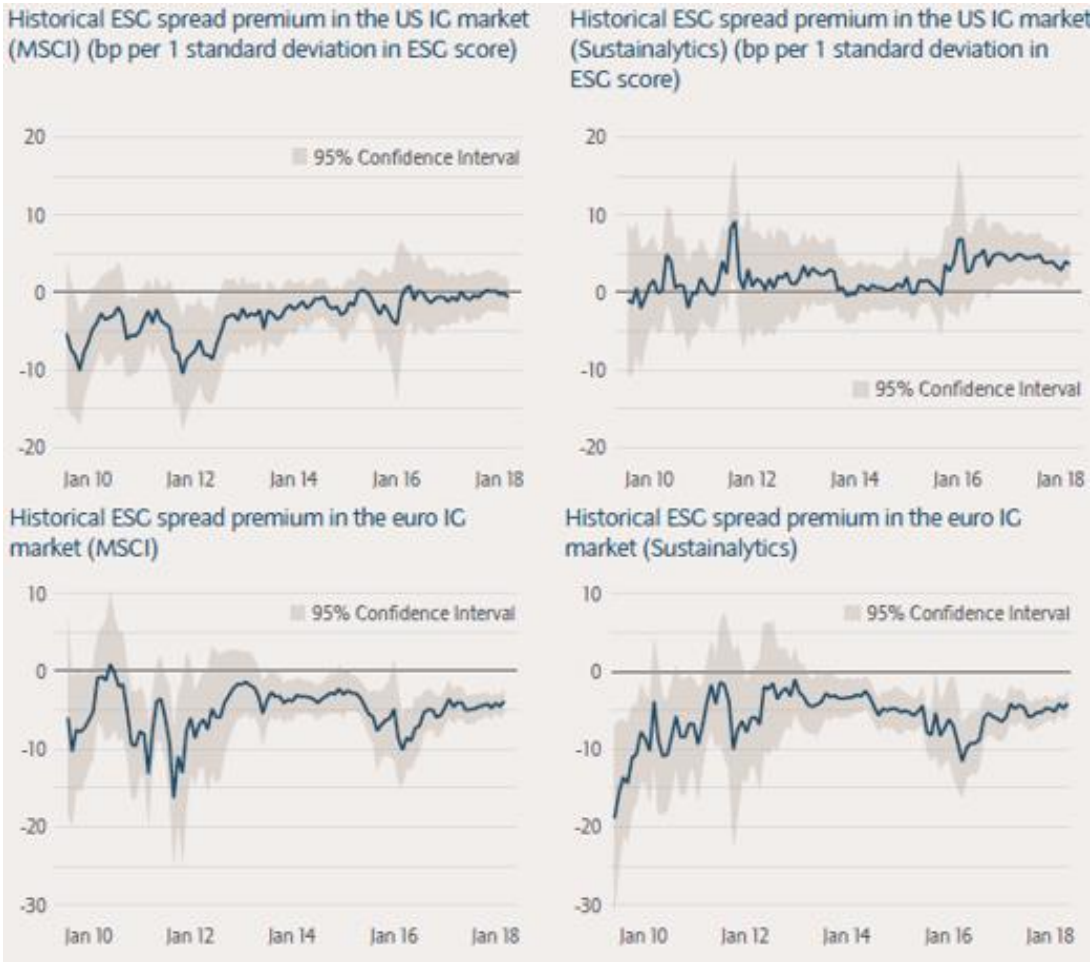
In a Barclays' (2018) more recent study, they analysed the effect of ESG on US IG bond returns. Even in this case, they used the corporate bond spread as a key indicator: higher-quality bonds typically show lower spreads, which in the long-term cause lower incomes returns. But, to

assess whether ESG affects the valuation of corporate bonds, they estimated the ESG spread premium, thus the difference in spread between high- and low-ESG bonds. In addition, all the factors which could affect the price such as credit rating, industry sector, duration and geography have been controlled.

If the difference in ESG spread is negative, high-ESG bonds tend to be more expensive than low-ESG ones. In this case investors could potentially prefer high-ESG bonds receiving lower incomes in order to own bonds with higher ESG valuation. On the other hand, if ESG spread premium decreases, high-ESG bonds probably will supply higher returns than low-ESG ones.

Table 22 provides the evolution of ESG spread premium in Europe and USA from two different providers: MSCI and Sustainalytics:

Table 22. ESG Spread Premium Europe vs USA



Source: Barclays (2018)

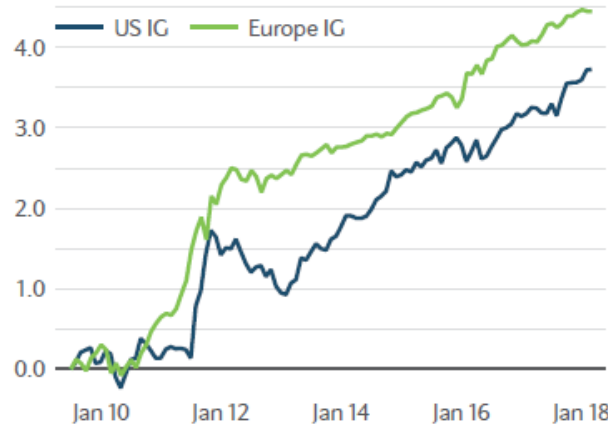
Due to the increased interest around sustainable investing, one could expect an increase in prices of high-ESG bonds. Nevertheless, a downward trend in ESG spread premium was not observed, as opposed it seems to be stable in Europe and rise in US. For this reason, any

outperformance of high-ESG over low-ESG bonds cannot be attributed by a richening of ESG bond over the time taken into consideration (Barclays, 2018).

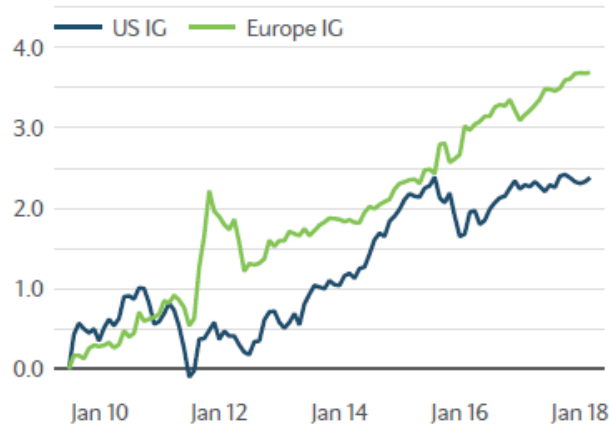
At this point, the Barclays study (2018) analyses the historical returns of diversified portfolios that fit all major index exposures except for a positive or negative ESG inclination. The difference in performance between high- and low- ESG portfolios exemplify the effect of the ESG factors on returns. According to Barclays (2018) the difference in the two portfolios could be read as a ESG performance factor, indeed, the return seems to favour high-corporate bonds over low-ESG ones, holding other things equals. Table 23 shows the cumulative performance associated with high-ESG portfolio over low-ESG one with the data of MSCI and Sustainalytics:

Table 23. High-ESG Portfolio vs Low-ESG Performance

Cumulative performance (%) of a high-ESG portfolio over a low-ESG portfolio using MSCI ESG data



Cumulative performance (%) of a high-ESG portfolio over a low-ESG one using Sustainalytics ESG data



Source: Barclays, 2018

Table 23 displays how the data from both MSCI and Sustainalytics exhibit that high-ESG bond portfolios perform better than low-ESG ones. The returns for both the cases have an upward and positive tendency over the nine years considered. Consequently, the current research confirms what was discovered in the previous one: ESG inclination helped to enhance performance in the US market. The Barclays study (2018) also investigated which factors from Environmental, Social and Governance elements mainly affected the performance of Bonds in investment-grade markets. They structure the analysis for US and Europe starting from the data of both MSCI and Sustainalytics and, for each provider, they constructed different portfolios to

measure the performance associated with the aggregated ESG, and then each one separately. The average difference is given by comparing high-ESG portfolios over low-ESG portfolios, particularly, the metrics used to measure this difference was the basis point per year.

It is important to mention that, contrary to the previous Barclays analysis (2016), in the US the best single-pillar most closely related to outperformance was Environment and not Governance. Instead, for what concerns Europe the results show less variation among single-pillar, indeed, all three have positive performance, with a more slight effect for Environment score and less for Social one. Table 24 resumes the evolution of outperformance between 2009 and 2018, in Europe for example the annualized outperformance of high-ESG over low-ESG portfolios was 43bp per year according to MSCI and 51bp for Sustainalytics:

Table 24. The Effect of E, S and G Individually in Investment Grade Markets



Source: Barclays, 2018

The same analysis was conducted even for the high yield market. They found out that high-ESG HY portfolios, mainly but not always, outperformed the low ESG-ones. Between 2012 and 2018, the portfolios strategies presented more negative returns on Environment factors with

reference to MSCI and Social one's for what concerns Sustainalytics. It is also important to mention that the highest returns were outlined by Governance factors for both data providers.

Generally, the most recent Barclays study (2018) expanded the previous one confirming several results. Nevertheless, some doubts arise: since there is no systematic change in the ESG valuation premium, they wonder what could drive the outperformance of high-ESG portfolios. Their hypothesis is that firms better able to tackle the broad range of non-financial risks covered by ESG scores may be less likely to have negative surprises. ESG returns could probably take the form of idiosyncratic risk: low-ESG firms might be more likely to perform worse than the market due to specific negative events such as, for example, environmental disasters, or labour conflicts.

Another study which provides evidence of inverse relation between ESG and bond spread is that of Bradley, Chen, Dallas and Snyderwine (2008). In particular, they examined the link between corporate governance factors, credit ratings and bond spreads, focusing on a panel of 774 unique firms from 2001 and 2007. Firstly, they found out that the primary determinant of a firm's credit rating is represented by its financial position, consistent with the existing literature. In addition, they discovered that governance features related to transparency, ownership structure, shareholder rights, board structure and executive compensation are strongly linked to credit ratings even after taking into account the financial condition of the firms. They also found that firms with stable boards present higher credit ratings and lower bond spread. Indeed, according to Bradley et al. (2008), higher stability on board helps take into consideration the longer-term interests of firms as a whole, hence benefiting bondholders.

Along this line, Bhojraj and Sengupta (2003) showed that high levels of block institutional ownership, thus institutions that hold more than 5% of a company's stock, have a negative relation with credit rating. Furthermore, they underlined that better governance had a powerful effect on yields for lower-rated bonds. In substance, they found that lower yields are related to a strong governance factor, as shareholders effectively monitor management.

Devalle, Fiandrino and Cantino (2017), instead of focusing on bond yields, focused their attention on the relationship between ESG performance and credit ratings. In Particular, they suggested that ESG factors should be taken into consideration in investment decisions since they affect borrowers' cash flows and the probability of default on their debt obligations. Their approach started distinguishing the relationship between E, S and G separately with credit rating on a sample of 56 Italians and Spanish public firms, through the use of 15 variables with a

totality of 840 items. The result shows that ESG performance is positively associated with higher credit ratings. In particular, they found that the community score related to the company's commitment to being a good citizen and respecting business ethics and Shareholder score related to the equal treatment of shareholders are statistically significant at 0.001 level. Nevertheless, any interesting result was achieved for what concerned environmental score.

In addition, the study, which also investigated the relation between ESG criteria and default probability, did not find a clear-cut boundary in the literature. Nevertheless, according to their view, if a negative relation between ESG and probability of default exists, it would also have practical implications. In this sense, ESG should have a role of risk mitigator, serving for the estimation of investment risk sensitivity and particularly for the default probability.

Another study which finds a positive relation between ESG and credit rating is one of Kim and Li (2021). They also investigate the relation between ESG and corporate financial performance: they evaluate ESG impact either separately or aggregated.

They obtained a positive impact of ESG on corporate profitability, especially for firms with large total assets values. Among different ESG elements, the governance factor has the most significant impact on corporate profitability. In addition, for what concerns credit risk, all ESG factors present a meaningful impact on credit rating: social and governance scores show a positive effect, on the contrary environmental element curiously has a negative impact.

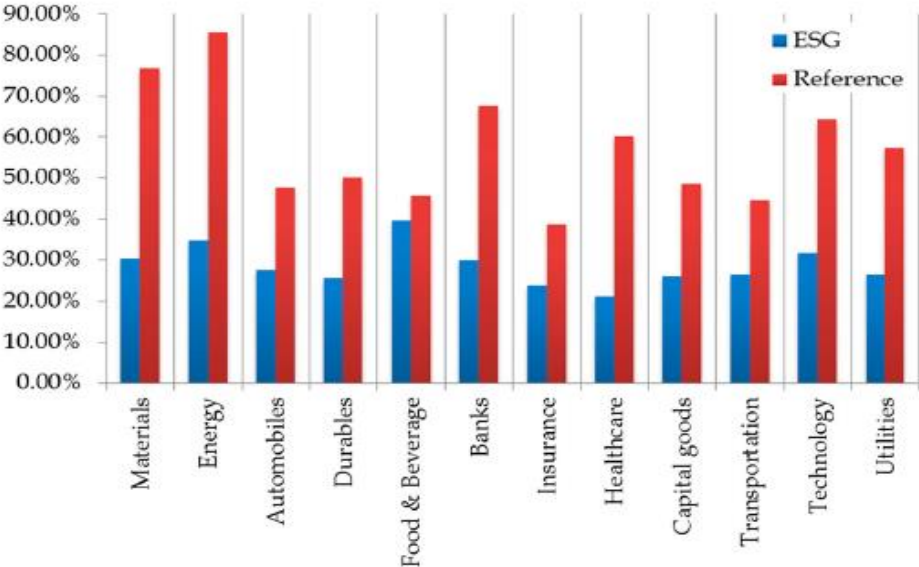
Instead, Kane, Velury, and Ruf (2005) analysed the data from index and research provider KLD from 1991 to 2001 in order to investigate whether firms' relations with their employees are associated with the likelihood of occurrence of financial distress. They also took into account a number of circumstances that might affect the research, such as firms-specific differences in size, liquidity, profitability, leverage, business cycle across time and corporate life cycle. Generally, they found out that employee relations could be an additional indicator for evaluating the likelihood of financial distress.

Li, Zhou and Xiong (2020), rather than focusing on financial distress as Kane, Velury, and Ruf (2005), tried to capture the determinants of bond default risk in China. In general, they took into consideration several factors such as industrial factors and ESG ones, in order to determine the probability of industrial bond default. In particular, the research assessed how not only financial performance criteria are determinant for firm development. In fact, integrated standards, such as environmental protection, social responsibility and corporate governance, might be examined in making strategic decisions, since these elements can affect firms' credit and

operational risk. Consequently, the result of the study shows that the bond default is positively correlated with the company energy consumption and negatively correlated with social responsibility, corporate governance and financial performance.

As far as volatility is concerned, Kumar, Smith, Badis, Wang, Ambrosy and Tavares (2016) provided a useful analysis with the aim to better understand the relation between ESG and volatility. They took the sample of 157 listed companies on the Dow Jones sustainability index and 809 that are not, for a time period of 2 years. They discovered, against the conventional finance wisdom which assesses that the less the risk the less returns, that companies that incorporate Environmental, Social and Governance elements show less volatility than their peers in the same industry, that each industry's diversity is affected by each of ESG factors and that ESG firms show higher returns. In particular, in Kumar et al. model (2016), the different levels of risks in the equity stock are embodied by the volatilities of their stock returns. Within their sample, i.e. 12 industries, the panel of ESG listed companies exhibit lower volatility by 28,6% on average, meaning that ESG firms face less risk than those one in the same in industry which are not. Table 25 provides a summary of the results obtained by the academics:

Table 25. ESG vs No ESG Companies' Volatility



Source: Kumar *et al.* (2016)

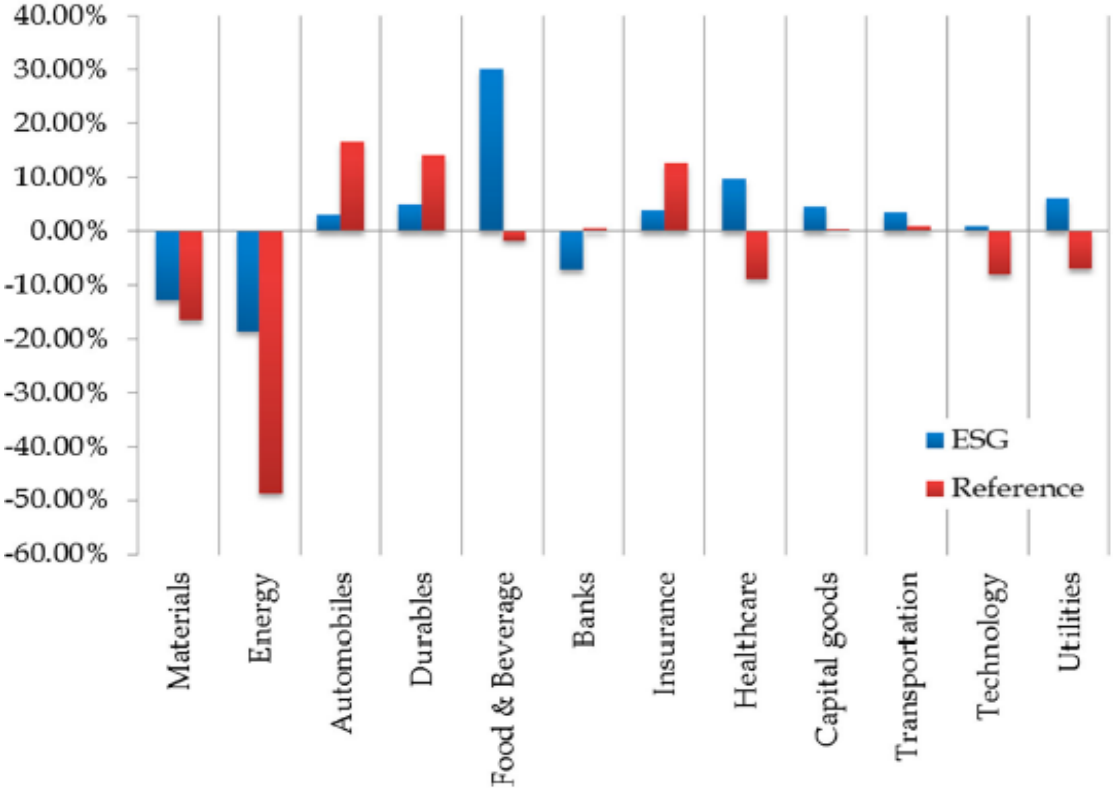
Among the samples taken into consideration by Kumar et al. (2016), it seems that ESG factors have a powerful impact on industries such as materials, banking, energy and technology. The difference in percentage between ESG and non-ESG is a risk premium that the companies

face and that investors may also take into account when making decision investments. In fact, equity investment in non-ESG companies presents 28% of more risk than ESG companies.

As already mentioned, in contrast with the conventional belief that the lower the risk the lower the returns, Kumar *et al.*, (2016) model displayed that investments in ESG companies could have higher returns, despite the lower risk.

In fact, most of the ESG companies on the panel provide better returns than their peers. On average the positive effect of ESG in equity return is 6.12%, but if we look only at those ESG companies which perform better, i.e. 8 out of 12, the impact rises to 14.08% on average. More precisely, energy, food & beverage and healthcare show the highest benefits from ESG factors, on the opposite we find out automobiles, durables and insurance industry. Table 26 shows the benefits provides by ESG in each industry:

Table 26. ESG vs Non-ESG Companies Returns



Source: Kumar *et al.* (2016)

So, according to Kumar et al. (2016), the relation between risk and return may not actually mirrored traditional market thinking: the lower risk provides by ESG practices may also improve the risk-adjusted return of the investment in these companies,

It is also important to mention the effect of ESG in credit default swap (CDS), in particular Höck, Klein, Landau and Zwergel (2020) investigated whether environmental sustainability affects the credit risk of European non-financial firms. Generally, they found out that more sustainable firms showed lower credit risk thanks to the lower reputational, financial and regulatory risks, which give a clear image of the sustainability as a risk mitigator. Also, it seems that only firms with better creditworthiness take advantage of having high environmental scores. Therefore, according to Höck, Klein, Landau and Zwergel (2020), investment professionals may include environmental elements in the investment decision-making process for assessing firms defaulting risks and consider the moderating effect of a firm's creditworthiness.

Along this line Barth, Hübel and Scholz (2018) explored how credit default swap spreads are linked to environmental, social and governance performance. Their study underlying the worst environmental performance causes a 25-basis point higher credit spreads. Nevertheless, the opposite applies to social factors, indeed, it shows a higher 22 basis points higher credit spreads which indicate a waste of valuable resources due to overinvestment.

According to UN PRI (2013) while academics focus their research on the link between ESG elements and corporate credit quality across the entire markets or sectors, especially in the US, practitioners tend to focus their attention on sector, region, timescale, and leverage. In other words, they are more interested in company-specific matters.

Along this line, table 27 shows how the ESG factors impact across different sectors. In this case MSCI, as investment index and research provider, has been used for the analysis. This statistic reports the weighting of each factor when the global ESG score has to be determine for an issuer:

Table 27. ESG factors across different sectors

	ENVIRONMENTAL				SOCIAL		GOVERNANCE
	CARBON INTENSITY (tCO ₂ e per USD million sales)	DIRECT AND INDIRECT WATER WITHDRAWAL (liters per USD million sales)	AIR POLLUTION INTENSITY (tons per facility)	HAZARDOUS WASTE INTENSITY (tons per facility)	FATALITIES (per million employees)	LABOR INTENSITY (employees per USD million sales)	CORRUPTION INDEX (10 = highest bribe incidence)
Utilities	1,237	79	1,853	149	0.1	1.6	6.8
Energy	524	26	550	9,643	0.3	1.5	7.0
Materials	583	44	1,270	7,534	0.1	3.5	5.6
Consumer Staples	67	121	164	71	0.0	4.0	5.5
Industrials	176	25	147	477	0.1	4.4	6.1
Telecommunication Services	34	10	9	112	0.0	3.1	6.3
Health Care	37	19	85	546	0.0	3.4	6.8
Consumer Discretionary	63	23	40	56	0.0	5.5	5.4
Information Technology	52	23	33	121	0.0	4.4	5.4
Financials	44	8	14	53	0.0	2.1	5.8

Source: UN PRI, 2013

As the above table shows, in certain industries some factors affect ESG score to a higher extent than others, one example could be the carbon and air pollution intensity, elements more prevalent in high-emitting sectors, which represent a higher potential risk for utilities, energy and materials industries.

2.3 ESG and Firm Performance

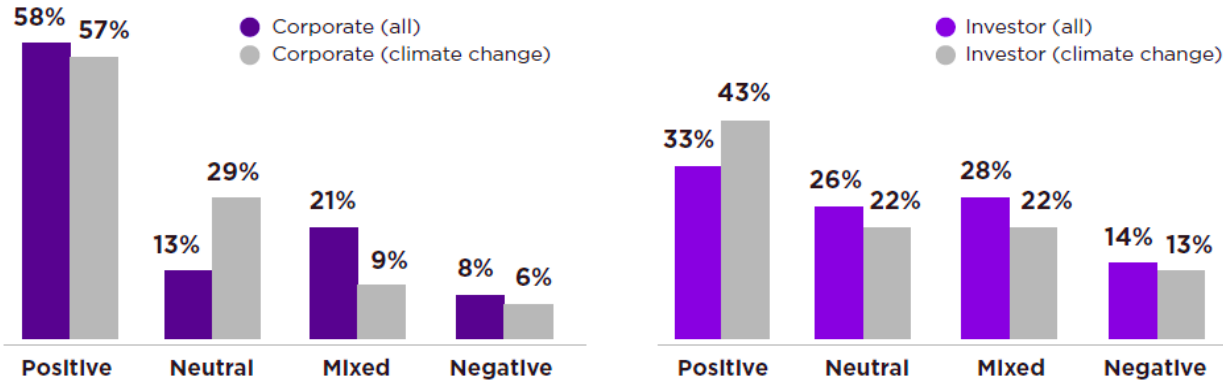
ESG is often related to a company's non-financial performance. Nevertheless, the attention of such factors on corporate performance has constantly increased: as already mentioned in the previous chapter, Amel-Zadeh and Serafeim survey (2018) suggests that professional investors use ESG information primarily for performance objectives. Academics, such as Friede, Busch and Bassen (2015), based on more than 2000 academic research until 2015, provided a general understanding around the study of ESG a corporate firm performance (CFP). Indeed, according to their analysis, developed through both vote-count and meta-analysis statistical study, return a positive relationship between ESG and CFP: underpinned by the vote-count analysis the 47.9% of the research return a positive relation between the two dimensions against the 6.9% of negative one. On the other hand, the meta-analysis gives a bit higher percentage compared to the first one, 62.6% of positive relation and 8.0% of negative one. In addition, it seems that the

higher share of positive response came from developing countries and North America, and properly in the latter ones was recorded the lowest percentage of negative links of ESG to CFP.

Nonetheless, almost all the meta-studies examining ESG and CFP relations cover the years prior 2015 (Whelan, Atz, Van Holt and Clark, 2020). Along this line, Whelan, Atz, Van Holt and Clark, (2020) performed an analysis across more than 1000 studies between 2015-2020. Particularly, those analyses found out positive correlations between ESG performance and operational efficiencies, stock performance and lower cost of capital: the 58% of the “corporate” studies returned a positive link between ESG and ROE, ROA or stock price, the 13% got a neutral impact, the 21% a mixed result and the 8% a negative relation. Instead, the result of investments studies, generally centred on risk-adjusted attributes such as alpha or Sharpe ratio on a portfolio of stocks, was: a 33% with a positive relationship, the 26% neutral, the 28% mixed and the 14% negative.

Furthermore, Whelan et al. (2020), renewing 59 climate change studies related to financial performance, found out that: on the corporate side 57% obtained positive conclusion, 29% neutral, 9% mixed and 6% negative; on the other side, from investor point of view the 43% got a positive result, the 22% both neutral and mixed and lastly the 13% returned negative result. Table 28 provides a summary of the aforementioned outcomes:

Table 28. Correlation Between ESG and Financial Performance Between 2015-2020



Source: Whelan, Atz, Van Holt and Clark, 2020

Over the years, there were different interpretations of the impact of ESG on firm performance. An example is one of the earlier studies of Aupperle, Carroll and Hatfield (1985) which does not predict any connection. According to their research, social responsibility and profitability could not be linked. On the other hand, Kim K., Kim M. & Qian (2015) investigated the same relation

with a slightly different approach. They divided companies by their competitive actions, these latter should be seen as an important contingency that determines the effects of CSR activities on company financial performance. Competitive actions in that study must be interpreted as direct, specific and observable competitive moves to improve a firm's competitive position, which includes the introduction of new product, marketing and capacity expansion. The result exhibit that highly competitive actions and positive responsible activities are compensated with better financial performance. Other evidence comes from the analysis of Alareeni and Hamdan (2020), who investigated the impact of ESG disclosure on the financial performance of listed companies in US S& P500. Particularly, they tested if there is a positive, negative, or neutral relationship between the level of disclosure and firms' operational (ROA), financial (ROE) and market performance (Tobin's Q) considering a sample study which includes 4860 observations from 505 listed firms. The result indicated that ESG disclosure positively affects a firm's performance benchmark.

From the descriptive analysis, a higher result of ESG, social responsibility, environmental and governance disclosure derived from firms with higher asset and financial leverage. Furthermore, they found out that firms with a high level of ESG, environment and social responsibility disclosure have higher ROA and ROE, while a low level of governance disclosure is associated with a high level of ROA. However, the company's market performance (Tobin's Q) seems to be better in firms with low levels of ESG, social responsibility, environment, and governance disclosure.

Nonetheless, from the regression models, the result suggests that ESG disclosure has a strongly positive impact on all the firms' performance indicators considered.

A similar analysis, performed by Mohammad and Wasiuzzaman (2021), investigates the relation of ESG disclosure on firm performance and competitive advantage. The sample taken into consideration comes from 661 Malaysian listed firms. Their findings suggest that a firm's sustainability efforts could ease management of resources more efficiently and help to run the business effectively. Furthermore, EG disclosure in Malaysia turned out to deliver better value to shareholders, supporting also the stakeholder's theory related to the positive relationship between ESG and firm competitiveness. They also found consistent evidence that an increase in ESG disclosure by one level raises firm performance by almost 4 percent.

Other evidence comes from Egyptian market by Genedy and Sakr (2017): they analysed social and economic aspects, finding a positive relationship between corporate responsibility and

financial performance. Particularly, companies with better responsibility performance have significantly higher ROA, ROE and EPS ratios. From this study emerged that strong responsibility practices produced benefits that outweigh the underlying costs.

Nevertheless, Ruan and Liu (2021), in contrast with prior study, found out a negative impact of corporate ESG activities on firm performance. Their research, based on China's Shanghai and Shenzhen A-share listed companies, shows that whenever ESG rating level increased by one unit, the firm performance dropped by 4.3%. They also arrived at the conclusion that non-state-owned enterprises compared to state-owned enterprises suffer more cost pressure in ESG activities, which consequently lead to a larger reduction in performance. According to Ruan and Liu (2021), an explanation of such a result derives from the fact that in terms of ESG, listed companies in China are still facing high-cost pressures. They also added that the impact of ESG rating present discrepancy due to enterprise nature and industry characteristics and combining that with Chinese regulatory authorities and the situation of capital market, this negative correlation may still continue to exist in the future.

Generally, as previously mentioned, among the plethora of studies on the subject the results indicate a positive relation between ESG and firm performance. From the point of view of Whelan et al. (2020), six key takeaways may be drawn on the relation of such factors:

1. The improvement of financial performance thanks to ESG becomes more marked over a longer-term horizon.

According to Whelan et al. (2020), the proxy for an implied long-term relationship had a coefficient with a positive tilt that is statistically significant. Their model indicated that, ceteris paribus, a study with an implied long-term attention is 76% more probable to find a positive or neutral result. Also, two recent papers were optimistic on how market evaluate long-term commitments: Kotsantonis, Rehnberg, Serafeim, Ward and Tomlinson (2019) found a positive relation between CEO communication of "long term plans" and the exceptional positive reaction by the stock market, instead Dorfleitner, Utz and Wimmer, M. (2018) derived that firms with strong ESG rating received returns up to 3.8% higher per standard deviation on ESG score in the medium and long-term.

2. ESG integration seems to work better than negative screening and ESG momentum may cause improvers to outperform leaders.

The key conclusion in this research embodied three aspects:

- A back-test, performed on US all cap equity between 2010-2020, on a hypothetical portfolio showed that top-quantile ESG improvers outperformed bottom quantile-quantile ESG “Decliners” by 3.8% annualized. The study also shows how the outperformance grew for each quantile.
 - A hypothetical ESG improvers portfolio optimized by controlling sector and factor biases would generate a 0,5% annualized excess return with 1.3% tracking error relative to Bloomberg US 3000 Index.
 - The ESG improvers factor strengthened returns when integrated with traditional factors over the back-test period.
3. ESG investing may protect from risk downside, especially if social or economic crisis occur.

ESG investing seems to provide asymmetric benefits. In fact, studies found a strong correlation between lower risk linked to sustainability and better financial performance: Fernández, Abu-Alkheilb and Khartabiel (2019) analyses the performance and risk sensitives of German mutual funds in comparison with their German socially responsible investment and conventional peers during financial crisis (2007-2009). They found out that the green funds received adjusted returns slightly better than their peers. Similar results were obtained during the Eurozone sovereign debt crisis (2010-2012) using the same full sample period. Along this line, in the first quarter of 2020 COVID crisis, 24 Of 26 ESG index funds outperformed their conventional equivalent, which in part shows how ESG leading to more resiliency (Morningstar, 2020)²⁵.

4. Corporation sustainability initiatives may drive financial performance thanks to factors such as improvement in risk management and higher innovation.

Sustainability strategies executed at the corporate level could lead to superior performance. These strategies, also called mediating factors, embody innovation, higher operational efficiency, better risk management. Particularly important to mention is the analysis of Vishwanathan, Van Oosterhout, Heugens, Duran and Essen (2019), who computed a meta-analysis in order to determine the four factors which at best contributes

²⁵ <https://www.morningstar.com/articles/976361/sustainable-funds-weather-the-first-quarter-better-than-conventional-funds>

to drive financial performance. They found out that the most impacting mediating factors are the enhancement in firm reputation, the increase of stakeholder reciprocation, the mitigation of firm risk and the strengthening of innovation capacity.

5. Research shows that better management for a low carbon future raises financial performance.

According to Whelan et al. (2020), research focused on the mitigation of climate change through decarbonization strategies is justly recent. However, strong evidence of these strategies with a better financial performance was found, for both companies and investors. One example could be the analysis of Cheema-Fox, LaPerla, Serafeim, Turkington and Wang (2019) who construct decarbonization factors that go long on low carbon intensity industries, sectors, or firms and short on high carbon intensity. They uncovered that different decarbonization strategies produced different risk-adjusted returns. Particularly the more strategies lowered carbon emission the more they performed better. A similar study performed on 736 US public firms from 2005 to 2015 by In, Park and Monk (2017) shows that a strategy which go long on carbon efficient and short on carbon inefficient firms may produce an extraordinary return of the 3.5-5.4%

6. ESG disclosure per se cannot drive financial performance.

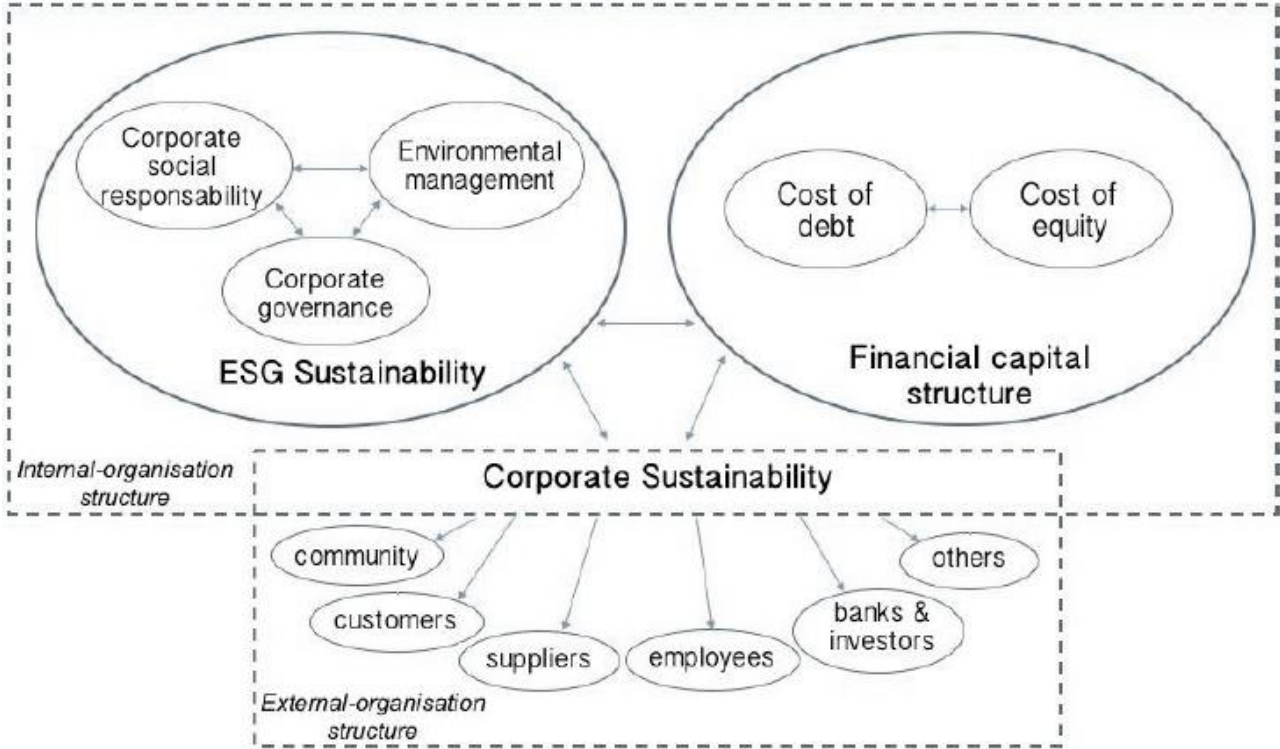
Often research centred on ESG disclosure alone hardly found a positive correlation, in fact, only the 26% of the cases compared to 53% of performance based ESG measure uncovered such a positive relation. This means that measuring ESG metrics without any kind of strategy seems to be ineffective: one example is the UN PRI signatories who agree to perform ESG policies, however the focus is on disclosure and performance. In this regard, Kim and Yoon (2020) found that funds on average do not show improvements in fund-level ESG scores after signing, while they display a decrease in portfolio return and alpha.

2.4 Are ESG a Decisive Factor in Decreasing the Cost of Capital?

After analysing the relation between ESG and firm's performance, now we will put our attention on the financial capital structure of the firm. In other words, whether a relation between sustainability factors and cost of capital exists.

With the aim to better focalize the content analysis, the following table 29 provides a useful framework for the comprehension of the connection between ESG sustainability and firm's financial capital structure:

Table 29. the relation between ESG and financial capital structure



Source:Devalle, Fiandrino& Cantino, 2017

In Table 29, Devalle, Fiandrino and Cantino (2017) provided synthetical framework of the internal-organization structure of companies in which financial, environmental, social and governance purposes should be aligned with the aim to go beyond the simple profit maximization and improve sustainability of the business, also including the interests of all the stakeholders. On one side, there are the ESG factors, which are included in a company's investment process as qualitative information. On the other side, there is the financial capital structure of the company composed of both equity and debt financing through which companies raise money to run and grow the business. According to Devalle, Fiandrino and Cantino (2017), this scheme helps us to delineate the relationship between ESG sustainability, equity and debt financing.

During the last decade, the relation between ESG and cost of equity have been investigated, and generally the literature has issued a unanimous opinion over the positive effect of ESG

factors on the cost of equity decrease. It is also important to mention that typically financial performance and high-quality accounting information strongly affect the firm's cost of equity by influencing investors' estimation of uncertainty about future cash flows (Hou, Van Dijk and Zhang, 2012). Easley and O'Hara (2004) showed how the quantity and quality of information generate cross-sectional differences in firm's required returns as a proxy of its cost of capital, this induced information asymmetries between informed and uninformed investors. In a similar way, different studies (Lambert, Leuz and Verracchia, 2007, 2012) examine how non-financial information affects cost of equity. In this sense, it is important to mention the research of Ng and Reazee (2015), they showed how better financial and ESG sustainability performance is related to lower cost of equity capital developing five mainly reasons:

1. The financial and non-financial sustainability performance is associated with better communication and interaction with all the stakeholders.
2. The objectives of wealth maximization of shareholders cannot be reached ignoring ESG risks.
3. The focus on ESG sustainability performance helps to identify strategic, operational, reputational, compliance and finance risks that could affect firm value and performance.
4. The firms with better sustainability performance are more willing to disclose their financial and non-financial ESG sustainability activities and initiatives to the financial market to signal their long-term commitment to sustainability.
5. Non-financial ESG dimensions of sustainability performance are as important as financial ones, they provide investors with new risks and opportunities in determining portfolio investment valuation

In practice, in Ng and Reazee (2015) view, a main reason for cost of capital reduction can be associated with the decrease of asymmetric information improved by ESG sustainability performance.

Along this line, Sharfman and Fernando (2008) provided an interesting analysis on environmental risk management and cost of capital. They studied 267 US firms exhibiting how improved environmental risk management is linked to lower cost of capital. According to their study, the implementation of environmental risk management operating changes that raise flexibility to handle economic downturns. Let us make an example, a company decides to change

its process in order to require less inputs or at least fewer toxic inputs. This will help the company in economic slowdown, in case of a firm's supply chain limitation, to be less susceptible to price increases due to its reduced input profile. In this way, the variability of performance is reduced, and the firm is less sensible to the market, i.e., it will reduce its beta, which implies lower cost of equity.

Instead, Ferris, Javakhadze and Rajkovic (2017) analysed the effect of managerial social capital on the firm's cost of equity. In their point of view, managerial social capital could be interpreted as a social tool, to enhance information sharing among stakeholders, on a firm's cost of equity. In order to compute the analysis, they estimated the mean value of the implied equity risk premium and then aggregated the total number of social connections between corporate executives and managers as a proxy of social capital. The outcomes underline an inverse relation between managerial social capital and the excess of equity risk premium. More specifically, the excess cost of equity monotonically falls across social capital quartiles, precisely looking at the average of the parameters the difference between high and low social capital is 0.00133 and statistically significant at one percent level.

Considering the aforementioned notion of information asymmetry, a study performed by Cohen, Holder-Webb, Nath, & Wood (2011) found out that social capital boosts the sharing of information inside a network reducing information differences between counterparts. In this way financial market inefficiencies as moral hazard and adverse selection are avoided. Cuadrado-Ballesteros, Garcia-Sanchez, & Martinez Ferrero (2016) validate the role of information asymmetry as a mediator component in decreasing cost of capital. According to their view, the more the financial and social disclosure quality the more the information asymmetry decreases, and as a consequence cost of capital decreases.

This concept mirrored what Ng and Reazee (2015) assessed, the better sustainability performance the more firms are willing to disclose information, in this way information asymmetry decreased diminishing firm's cost of capital.

Table 30 provides a summary of the studies, the sample, the time period, the methodology and the result obtained on the relation between cost of equity and ESG. Particularly, in the last column, the finding of the studies is presented as the impact of ESG in increasing/decreasing cost of equity.

Table 30. The Role of ESG in Decreasing Cost of Equity

Study	Methodology	Data Collection	Sample	Time period	Findings
(Armitage & Marston, 2007)	Survey Research	16 semi-structured interviews	Finance directors	November 2005 – June 2006	Lower CE
(Borghesi et al., 2014)	Quantitative (Regression, Fixed Effects)	KLD Research & Analytics; CRSP/Compustat database	11,711 US companies	1992 - 2006	Lower CE
(Botosan, 2006)	Qualitative				Lower CE
(Crifo & Forget, 2015)	Qualitative				Lower CE
(Cuadrado-Ballesteros et al., 2016)	Quantitative (multi-regression model)	Thomson One Analytics; I/B/E/S database	1,260 non-financial listed companies	2007 - 2014	Lower CE
(Dhaliwal et al., 2011)	Quantitative (logistic regression model)	KLD STATS, Compustat I/B/E/S database	11,925 CSR Reports	1993 - 2007	Lower CE
(Ferris et al., 2017)	Quantitative (multi-regression model)	DataStream; Worldscope; BoardEx database of Management Diagnostic Limited I/B/E/S	37,712 firms across 52 countries	1999 - 2012	Lower CE
(Hung et al., 2013)	Quantitative (difference-in-differences method with a propensity-scorematched procedure)	GTA, China Security Market and Accounting Research (CSMAR) database	3,723 firms	2006 - 2010	Lower information asymmetry
(Lins & Servaes, forthcoming)	Quantitative (difference-in-differences model fixed effect)	Compustat; MSCI ESG Stats Database	3,000 largest U.S. companies	2008 – 2009	Lower cost of capital
(M. L. Matthiesen & Salzmann, 2013)	Quantitative (multi-regression model)	Thomson Reuters ASSET4 database; Institutional Brokers' Estimate System I/B/E/S database; DataStream	3,439 firms in 42 countries	2002 - 2013	Lower cost of capital
(Ng & Rezaee, 2015)	Quantitative (PCA)	KLD database, Compustat; CRSP	3,000 firms	1991 - 2013	Lower cost of capital
(Sharfama & Fernando, 2008)	Quantitative (regression model)	KLD Stat, Compustat; United States EPA TRI data; Bloomberg Financial Dataset	267 U.S. firms	Risk premium over the period 1872 – 2000	Lower cost of capital
(Reverte, 2012)	Quantitative (regression model)	Observatory on Corporate Social Responsibility (OCSR) reports; JCF Quandt database	Spanish listed firms	2003 - 2008	Lower cost of capital
(El Ghoul et al., 2011)	Quantitative (multivariate regression analysis)	KLD STATS; Thompson (I/B/E/S); Compustat	12,915 U.S. firms	1992 - 2007	Lower cost of capital

Source: Devalle, Fiandrino and Cantino, 2017

For what concerns the linkage between ESG and cost of debt, the literature can be split into two mainstreams: the first one concerns the cost of corporate bond and bond issues and the second one on the private debt and loans principally extended by banks. A research, part of the first mainstream, is the one of Sharfama and Fernando (2008): the study showed how environmental risk management decreased the firm's costs of financial distress and the quality of its debt. Particularly, the cost of debt financing underpinning by a firm mainly depends on the evaluation of the capital market on the default risk of the company. More precisely, the rate of default risk of a firm could be seen as a function of its future activity uncertainty. The greater

uncertainty about a firm's future activities, the lower the quality of its debt and the higher the cost of the latter. In Sharfam and Fernando (2008) view, firms which engage in environmental risk management could reduce their probability of facing extreme environmental events. This improves the firm's risk profile in the markets which in turn is rewarded with lower cost of debt capital. Generally, a company with the advantage of lower cost of debt can increase its level of leverage due to better risk management. In this way, the firms raise the amount of income that a firm could shield from taxation.

It is also important to mention the research of Ge and Lui (2015), who investigated the relationship between CSR and yield spreads, their results suggested that higher CSR strength score is linked to lower yield spread in new corporate bond issues and better credit ratings. This demonstrates how bondholders appreciate the CSR activities promoted by borrowers.

On the other side, Goss & Roberts (2011), whose research falls into the second mainstream, examined the link between corporate social responsibility and bank debt using a sample of 3996 loans of US firms. Generally, they argued that the corporate bond market is less efficient than bank loans because of the private information that banks can handle at the beginning of the contract. Furthermore, they stated that the impact of CSR on spreads showed how banks consider CSR as a second-order determinant of spreads. Generally, this means that lenders do not reward the CSR investments and do not view it as a risk mitigator factor.

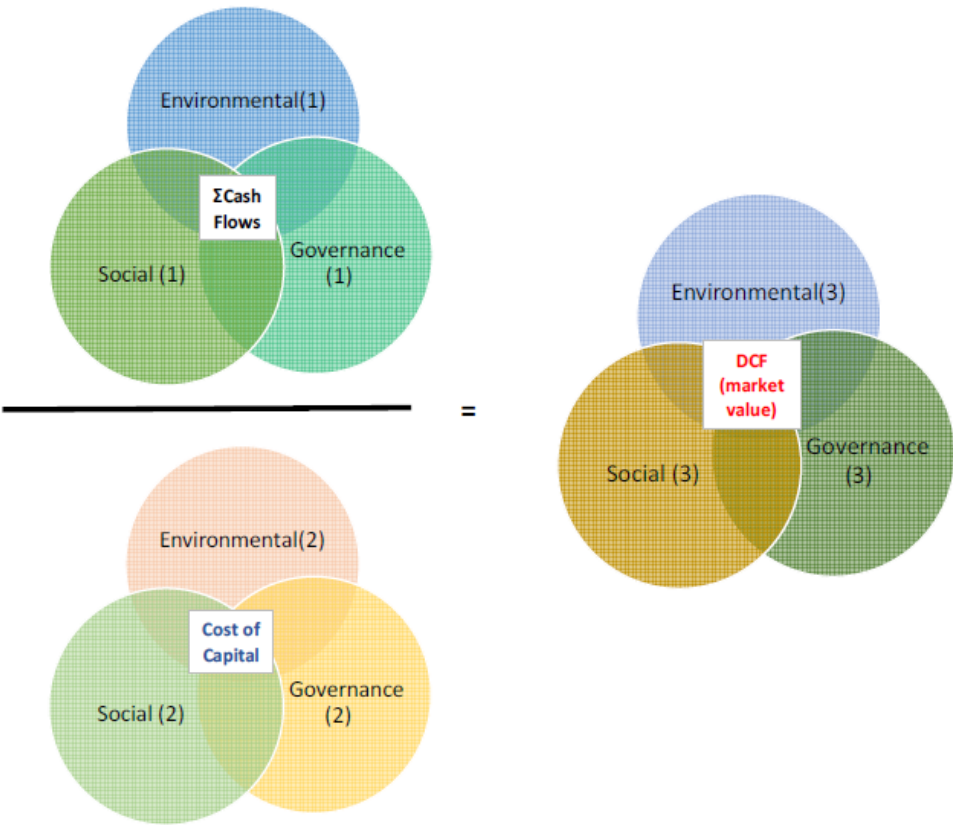
On the contrary, Nandy and Lodh (2012) explored the relationship between cost of debt and environmental information, specifically firms which engage in environmental management activities benefit from more favourable loan contracts from banks thanks to the lower cost. They also stated that coupled with firm level governance and loan features the firm's environmental responsibility could provide a good proxy in taking loan-granting decisions.

Compared to cost of equity, the results from the several research concerning costs of debt remains contradictory, in fact it is still an open debate for academics.

In conclusion, we have seen as ESG could impact performance and cost of capital of firms, particularly, from meta-analysis studies emerge a positive tilt of their effect. However, a mixed result has been obtained. According to Visconti (2020), ESG parameters might affect the company's valuation: referring to DFC metrics, ESG factors influence both the numerator and denominator, thus cash flows and cost of capital. Generally, the overall market estimation represented by the sum the discounted cash flow is asymmetric whether $E(1) \neq E(2) \neq E(3)$, $S(1) \neq S(2) \neq S(3)$ and $G(1) \neq G(2) \neq G(3)$. In Visconti's view (2020), this means that the same factors

affect differently cash flows, cost of capital and DCF sum. The explanation given by the academic seems to be based on the fact that cash flows are an internal parameter, while the cost of capital which mirrors the discount risk of the cash flow but also integrates external factors. In addition, the impact of ESG could be seen dynamically, in the sense that the influence varies as the time changes. Table 31 provide a clear image on how ESG affect the two dimension and consequently the possible change in DFC value

Table 31. ESG and Their Impact on DFC Value



Source: Visconti, 2020

2.5 Merton Model Approach on Corporate Performance

In the early 1970s Fisher Black, Myron Scholes and Robert Merton realized one of the major breakthroughs in the pricing of European options (Hull, 2014). Merton (1973) and Black & Scholes (1973) provided the basic approach for the valuation of stock and corporate bonds as derivatives on the firm’s assets. Principally, Black and Scholes (1973) provided a complete general equilibrium theory of option pricing which is fundamentally since the final formula is a

function of “observable” variables. It is important to mention that their approach foresaw the use of the capital asset pricing model to determine a relationship between market’s required return on the option and the required return of the stock. However, Merton (1973) clarified and extended the Black and Scholes model: his approach involved in setting up a riskless portfolio composed from the option and the underlying stock assessing that the return on the portfolio over a short time period of time must be equal to the risk-free return.

After that, Merton in 1974 proposed a model in which he used the stock prices as an input in order to determine the equilibrium bond spread and the probability of default. The model is funded on a simple intuition: a company defaults when the value of its assets becomes lower than the value of its liabilities. As a matter of fact, if the investments made by a company funded by the banks or bondholders are unable to generate expected cash flows, shareholders suffer a loss on the risk of capital they placed in the company. If the value of the capital achieves zero, shareholders have already lost everything, so for the principle of limited liability they are not required to invest other capital in the company to pay the company’s debt (Resti & Sironi, 2008). In this case, when the first payment to the creditors is due, the shareholders will be better declaring bankruptcy and leaving the company to the creditors (Resti & Sironi, 2008). In practice, in Merton view when liabilities exceed a firm's asset, shareholders have an option of defaulting and leaving the firm to the creditors, rather than repaying the debt, (Resti & Sironi, 2008).

Generally, this model focuses on the structural traits of a company that determine its probability of default, thus the value of the assets, the value of the debt linked to the degree of leverage, and the volatility of asset values.

Fundamentally, in the Merton model approach, in order to derive major insight about the determinants of credit spreads, the following assumptions were set (Merton, 1974):

- A.1 There are no transactions costs, taxes, or problems with indivisibilities of assets.
- A.2 There is a sufficient number of investors with comparable wealth levels so that each investor believes that he can buy and sell as much of an asset as he wants at the market price.
- A.3 There exists an exchange market for borrowing and lending at the same rate of interest.
- A.4 Short-sales of all assets, with full use of the proceeds, are allowed.
- A.5 Trading in assets takes place continuously in time.

A.6 The Modigliani-Miller theorem that the value of the firm is invariant to its capital structure obtains.

A.7 The Term-Structure is "flat" and known with certainty. I.e., the price of a riskless discount bond which promises a payment of one dollar at time T in the future is $P(T) = \exp[-rt]$ where r is the (instantaneous) riskless rate of interest, the same for all time.

A.8 The dynamics for the value of the firm, V , through time can be described by a diffusion-type stochastic process with stochastic differential equation

Merton (1974) assessed that many of these assumptions are not required for the model but they are used for convenience. Specifically, the first four, so the "perfect market" assumptions, can be relaxed. A.6 is proved as a part of the analysis and A.7 is utilized with the aim to distinguish risk structure from the term structure effect effects in pricing. As far as A.5 and A.8 are concerned, they are critical assumptions in the model.

The model simplified the capital structure of a company as follow (O'Kane, 2008):

- A zero coupon bond with a face value F of maturity T with total value D .
- Shares with total value E with no dividend payment.

Anytime the asset value of the firm A_T is linked to the value of debt D_T and equity E_T through the accounting equation which assess that the value of a company's asset is equal to the sum of debt and equity (O'Kane, 2008):

$$A_T = D_T + E_T \quad [1]$$

According to Merton (1974), the default can take place only at time T , which corresponds to the maturity of the debt. In this date, the firm could assume two different state (O'Kane, 2008):

- Solvency: $A(T) \geq F$, the value of the assets is greater than the face value of the debt, in this way, the bondholders are fully repaid leaving to shareholder $A(T)-F$.
- Insolvency: $A(T) < F$, the value of the assets less than the face value of the debt, in this case it is not possible to repay fully the debt outstanding. The debtholders have a claim on the remaining assets taking all their residual value $A(T)$.

We can specify the payoff for the bondholders at time T as follows (O’Kane, 2008):

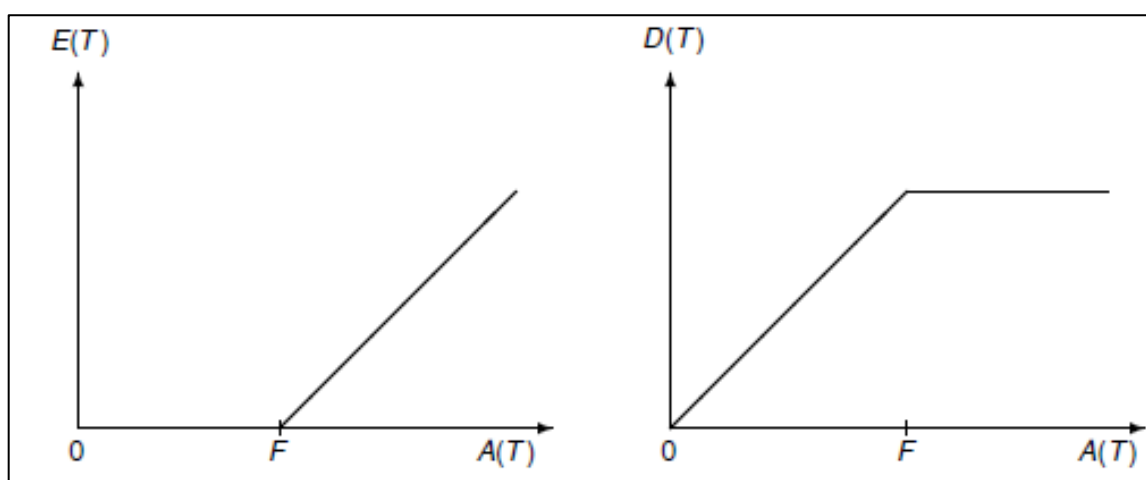
$$D(T) = F - [F - A(T), 0] = \min [F, A(T)] \quad [2]$$

And for equity holders:

$$E(T) = \max [A(T) - F, 0] \quad [3]$$

In order to better understand the position of both shareholders and bondholders, table 32 provides an example. In particular, the equity payoff at time T is alike to a call option on the asset value with a strike price equal to the face value of the outstanding debt F. Instead, we can see the debt payoff equivalent to being long on F and a short position on a put option (O’Kane, 2008):

Table 32. Debt and Equity Payoff



Source: O’Kane, 2008

He presumed that the market value of the firms fluctuates in a partially unpredictable manner. In particular, Merton assumed that the company’s asset value V can be described as the following geometric Brownian motion (O’Kane, 2008):

$$dA = \mu A dt + \sigma_A A dW \quad [4]$$

Hence:

$$\frac{dA(t)}{A(t)} = \mu dt + \sigma_A dW \quad [5]$$

Where $\frac{dA(t)}{A(t)}$ figures the instantaneous percentage change in V, μ is the expected instantaneous rate of return on asset A, σ_A is the volatility of the firm asset and dW is a random disturbance which could be also expressed as the product of a normally standard distributed term ε and the square root of time (Resti & Sironi, 2008). In this way we could expressed [5] as (Resti & Sironi, 2008):

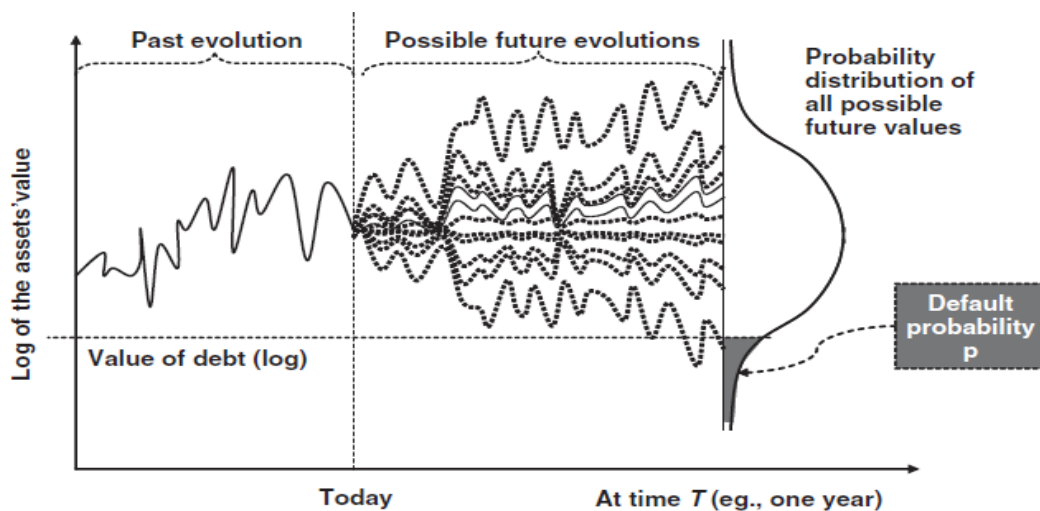
$$\frac{dA(t)}{A(t)} = \mu dt + \sigma_A dW = \mu dt + \sigma_A \varepsilon \sqrt{dt} \quad [6]$$

Following the Merton's model approach, the probability of default can be represented as a function in which the asset value upon debt maturity A_T will be less than the repayment value of the debt F. In this way the solution is (Resti & Sironi, 2008):

$$A_T = A_0 \cdot e^{\left(\mu - \frac{\sigma^2}{2}\right)T + \sigma_A \sqrt{T} \cdot Z} \quad [7]$$

According to [1] the Merton's model states that the percentage change in assets returns evolves stochastically and the uncertainty increases with the time horizon. Table 29 provides a clear image of the logic behind the Merton's model.

Table 33. The Logic of Merton's Model



Source: Resti & Sironi, 2008

Specifying that D_0 , A_0 and E_0 represent the three current values of these amounts. The credit risk of a company relates to the possibility that the value of the company asset's is less than the repayment of the debt at T . In particular, this probability increased as (Resti & Sironi, 2008):

- The ratio D_0/ A_0 , i.e. the company's leverage at time $T=0$, increased
- The volatility of the company's asset return measured by σ_A increased
- The debt maturity increased

Generally, specified a certain value in T , the aforementioned three variables figure all fundamental information in determining a firm's probability of default:

- The firm's expected future cash flows, which help quantify the market value of its asset A_0 , are affected by the perspective, the industry, and the economy of the company.
- The firm's financial risk is summarized by the ratio of assets to liabilities.
- The level of business risk implicitly incorporated in the volatility asset returns.

The probability of default is visually the area under the normal distribution in table 26, which depict all negative asset returns that from A_0 to A_T are lower than the repayment of the debt F . Ceteris paribus, this area increases as:

- i. Decreases the beginning market value of the asset (A_0).
- ii. Increases the nominal value of the debt (F).
- iii. Increases the volatility of the market value of assets (the higher σ_A , the more the distribution is squashed and the tails thicken).
- iv. Increases the deb maturity.

Starting from [2] and [3] we can say that the representation of the payoff to bondholders shows that the latter is short on a put written on the asset of the borrowing firm with a strike price equal to F , so the face value of the debt. Furthermore, it is possible to view that the shareholder, so the equity holders, owns the firm, borrowed at F at time $t=0$, and owns a put option on the asset of the firm with a strike price equal to F . This means that by means of the put-call parity relationship the equity of the firm can be expressed as a call option on the assets of the borrowing firm with a strike price equal to F , the face value of the debt (Sundaresan,

2013). Through the well-known Black-sholes equation, both the present value of the debt and equity, can be now expressed as follow (Resti & Sironi, 2008):

$$P_0 = Fe^{-rT}N(-d_2) - A_0N(-d_1) \quad [8]$$

$$E_0 = A_0N(d_1) - Fe^{-rT}N(d_2) \quad [9]$$

Where for $N(\cdot)$ is the standard normal cumulative density function, while d_1 and d_2 are defined as (Resti & Sironi, 2008):

$$d_1 = \frac{\ln\left(\frac{A_0}{F}\right) + \left(r + \frac{1}{2\sigma_A^2}\right)T}{\sigma_A\sqrt{T}} = \frac{\ln\left(\frac{A_0}{Fe^{-rT}}\right) + 1/2\sigma_A^2T}{\sigma_A\sqrt{T}} = \frac{\frac{1}{2}\sigma_A^2T + \ln(L)}{\sigma_A\sqrt{T}} \quad [10]$$

Where $L = \frac{A_0}{Fe^{-rT}}$ represent the level of the debtor firm's leverage:

$$d_2 = -\frac{\frac{1}{2}\sigma_A^2T + \ln(L)}{\sigma_A\sqrt{T}} = d_1 - \sigma_A\sqrt{T} \quad [11]$$

Now, starting from the position of the debt holder [2] and substituting P_0 [8], we can obtain D_0 (Resti & Sironi, 2008):

$$D_0 = Fe^{-rT}[1 - N(-d_2)] + N(-d_1)A_0 = Fe^{-rT}\left[N(d_2) + \frac{1}{L(-d_1)}\right] \quad [12]$$

From [12] we can assess that the value of the loan is inversely related to the leverage and loan's maturity (Resti & Sironi, 2008). In conclusion, after the analysis of the Merton's model we can say that credit risk is strongly influenced by the level of leverage of the firm, the volatility of the asset returns and the debt maturity (Resti & Sironi, 2008). Furthermore, thanks to ESG, higher and more stable cash flow can be translated into higher asset value of firms and so lower likelihood of default (Barth, Hübel & Scholz, 2018)

CHAPTER 3

The Empirical Analysis

3.1 ESG and CDS Spread: Literature Review

In the previous chapter, we have analysed how ESG performance affects positively creditworthiness. The relation between ESG and firm risk should shift into the valuation of credit risk, such as the default probability. According to Merton model (1974), the value of a firm debt could be seen as a short put option on the firm's assets with the loan's nominal value as the strike price. In the case the assets fall below the face value of the loan at maturity of the option, the shareholder will not repay the loan and exercise the option, which means that the company defaults. In this sense, if better ESG lead to more stable cash flows that result in higher assets value, firms with better ESG performance may show lower probability of default.

In general, different risk indicators are used for measuring the level of credit quality of a corporate bond. For example, we have seen the effect of environmental management on creditworthiness, and as a consequence on bond spread (Bauer & Hann, 2011), and how governance factor could impact both credit rating and bond spread (Bradley, Chen, Dallas & Snyderwine, 2008). After that, we have examined the relation between ESG and probability of default (Devalle, Fiandrino & Cantino, 2017), volatility (Kumar, Smith, Badis, Wang, Ambrosy & Tavares, 2016) and credit default swap (Höck, Klein, Landau & Zwergel, 2020)

Particularly, the role of Credit default swap spread as a risk indicator has gain increasing importance: indeed, Galil, Shapir, Amiram and Ben-Zion (2014) analysed the determinant of Credit default swap spread and spread changes. For this objective, they drew up a database of 718 US firms from 2002 and 2013. In particular they found three explanatory variables which overshadow the other ones: the stock returns, the change in stock return volatility and the change in the median CDS spread in the rating class.

In the literature, some research refers to the link between ESG and CDS spread exists. For example, Akdogu and Alp (2016) studied how shareholder governance mechanism could affect firms' credit risk by means of credit default swap spread. According to their view, the use of CDS spread, rather than bond prices, shows two primary benefits: firstly, the restrictive covenants could create distortion within bonds of the same company, on the contrary CDS seems to be not affected by that. Secondly, bond prices present matrix problems due to infrequent

trading. Instead, thanks to high trading, liquidity and volume, CDS represents a good alternative. The proxy utilized by the two academics is the G-index created by Gompers, Ishii and Metrick (2003), which is based on the company's number of shareholder rights-decreasing anti-takeover provisions. The index goes from 0 to 24 and, in particular, a high G-index score is related to weak shareholder rights, managerial entrenchment and higher takeover defences, which represent a signal of scarce managerial governance performance.

Akdogu and Alp (2016), using a sample of 203 firms with 711 year-observation, obtained that anti-takeover provision lower CDS spreads of a firm by 3.46 basis points. Based on the result, they assessed that the beneficial factors of weak shareholder governance compensate the adverse effect on average. The explanation of this result can be funded on the primary agency problem within the firm: generally, a good manager aligned its interests with those of shareholder, however, by doing that manager may take action which harm bondholders. This suggests that bondholders could not always prefer good governance. Indeed, the result properly suggests that bondholders interpret antitakeover provisions favourably because it reduces uncertainty caused by a takeover and an excessive alignment between shareholder and managerial interests.

Another study advanced by Switzer, Tu and Wang (2017) examined the relation default risk and corporate governance in the post-financial crisis period. The sample is principally composed of financial firms from 28 countries outside North America. The default risk is estimated starting from the CDS spreads and by a Merton-type model.

The first variable taken into consideration in the study is the average five-year CDS spread: the higher the CDS spread, the higher the probability of the firm's default. Another, measure used in the research is the five-year default probability: the default likelihood model is based on the Merton's model distance to default. Instead, for what concerns corporate governance, the variable utilized are as follows: the stock holdings as representative of the institutional ownership, the board independence as measures of CEO power, the board size and the CEO duality. Other variables, as far as firm characteristics are concerned, are the total assets, the return on asset, the leverage and the price-to-book ratio. The result shows that governance factors vary according to the continent. In particular, they found out that governance variables highly impact on default risk especially in Asian firms rather than European ones.

Barth, Hübel and Scholz (2018) examined how credit spreads of European companies are linked to the ESG performance. They computed the analysis starting from the Fama-Macbeth regression on a sample which goes from 2009 to 2016. They found that better environmental

performance is associated with lower CDS spreads, on the opposite for social and governance factors any connection has been found.

Nevertheless, linear regression may not be able to grasp non-linear patterns. For this purpose, they divided CDS into quartiles based on ESG ratings and investigated their residual. In this way, they found the highest residual of CDS spreads for the worst environmental ratings and the lowest CDS spreads for the best environmental performance. In particular, the difference between the two exceeds 25 basis point on average, being also statistically significant. For what concerns social performance, CDS spread seems to decline from higher social ratings to lower ones, where CDS spreads residual increased by 11 basis point on average.

In short, Barth, Hübel and Scholz (2018) findings showed a connection between CDS spreads and environmental and social factors. This connection does not seem to be related to known determinants of CDS spreads, but in their view, the two factors can be considered as additional determinants.

Höck, Klein, Landau and Zwergel (2020) studied the impact of environmental sustainability on the pricing of credit risk on a sample of European companies. In particular, they also analysed whether the creditworthiness of a firm may impact the relationship between environmental sustainability and the credit risk premium. In this study, CDS spread is used to measure default risk premium. In fact, in their opinion, CDS prices reflect firm data changing faster than bond prices, they represent a pure measurement of credit risk and lastly, they are not required to take into account different maturities while bonds have to. Furthermore, stock markets coupled with sustainability data are used to explain default risk premium. Specifically, Höck, Klein, Landau and Zwergel (2020) used leverage, profitability, and market capitalization. For what concerns the choice of leverage, they have justified it through the Merton's structural model (1974), in which the distance to the default decrease if the leverage increase which leads to a greater default likelihood. As already mentioned in the previous chapter, the more the debt than the asset, the more the probability of default and risks premium to pay. Profitability is measured with the use of EBIT, principally because higher earnings mean a higher probability to repay the debt. In addition, also the annualized returns of stock during 180 trading days and annualized volatility are taken into account.

In general, the result shows that more sustainable firms have lower credit risk thanks to low reputational, legal and event risks. Furthermore, they exhibit how firms' creditworthiness moderates the effect of environmental sustainability on credit risks. However, it seems that only

company with high creditworthiness take advantage of having a high environmental sustainability score. According to their view, investment professionals may integrate environmental criteria to evaluate a company's default risk.

Moreover, Razak, Ibrahim and Ng (2020) tried to discover empirical evidence of a relationship between credit risk and sustainability performance. They analysed a sample composed of 2094 global non-financial firms for a period between 2013 and 2016. Firstly, they took into consideration the effect of different corporate sustainability performance dimension on credit risk. The result suggests that the reducing risk effect thanks to better performance across the sustainability dimension is not uniform: climate change, natural resource use, human capital and corporate governance seem to be the most effective dimensions. Then, in order to assess the relationship between the sustainability dimension and credit risk, they used the Credit default swap spread as a proxy of credit risk. The result shows that, independently of the country sustainability context, corporate governance seems to have a stronger effect on credit risk. This suggests that through better corporate governance practices, the firm could build internal resources and intangible benefit which reduces cash flow volatility and improves the firm's credit risk profile.

Another study, which a little differ from the previous current, advanced by Naumer and Yurtoglu (2020) analysed the various ways in which media shape the information environment and the financial market outcomes. In their opinion, news provided by media could represent a window which help investors and managers to shed light on financial markets. For this reason, they have investigated the relation between CDS spread and the amount of flow of news related to ESG and non-ESG. In particular they have taken into account the volume of news, the tonality, this positive, negative and neutral, and the source. They have discovered that the volume of ESG-related new significantly impact CDS spread, the new with positive tonality is related to lower CDS spread, while negative news with higher CDS spread. Lastly, they have showed how tonality specificity impact even more thar ESG-related news.

3.2 Methodology

This thesis intends to examine whether a relation between ESG and CDS exists. For this reason, in the following paragraphs, the methodology we have followed will be explained in details: firstly, we have developed three different models using the fixed model, applied at time, country and sector. The aim is to investigate the effects of ESG on CDS avoiding the effects of

time, country and sector. Worth mentioning is that we have also added robust standard error, in order to control heteroskedasticity.

3.2.1 Research Question and Tools of Research

As already mentioned before, it seems that high ESG performance help to improve creditworthiness and reduced CDS spread (Barth, Hübel & Scholz, 2018). Indeed, thanks to ESG, a company could benefit higher and more stable cash flows, which translate into higher asset value and a lower probability of default, lowering the CDS spreads. (Barth, Hübel & Scholz, 2018). Along these lines, we have developed the following hypothesis:

- *H₁: Credit default swap spread and ESG performance have a negative relationship*

For computing this analysis, we have mainly used *Stata 17*. *Excel* has also been used for the part of the descriptive statistics, in order to categorise the countries and the sectors of the data sample.

3.2.2 Data

In the following paragraphs, the description of the sample will be made. In particular, some information about the source of the data will be given and then a description of the variables used in the research will be made. To compute the analysis on ESG and CDS spreads, we have firstly reorganized the data composed of European firms which issued corporate bonds: to obtain the final sample, we have eliminated companies which appeared twice. Then, we have evaluated the presence of CDS spread for each company in order to obtain a comprehensive list for performing the analysis. The final sample is composed of N=56 companies and T=7 years (2010-2016) with quarterly data. The data sample has been realized by Professor Michele Costola and Professor Diana Barro (Barro & Costola, 2021). The analysis will use CDS spread as dependent variables in accordance with the hypothesis to test.

3.2.2.1 CDS

In general, CDS will be considered in the analysis as a proxy of credit risk. Credit default swaps are popular credit derivatives, which provide insurance against the risk of default by company. In particular, it is a standardized contract exchange on the over the counter (OTC) market and it represents a measure indicator of riskiness defined in basis points. The buyer of the insurance obtains the right to sell bonds issued by the company for their face value when a credit event occurs and the seller of the insurance agrees to buy the bond for their face value if the credit event occurs. The buyer of the CDS makes periodic payments to the seller until the end of CDS life, typically 5 years (Hull, 2018).

In particular, according to academics (Forte and Pena, 2009, Tang & Yan 2010), CDS provides a precise parameter for the measurement of credit risk which is also easily comparable across firms and includes most of the firm-level determinants of default risk. Furthermore, according to Barth, Hübel and Scholz (2018), CDS seems to be better suited for empirical research rather than bond or credit ratings. In fact, CDS tend to show higher liquidity than corporate bond markets (Ericsson, Jacobs & Oviedo, 2009) and more updated than credit ratings (Finnerty, Miller & Chen, 2013). Particularly, we will use the natural logarithm of the CDS spread with the aim to take into consideration variable skewness and to obtain a better distributional behaviour (Höck, Klein, Landau & Zwergel, 2020).

3.2.2.2 Control Variables

As far as corporate sustainability performance is concerned, the proxy will be the ESG score aggregated in order to take into consideration Environmental, social and governance performance. In particular, the ESG score goes from 0 to 100: 0 relates to poor ESG performance, while 100 corresponds to excellent ESG performance.

To grasp which pillar most influences CDS spread, E, S and G pillar individually will be taken into account, even in this case the score goes from 0 to 100. Furthermore, other parameters concerning financial factors will be also included as control variables, this will help account for firms' dimension and return a better result avoiding potential bias. For this purpose, the following variables will be used: market value of the company, leverage, debt to EBITDA, In EBITDA, net income, ROA, capital expenditures, total current asset to total current liabilities. The choice under the use of these variables relies on the fact that they will help to explain the credit risk and the financial structure of a firm. Especially:

- Market value of the company also refers to market capitalization. It is used as a measure of the company size. Generally, it is the price at which an asset is delivered in the marketplace. According to Lee, Naranjo and Sirmans (2016), larger firms seem to have a better ability to repay their debt compared to smaller ones. In addition, as ESG issues are concerned, they tend to attract more attention from stakeholders (Jiraporn P., Jiraporn N., Boeprasert, & Chang, 2014). In particular, we have divided the market value of the company in tercile and included only the first and the third tercile with the aim to understand how the size of the company relates to CDS spread.

- Leverage is significantly linked to credit spread (Barth, Hübel & Scholz, 2018) and can be defined as the use of debt with the aim to undertake an investment. The objective is to multiply the potential returns from an investment. Nevertheless, the leverage will also multiply the potential downside risk. When a firm is highly leveraged, it means that the firm has more debt than equity. If the indebtedness is greater than 1, it means that the debt exceeds equity, and a firm is exposed to higher potential risk. Furthermore, in line with Merton's structural framework developed in 1974, the distance-to-default narrows if leverage increases which leads to a higher probability of default. In fact, according to Magnanelli & Izzo (2017), highly leveraged firms deal with higher default risk and have a higher credit spread.

- Debt to EBITDA is a leverage ratio that measures the amount of earnings before interest, taxes, depreciation and amortization that firms generate to pay off their debt. Generally, it helps understand the ability of the firms in paying their debts and liabilities.

- The logarithm of the EBITDA, the earnings before interest taxes depreciation and amortization is a proxy of a firm's overall financial performance. It represents a useful metric, insofar it shows a precise measure of the corporate performance before any kind of account or deduction influence. EBITDA can be used to estimate cash flows, and in this sense can be seen as a proxy of cash flow. As already mentioned, according to Barth, Hübel & Scholz (2018), looking at Merton's framework, high and more stable cash flows leads to higher asset values and lower profitability of default, meaning lower credit spread.

- Net income, which measures the net earnings of the companies, we applied as a measure of profitability in order to understand the real profit of a company
- ROA represents how a company is profitable relative to its asset, and measures how efficiently firms use its asset in order to generate earnings. As the previous variable, i.e. the logarithm of EBITDA and net income is a measure of profitability. According to Lee, Naranjo and Sirmans (2016), the more profitable firms are, the greater the capacity to repay debts and to invest in socially responsible activities.
- Capital expenditures represent the flow of cash used to acquire, upgrade and maintain physical assets. It is important for a company to maintain existing assets and invest in new technologies in order to grow. In this sense, capital expenditure represents a proxy for liquidity. According to Koller, Nuttall and Henisz (2019), ESG helps optimize capital expenditure. For this reason, we have taken into account the first and the third tercile of the firm's Capex.
- Total current asset to Total current liabilities ratio measured the firm's ability to pay short-term obligations within one year. It represents a liquidity ratio, and a low level of the latter mainly indicates a higher risk of distress. Furthermore, according to Corò, Dufour and Varotto (2013), more liquid firms are better able to repay their obligations on time and usually have a lower credit risk adding that firm-specific liquidity factors may be critical determinants of CDS price variations.

3.2.3 Descriptive Analysis: collection of data

The sample consists of 56 firms analysed between 2010 and 2016 with annual data. Table 34 shows that most of our sample firms are located in France (26.80 %), Germany (25.00 %) and Netherlands (16.10%).

Table 34.

Sector	Observations	Sector Weights%
Financials	6	10,70%
Communication services	8	14,30%
Energy	3	5,40%
Utilities	9	16,10%
Health Care	1	1,80%
Materials	6	10,70%
Consumer Staples	3	5,40%
Consumer Discretionary	5	8,90%
Information Technology	1	1,80%
Industrials	11	19,60%
Real Estate	3	5,40%
	56	100,00%

As far as sector is concerned, table 35 shows that most of the sample firms are classified as industrials (19.60 %), utilities (16.10 %), financials (10.70 %) and materials (10.70 %).

Table 35.

Sector	Observations	Sector Weights%
Financials	6	10,70%
Communication services	8	14,30%
Energy	3	5,40%
Utilities	9	16,10%
Health Care	1	1,80%
Materials	6	10,70%
Consumer Staples	3	5,40%
Consumer Discretionary	5	8,90%
Information Technology	1	1,80%
Industrials	11	19,60%
Real Estate	3	5,40%
	56	100,00%

Table 36.

Variable	Mean	Std. dev.	Min	Max
lnCDS	422.393	0.9255045	-0.9162907	7.634.482
ESG	7.392.251	1.248.074	2.831.378	945.216
E	765.192	1.734.007	0	9.846.442
S	7.646.976	1.473.318	2.837.825	9.799.386
G	6.652.571	1.912.062	6.784.314	9.773.248
Market T3	0.3098592	0.4624935	0	1
Market T1	0.3098592	0.4624935	0	1
Leverage	279.934	41.631	1	4.342.954
Capex T3	0.3083501	0.4618701	0	1
Capex T1	0.3118712	0.4633158	0	1
lnEBITDA	2.212.641	1.482.791	131.113	247.454
Net income	3.37E+09	6.43E+09	-9.23E+09	5.07E+10
ROA	0.0373671	0.0485738	-0.251247	0.4148421
DebttoEBITDA	454.267	8.153.257	0.5400708	1.389.048
CA/CL	1.165.869	0.563146	0.2332821	5.635.447

As it is possible to see, the natural logarithm of CDS spread has a minimum of -0.916 and a maximum of 7.634, while ESG scores have a minimum of 2.83 and a maximum of 94.52. The Environmental pillar has a minimum of 0 and a maximum of 98.46, while Social and Governance one has respectively a minimum of 2.83 and 6.78 and a maximum of 97.99 and 97.73

In addition to this analysis, we have also computed a simple correlation for the variables of the model. The aim behind this choice is to have a better overview of the relationship between variables. Nevertheless, the analysis is computed without taking into account either time, period or geographic area (see Table 37 in the next page).

Table 37.

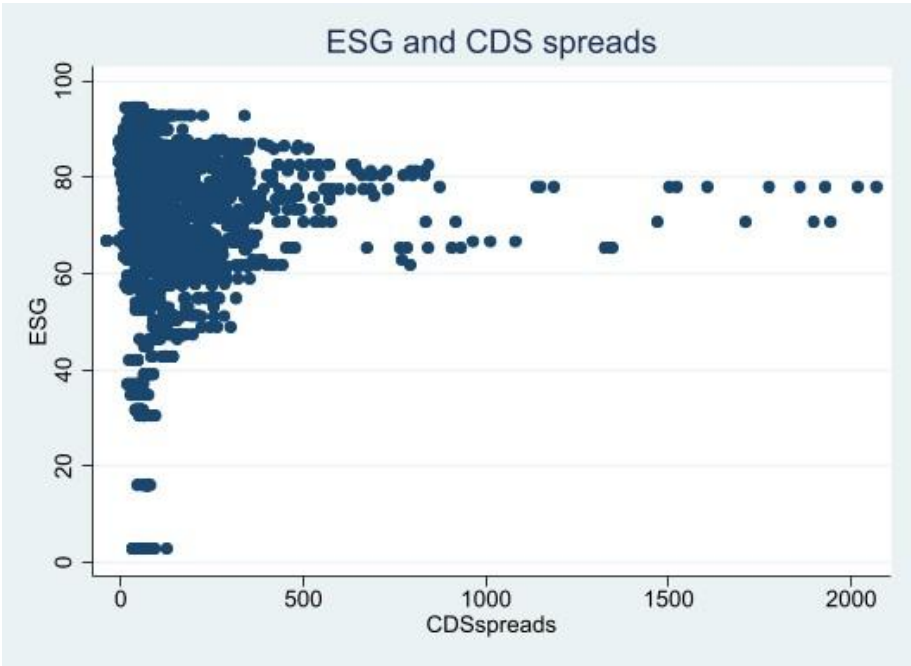
	InCDS	ESG	E	S	G	Market T3	Market T1	Leverage	Capex T3	Capex T1	InEBITDA	Net income	ROA	DebttoEBITDA	CA/CL
InCDS	1														
ESG	-0.1991	1													
E	-0.121	0.7586	1												
S	-0.0802	0.7803	0.4739	1											
G	-0.2695	0.6161	0.2214	0.1665	1										
Market T3	-0.4214	0.2718	0.2284	0.18	0.1653	1									
Market T1	0.4495	-0.1695	-0.1411	-0.0789	-0.183	-0.462	1								
Leverage	0.1179	-0.0796	-0.0642	-0.0474	-0.0669	-0.1706	0.3201	1							
Capex T3	0.3028	-0.2289	-0.1959	-0.1453	-0.1181	-0.4203	0.4831	-0.1207	1						
Capex T1	-0.1959	0.2718	0.1927	0.2396	0.1027	0.5019	-0.2468	0.0236	-0.4675	1					
InEBITDA	-0.3979	0.2268	0.0869	0.1737	0.1977	0.5798	-0.5483	0.0785	-0.6551	0.7571	1				
Net income	-0.2671	-0.062	-0.2949	-0.0476	0.1934	0.159	-0.2292	0.0553	-0.1424	0.2962	0.5109	1			
ROA	-0.1534	0.0431	-0.0909	-0.0298	0.2273	-0.0095	-0.0832	-0.0545	0.1059	-0.0448	0.0674	0.5062	1		
DebttoEBITDA	0.1803	-0.035	0.0457	-0.0107	-0.1214	-0.145	0.1122	0.0353	0.158	-0.1066	-0.2799	-0.1159	-0.1259	1	
CA/CL	-0.1246	-0.1865	-0.3894	-0.1313	0.1179	-0.1181	-0.0522	0.0928	0.1031	0.0371	0.1779	0.5381	0.3827	-0.1575	1

From the analysis of the correlation matrix, it is possible to grasp:

- ESG scores have a negative correlation with the natural logarithm of CDS spreads.
- All three pillars present a negative correlation with the natural logarithm of CDS spread.
- The third tercile of market valuation of the company is negatively correlated with the natural logarithm of CDS spreads, contrary to the first one which is positively correlated with the latter one. Instead, for what concerns ESG, the third tercile seems to have a positive relation, on the opposite the first one shows a negative correlation.
- The leverage is positively correlated with the natural logarithm of CDS spread and while it is negatively correlated with ESG scores and the three pillars singularly.
- The first tercile of the capital expenditure is negatively correlated with the natural logarithm of CDS spread and positively related to ESG. On the contrary, the third tercile is positively correlated with the natural logarithm of CDS spread, and negatively with ESG.
- The logarithm of EBITDA is negatively correlated with the natural logarithm of CDS spread, while it is positively related to ESG scores and the three pillars singularly.
- Net income is negatively correlated with both the natural logarithm of CDS spread and ESG score.
- Debt to EBITDA is positively related to the natural logarithm of CDS spread and negatively correlated with ESG score.
- CA/CL is negatively correlated with both the natural logarithm of CDS spread and ESG score.

The negative correlation between ESG and CDS spreads can be also viewed from the following scatterplot in which the two variables are confronted. In fact, it is possible to notice how the strong presence of the observations with low CDS spread is concentrated into the northwest quadrants of the scatterplot. This shows a tendency of a reduction of CDS spreads as the ESG scores increase, even though it does not seem clear from the chart.

Table 38.



3.2.4 Research Model

The following sub-paragraph underlines the model used in the research, particularly in the first subparagraph the model will be analysed from a theoretical point of view, instead, on the second one will be specifically discussed the model used in this research.

3.2.4.1 Fixed Effects Model for Panel Data

The empirical analysis will be performed on a regression model based on a panel of data or longitudinal data. This means that the panel data consists of information across both time and space. In the case of the panel data under analysis, the cross-sectional information refers to the area, time and sector of the observation.

In particular, two classes of panel estimator approaches can be used: the fixed-effects model and the random-effects models. Specifically, the fixed effects models allow us to better understand the effect of variables that vary across time, in fact, this model eliminates any kind of heterogeneity among individuals. In this way, we can effectively comprehend the effect attributable to time variation and these ones attributable to individual specifics. Through a fixed-

effect model, we will help us to see the significance of the exogenous and endogenous variables. Generally, in order to see how the fixed-effects model works we can decompose the disturbance term μ_i , and the “remainder disturbance” v_{it} that differ over time and entities as follows:

$$u_{it} = \mu_i + v_{it} \quad [13]$$

And it can be rewritten as:

$$y_{it} = \alpha + \beta x_{it} + \mu_i + v_{it} \quad [14]$$

So, we can see μ_i as a term that encapsulate all the variables that affect y_{it} cross-sectionally, but not overtime. This model can be also performed using dummy variables, which is called least squares dummy variables (LSDV):

$$y_{it} = \beta x_{it} + \mu_1 D_{1i} + \mu_2 D_{2i} + \mu_3 D_{3i} + \dots + \mu_N D_{Ni} + v_{it} \quad [15]$$

Where D_1 is the dummy variable that assumes value 1 for all the observations on the first entity, D_2 is the dummy variable which assumes value 1 for the second entity and the same for all the dummy variables in the model. Instead, the intercept term α is removed in order to avoid the “dummy variable trap” where we have multicollinearity between the dummy variables and the intercept.

Furthermore, it is possible to perform a time-fixed model rather than an entity-fixed effect model. In fact, this model is useful when the average value of y_{it} changes over time but not cross-sectionally. The model could be described as follows:

$$y_{it} = \alpha + \beta x_{it} + \lambda t + v_{it} \quad [16]$$

Where λt represents the time-varying intercept that captures all the variables that affect y_{it} and that differs over time but are constant cross-sectionally. Also, in this case, we can perform with the use of dummy variables, obtaining:

$$y_{it} = \beta x_{it} + \lambda_1 D_{1t} + \lambda_2 D_{2t} + \lambda_3 D_{3t} + \dots + \lambda_T D_{Tt} + v_{it} \quad [17]$$

Finally, in the case of both entity-fixed effects and time fixed effects within the same model, we can define the model as a two-way error component model, which combines the two equations, obtaining the LSDV model which embodies both cross-sectional and time dummies:

$$y_{it} = \beta x_{it} + \mu_1 D_{1i} + \mu_2 D_{2i} + \mu_3 D_{3i} + \dots + \mu_N D_{Ni} + \lambda_1 D_{1t} + \lambda_2 D_{2t} + \lambda_3 D_{3t} + \dots + \lambda_T D_{Tt} + v_{it} \quad [18]$$

In practice, with the introduction of the dummy variables, we will be able to capture the heterogeneity in the fixed-effect model.

As already mentioned, in developing LSDV we could incur in the “dummy variable trap”: the sum of the dummies would be 1 in every time period, but the sum is identical to the variable that is implicitly related to the intercept coefficient. For this reason, if the intercept and the totality N of dummies variables are included in the same regression, we would have perfect multicollinearity. Particularly, two solutions for the problem exist: the first one is just to use N-1 dummy variables plus the intercept or alternatively use N dummy variables with no intercept.

The decision to use a fixed-effects model, rather than random effects or pooled OLS, has been made because it helps delete any kind of possible heterogeneity in a constant way over time between individuals. This would allow us to estimate the effect of a specific sub-sample as the geographic area, sector or time period. This is the reason why we do not develop the Hausman test, which is used to understand what kind of model between fixed effects and random effects better suited with the data (Das, 2019).

3.2.4.2 The Implemented Model

As above mentioned, in this study, we have opted for a fixed-effects model. The motivation under this choice is justified by the fact that we want to better understand the real differences in the sample, in fact, the model helps to clean the effects related to time-period or geographic area. We have chosen to perform the fixed-effect model, since we are interested in analysing variables by removing the effect of time, country and sector.

In our case, we have chosen to adopt fixed effects for time-period, geographic area and sector, developing least square dummy variables for all the previous aspects. The interest behind the

choice is to understand the effect of ESG on creditworthiness, or more precisely on credit default swap (CDS) spread, independently of geographic area, time-period and sector.

To test the hypothesis, we have developed N-1 series of dummy variables, thus binary variables, with the aim to include a qualitative variable in our regression model. These dummy variables are constructed in a way to return 1 if the phenomenon is observed otherwise 0.

Nevertheless, having N elements for each group, we could incur in “dummy variable trap”. For this reason, we have operated the choice to introduce N-1 dummy variables for avoiding multicollinearity problems. The dummy variable is constructed as follows:

- Years: in this case, we have construct 7 dummy variables, omitting the first one
- Geographic area: in this case, we have formed 10 dummy variables, omitting the first one
- Sector: we have constructed 11 dummy variables omitting the first one

Initially, we have started to develop three models, in order to perform the analysis on the relation between ESG and CDS spreads. The first model is constructed as follows:

$$\begin{aligned} \ln CDS_{spread_{it}} = & \alpha_t + \beta_{1t} ESG_{it} + \beta_{2t} MarketT3_{it} + \beta_{3t} MarketT1_{it} + \beta_{4t} CapexT3_{it} + \\ & \beta_{5t} CapexT1_{it} + \beta_{6t} Leverage_{it} + \beta_{7t} Netincome_{it} + \beta_{8t} ROA_{it} + \beta_{9t} \ln EBITDA_{it} + \\ & \beta_{10t} DebttoEBITDA_{it} + \beta_{11t} CA/CL_{it} + \sum_{S=1}^7 DYear + \sum_{j=1}^9 DCountry + \sum_{K=1}^{11} DSector + \varepsilon_{it} \quad [19] \end{aligned}$$

After that, intending to test our hypothesis we have introduced time fixed effect, country fixed effect and sector fixed effect to clean any kind of years, areas and sector influences. In this line, we omit one dummy variable to avoid the multicollinearity problem. Furthermore, we have also applied robust standard errors to obtain unbiased standard errors of OLS coefficients under heteroscedasticity. Although, under heteroskedasticity the OLS estimator still returns unbiased and consistent coefficient estimates, it violates Gauss Markov assumptions, making OLS estimator biased for standard errors. For this reason, robust standard error is needed for rendering OLS the best linear unbiased estimator.

The second model, instead of the ESG score combined, includes the three Environmental, social and governance pillars taken individually. In this case, we want to better understand the

influence that the pillars have separately. Also, at this stage we opt for a fixed effect for time, country and sector, omitting one dummy variable and adding the robust standard errors. The model is composed as follows:

$$\begin{aligned} \ln CDS_{spread_{it}} = & \alpha_t + \beta_{1t}E_{It} + \beta_{2t}S_{It} + \beta_{3t}G + B_{4t}MarketT3_{It} + \beta_{5t}MarketT1_{It} + \\ & \beta_{6t}CapexT3_{It} + \beta_{7t}CapexT1_{It} + \beta_{8t}Leverage_{It} + \beta_{9t}Netincome_{It} + \beta_{10t}ROA_{It} + \\ & \beta_{11t}\ln EBITDA_{it} + \beta_{12t}DebttoEBITDA_{It} + \beta_{13t}CA/CL_{It} + \sum_{S=1}^7 DYear + \\ & \sum_{j=1}^9 DCountry + \sum_{k=1}^{11} DSector + \varepsilon_{it} \end{aligned} \quad [20]$$

The third model. Include either ESG score combines or the three pillars individually E, S and G. Even in this case, we opt to include immediately fixed effects for time, country and sector to avoid their influences. We have also applied robust standard error in order to control for heteroskedasticity. The model is formed as follows:

$$\begin{aligned} \ln CDS_{spread_{it}} = & \alpha_t + \beta_{1t}ESG_{it} + \beta_{2t}E_{it} + \beta_{3t}S_{it} + \beta_{4t}G + \beta_{5t}MarketT3_{it} + \beta_{6t}MarketT1_{it} + \\ & \beta_{7t}CapexT3_{it} + \beta_{8t}CapexT1_{it} + \beta_{9t}Leverage_{it} + \beta_{10t}Netincome_{it} + \beta_{11t}ROA_{it} + \\ & \beta_{12t}\ln EBITDA_{it} + \beta_{13t}DebttoEBITDA_{it} + \beta_{14t}CA/CL_{it} + \sum_{S=1}^7 DYear + \\ & \sum_{j=1}^9 DCountry + \sum_{k=1}^{11} DSector + \varepsilon_{it} \end{aligned} \quad [21]$$

In all the three models:

- InCDS spread: the natural logarithm of CDS spread
- ESG: ESG combines score which goes from 0 to 100
- E: Environmental pillar score which goes from 0 to 100
- S: Social pillar score which goes from 0 to 100
- G: Governance pillar score which goes from 0 to 100
- Market T3: the third tercile of the market value of the companies
- Market T1: the first tercile of the market value of the companies
- Capex T3: the third tercile of the capital expenditures of the companies
- Capex T1: the first tercile of the capital expenditures of the companies
- Leverage
- Net income
- ROA: Return on asset

- lnEBITDA: the natural logarithm of earnings before interest, taxes, amortization and depreciation
- Debt to EBITDA: debt to earnings before interest, taxes, amortization and depreciation
- CA/CL: total current assets to total current liabilities

3.3 Results

In this paragraph, we will investigate the results of the analysis. In particular, we have developed three models, which table 39 summarizes. In the first model, we have first considered the ESG scores combined in order to have a better understanding of whether a relation between CDS spread and ESG could be significant. We have chosen to apply the fixed effect for time, country and sector, also adding the robust standard error.

In the second model, we have opted to analyse which pillars among E, S and G have a significant relation with CDS spread. Even in this case, we have applied time, country and sector fixed effects coupled with robust standard error.

The third model includes not only the ESG score combined, but also all the three pillars individually. Furthermore, as the previous ones, in this last model, we have applied time, country and sector fixed effects with robust standard error.

3.3.1 The Results of the First Model

The first model has taken into consideration only the ESG score combined and the control variables. As already mentioned, in this case, we opt to immediately apply time, country and sector fixed effects applying also the robust standard error. The result obtained shows that ESG score is statistically significant at 1% level with a coefficient equal to -0.008. As expected, leverage and debt to EBITDA has a positive coefficient equal respectively to 0.04 and 0.015 which is statistically significant at 1%. This reflects Merton's view according to which the higher the leverage the higher the probability of default, thus a higher CDS spread. On the contrary, all the profitability indicators show a negative effect at 1% statistical level of significance. Even in this case, the result is due to the fact that a high level of profitability allows the companies to better meet their obligations. Indeed, the ln EBITDA shows a negative coefficient equal to -0.2,

the Net income exhibits a coefficient of $-8.53E-12$ and lastly, ROA shows a coefficient of $-1.8E-6$. As far as liquidity indicators are concerned, we find positive coefficients for both Capex T1 and CA/CL at 1% level of significance. On the other side, we find a negative coefficient for what concerns Capex T3. This could mean that the flow of cash used to acquire, upgrade and maintain physical assets in order to grow companies contributes to decreasing the risk. As expected, a high market value of the company has a negative coefficient with ln CDS spread, compared to a low market value of the company which has a positive coefficient, both of them at 1% level of statistical significance. Indeed, larger companies are better able to repay debt than smaller ones.

In general, we can conclude that an increase of ESG score by one basis point leads to a decrease in ln CDS spread of about 0.8%. We can also say that larger companies, i.e. companies with higher market value, show negative relation with ln CDS spread meaning that they present lower risk than smaller ones.

3.3.2. The Results of the Second Model

Compared to the first model, the second one includes the E, S and G taken individually in order to better understand the most significant pillar among the three, also in this case the same control variables are included. We have applied time, country and sector fixed effects adding robust standard error control. In this model, we can observe that the Environmental pillar seems to be non-statistically significant with the ln CDS spread. On the contrary, both social and governance scores show a negative coefficient at 1 % level of statistical significance. In particular, the social score exhibits a negative coefficient equal to -0.003 meaning that an increase of 1 point in social performance led to a decrease of about 0.3 % in the ln CDS spread. For what concerns the governance pillar, we can see a negative coefficient equal to -0.005 , which means that an increase of 1 point in governance performance led to a decrease of about 0.5 % in the ln CDS spread. Generally, all the control variables show a similar return to the first model. In fact, both leverage and debt to EBITDA have a positive coefficient equal respectively to 0.04 and 0.016 which is statistically significant at 1%. For what concern profitability indicators, all are statistically significant at 1 % level: the ln EBITDA shows a negative coefficient equal to -0.21 , the Net income exhibits a coefficient of $-7.28E-12$ and lastly, ROA shows a coefficient of $-1.74E-6$. Even in this case, liquidity indicators show positive coefficients for both Capex T1 and CA/CL at 1% level of significance. Instead, the capex third tercile shows a similar result to the first model with a negative coefficient at 1% level of significance.

3.3.3 The Results of the Third Model

The third model includes the ESG combined score, and all the three pillars taken individually, also in this case we have applied time, country and sector fixed effects adding robust standard error control. Differently to the previous model, ESG combined score shows a positive coefficient equal to 0.03 at 1 % level of significance. For what concerns the three pillars, they all show a negative coefficient at 1 % level of significance: E equal to -0.008, S equal to -0.016 and G equal to -0.014.

Referring to control variables, the results obtained reflect quite similarly to the previous models: leverage and debt to EBITDA have a positive coefficient equal respectively to 0.04 and 0.015 which is statistically significant at 1%. The ln EBITDA shows a negative coefficient equal to -0.23, the Net income exhibits a coefficient of -7.91E-12 and lastly, ROA shows a coefficient of -1.71E-6. Liquidity indicators show positive coefficients for both Capex T1 and CA/CL at 1% level of significance. Hence, Capex T3 exhibits a negative coefficient at 1 % level of significance.

Table 39.

Dependent Variable:Ln CDS spread			
	[1]	[2]	[3]
ESG	-0.0084103 *** (0.00117)		0.0330427 *** (0.007073)
E		0.0012039 (0.000921)	-0.0089706 *** (0.002290)
S		-0.003458 *** (0.000814)	-0.0169116 *** (0.003026)
G		-0.0050436 *** (0.000672)	-0.0141981 *** (0.002220)
Market T3	-0.4390201 *** (0.035802)	-0.3922662 *** (0.037138)	-0.3858578 *** (0.037095)
Market T1	0.24709 *** (0.041080)	0.2431451 *** (0.041431)	0.1980204 *** (0.043399)
Leverage	0.04860 *** (0.015705)	0.049684 *** (0.015368)	0.0484716 *** (0.015269)
Capex T3	-0.12011 *** (0.030641)	-0.1489839 *** (0.032460)	-0.1270939 *** (0.032607)
Capex T1	0.25866 *** (0.036268)	0.2473527 *** (0.036146)	0.2431511 *** (0.036191)
lnEBITDA	-0.20546 *** (0.033249)	-0.2197233 *** (0.033001)	-0.2370072 *** (0.032952)
Net income	-8.53E-12 *** (2.63E-12)	-7.28E-12 *** (2.64E-12)	-7.91E-12 *** (2.64E-12)
ROA	-1.876.263 *** (0.301609)	-1.745.806 *** (0.287676)	-1.710.956 *** (0.284737)
Debt to EBITDA	0.01516 *** (0.003641)	0.0160196 *** (0.003422)	0.015741 *** (0.003291)
CA/CL	0.10848 *** (0.031812)	0.0986031 *** (0.032589)	0.0980232 *** (0.032561)
Time fixed effect	YES	YES	YES
Country fixed effect	YES	YES	YES
Sector fixed effect	YES	YES	YES
Robust Standard Error	YES	YES	YES
Adjusted R ²	0.6621	0.6657	0.6674

Note that *,** and*** indicate a statistical significance of p-val<0.1, p-val<0.05 and p-val<0.01, respectively.

3.4 Summary of the Results

The three models underline that a relation between ESG and Credit default swap spread does exist. Indeed, the results of the first model, which take as sustainable performance only the ESG

combined score, exhibit a negative coefficient statistically significant at 1% level. The second model, which takes the three single pillars individually, shows as only social and governance pillars return a negative coefficient which is statistically significant at 1 % level. Lastly, in the third model, we opt to include both the ESG combined score and the three-pillar taken individually. The results appear statistically significant at 1 % level. In particular, ESG combined scores tend to have a positive coefficient, on the opposite all the three pillars underline as the factor taken individually have a negative coefficient, influencing in this way negatively CDS spread. Generally, all the three models put in evidence that ESG negatively impacts CDS spread, reducing in this way the risk burden by the companies.

Moreover, we can also affirm that the market value of the company has a significant impact on the CDS spread, confirming what Lee, Naranjo and Sirmans (2016) already said. Therefore, the larger the firm, the higher the ability of that company to repay the debt. It is also possible to see that in all the models, the third tercile of the capital expenditure helps reduce CDS spread. This means that companies, which are used to acquire, upgrade, and maintain physical assets in order to grow, can face lower CDS spread. In this sense, it is important to mention that according to Koller, Nuttall and Henisz (2019), ESG helps optimize capital expenditure. In addition, it is possible to conclude that profitability indicator helps reduce the risk insofar have always a negative impact on CDS spread confirming what Barth, Hübel and Scholz (2018) found: high and more stable cash flows leads to higher asset values and lower profitability of default. We also noticed that leverage level positively impacts the risk of default, perfectly in line with Merton's structural framework developed in 1974 and Magnanelli and Izzo's (2017) view: highly leveraged firms deal with higher default risk.

Generally, the three models seem to confirm our hypothesis. Especially, the third model provides an overview of the negative effect of the pillars. Nonetheless, ESG combined score shows a positive coefficient with CDS spread.

CONCLUSION

The sustainability aspect has increased its relevance over the years, especially in the economic context. ESG metrics properly denotes this tilt, and their consideration is not a new phenomenon, as many investors deal with them in their investment decisions. The former Bank of England Governor, Mark Carney, during a sustainable conference in 2019 said that “in the future, climate and ESG considerations will likely be the heart of mainstream investing”. In his opinion, ESG not only could help to build a more resilient financial system but also improved earnings stability and lower share price volatility. Despite this, several critics were posed around the theme: ESG are generally seen as non-financial factors and their integration into conventional financial risk remains difficult. In fact, ESG are often defined as long-term investments, while many institutional investors seem to be focused on the short-term investment horizon. Furthermore, ESG have different relevance depending on the industry in which we invest too. In this sense, a lack of industry standards to conduct ESG reporting still exists.

Despite these difficulties, ESG benefits outweigh these nowadays problems, and for this reason, their importance, especially in the future, is extremely fundamental.

In the first chapter, we have focused on what ESG means, how investors look at it, and the main distinctions among the different categories of sustainable investments. In fact, ESG factors are often in the habit of being used as a catchall label for all sustainable investments. After that, an analysis on SRI approach and evolution of UN PRI has been carried out. Then, we have focused on the main reasons behind the choice to use ESG in investment decision making. Consequently, we have investigated the greater misconception around ESG theme the work focuses on common myths. Lastly, we have observed credit rating and specifically on the high degree of discordance among rating providers about ESG.

In the second chapter, we have firstly analysed corporate social responsibility. Two aspects have been taken into consideration: its change in paradigm during the years and how it can affect company performance. Then, we have focused on corporate creditworthiness and the factors that influence it, we mainly investigated how ESG aspects can impact corporate creditworthiness factors and consequently affect credit risk indicators. After that, some factors in relation to creditworthiness linked to ESG have been analysed, in specific corporate performance and cost of capital. In the last paragraph, we have put attention to the Merton model approach on corporate bonds.

In the last chapter, we have focused on our empirical research: we have investigated the relation between CDS spread and ESG factors. We have developed three models opting to apply fixed effects: the reason under this choice is justified by the fact that we want to better understand the real differences in the sample. In fact, the model helps to clean the effects related to time-period, geographic area and sector. In this objective, we have developed N-1 series of dummy variables but having N elements for the group we could incur in the “dummy variable trap”. For this reason, we have operated the choice to introduce N-1 dummy variables for avoiding multicollinearity problem. We have developed three models: the first one only includes ESG combined scores, the second one focused on the three pillars taken individually, while the third compromised both ESG combined score and E, S and G taken individually.

We have also included several controls variables aimed to explain the credit risk and the financial structure of a firm. For measuring the size of the companies, we have used the first and third tercile of the market value of companies since larger firms seem to have a better ability to repay their debt compared to smaller ones. We also consider the level of leverage, including also a leverage ratio as Debt to EBITDA. In fact, distance-to-default narrows if leverage increases leading to a higher probability of default and credit spread. We have then taken into account profitability indicators as the logarithm of EBITDA, net income and ROA, given that the more profitable firms are, the greater the capacity to repay debts. Lastly, we have considered liquidity indicators as Capex and current ratio, the first one because the maintenance of existing assets and invest in new technologies for growing is fundamental given that ESG factors help capital expenditure optimization; the second one since the more liquid firms are better able to repay their obligations on time,

The results in the first model show that ESG combined score has a negative coefficient statistically significant at 1% level. The second model, which takes the three single pillars individually, shows only social and governance pillars return a negative coefficient which is statistically significant at 1 % level. Lastly, in the third model, in which both ESG combined score, and three-pillar are taken individually, it appeared to be statistically significant at 1 % level. In particular, ESG combined scores tend to have a positive coefficient, on the opposite all the three pillars underline as the factor taken individually have a negative coefficient, influencing in this way negatively CDS spread. Moreover, we can conclude that the market value of the company has a significant impact on the CDS spread, confirming that the larger the firm, the higher the ability of that company to repay the debt. The profitability indicator helps reduce the

risk, insofar they always have a negative impact on CDS spread, while leverage level positively impacts the risk of default.

Generally, all three models appear robust and put evidence that ESG negatively impacts CDS spread, reducing the risk burden by the companies.

Nevertheless, this work delineates some limits: ESG scores often present a high degree of discordance among rating providers, who also present little knowledge about their application and absence on what good ESG performance constitutes. In addition, a lack of standards in their application and evaluation exists, creating additional discordance among rating providers. Furthermore, although the observations in the sample are enough large, the number of firms for some countries is relatively small compared to others. For future research, it could be interesting to include firms coming from other developed markets, like the USA, widening the sample.

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