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Sustainability in the financial system: ESG and corporate credit risk – An empirical study of the European banking sector

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Abstract

This study investigates a possible relationship between the credit default swap spreads of major European banks and their environmental, social and governance (ESG) performance, and what differences there are between them at supranational, national and corporate levels. The results of our Pearson correlation and scatter plot analyses indicate that at the EU level there is no traceable relationship between CDS spreads and ESG performance. Additionally, our results indicate that there may be a significant positive linear correlation between the Spanish and French banks in our sample, but not in the other countries studied. These findings suggest observations can differ very strongly across regions, which is why the influence of regional factors might play a special role in the relationship between ESG performance and CDS spreads in Europe. Here, higher ESG performance seems to be also associated with higher CDS spreads in Spain and France, which is contrary to the results of most previous studies. Finally, we find strongly firm-dependent correlations between the relationship between ESG performance and CDS spreads, which may indicate that the impact of ESG engagement at the firm level can be very different for corporate financial performance, confirming both the risk mitigation theory and the overinvestment theory.

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1 Introduction

On September 25, 2015, the heads of state and government of the 193 member states of the United Nations (UN) adopted the Sustainable Development Goals (SDGs) in New York as part of the 2030 Agenda, one of the most important current foundations for sustainability policy. The pursuit of these Sustainable Development Goals combats current problems facing the global economy and society in a wide range of dimensions, such as climate change, biodiversity extinction and rising resource consumption, as well as issues of intergenerational and gender and regional equity. (United Nations - Department of Economic and Social Affairs Sustainable Development, 2016).

According to United Nations (2017), in order to realistically achieve these goals, an immense amount of financial investment is required, which is estimated at around 6-7 trillion US dollars annually. This will require government investment programs, e.g., the European Union's Green Deal (European Commission, 2019), which envisions annual investments of €260 billion in EU member states, or many of the recent government incentive programs aimed at mitigating the effects of COVID 19. To a large extent, they too aim to increase sustainability globally.

But in addition to these government-driven investments, the aforementioned sum will also need to be financed to a large extent through the debt capital markets.
Therefore, there is now a growing global demand to link sustainability to credit and default risk, and thus to credit pricing, in order to incentivize sustainable investment and deter unsustainable corporate practices (S&P Global, 2020). This demand is impacting the vast global debt capital markets, which are a very powerful tool to incentivize companies to review and improve their ESG footprint.

As one of the key drivers of this sustainable finance, the United Nations Principles for Responsible Investment (PRI) launched the ESG in Credit Ratings initiative in 2016 to improve our understanding of how ESG factors influence credit risk analysis. (Principles for Responsible Investments, 2016). Here, academic research in particular plays an important role in providing clarity on this complex topic.

The consensus of current literature describes the benefits or costs of ESG footprint as a relatively immediate, direct, and tangible impact on companies and other issuers in the debt capital market, similar to policies implemented by the public sector, such as laws, regulations, tax measures, and subsidies (Bauer & Hann, 2010). Much research has been done on these impacts on various correlations between ESG factors, credit ratings, and default risk, focusing mainly on corporate and sovereign issuers.

To date, however, only limited work has been done on the correlation between ESG factors and credit default swaps. The focus on financial institutions seems particularly interesting here, as they have an important transmission function, matching capital demand and supply for corporates, other financial institutions, sovereigns and other sovereign issuers, and retail investors. Because of this transmission function, financial institutions have a significant accelerator and also multiplier effect for such ESG initiatives (Zimmermann, 2019). A financial institution with a strongly defined ESG footprint should clearly be able to incentivize borrowers, bond issuers, as well as other lenders and bond investors, which is why it is critical for all ESG initiatives that financial institutions themselves are rigorously measured against their own ESG footprint and thus should achieve lower CDS costs due to a better ESG record or higher CDS costs due to a weaker ESG record. To this raising topic I try to make my small academic contribution.

1.1 Objective

The objective of this bachelor thesis is to shed light on the relationship between ESG rating scores and credit default spreads of European banks at the EU, country, and corporate level and with the observations and conclusions gained to provide insights that add new ideas and incentives to the academic consensus around the relationship between ESG performance and corporate financial performance, which can serve as a basis for deeper analysis by future academic research.

1.2 Hypothesis

The hypothesis of our study is that there is a statistically significant observable relationship between ESG performance, attested by a Sustainability Rating Score, and the credit default risk of a company, measured by the credit default swap spread of the financial company under investigation.

1.3　Methodology

In this paper, based on 558 observations of 10 systemically important financial firms over the period 2015 - 2019, I will investigate in an empirical analysis on which dimensions in the single market of the European Union 1) EU-level, 2) country-level 3) firm-level demonstrable relationships between the ESG rating score of banks and their credit default swap spread can be observed. I start our data analysis at the beginning of 2015 because there was no reliable ESG data compiled by Bloomberg before, and conclude it at the end of 2019, due to the previously described distortion of performance caused by the COVID-19 pandemic. Using a correlation analysis as well as a scatter plot analysis, the respective levels are examined for strength, direction and ultimately linear or non-linear patterns. The rest of the paper is organized as follows: The next section again describes in detail our stated research hypothesis. I then delve into an analysis of the relevant literature available to date and highlight the main conjectures, trends and findings of other studies obtained so far. In Section 4, we select a suitable sample for our empirical analysis and describe the market structures and dynamics underlying each level that could have implications for the findings of our analysis. After comparing the previous approaches of other studies, we then indicate the main techniques and observations about the data we collected and the statistical methods we performed, and then conclude the paper with considering the limitations of our study, interpreting the results, and providing an outlook for future studies in this field.

2   Related Literature

Through their role as the financial intermediaries transmitting and allocating financial resources between individual industries, banks have a central role to play in achieving the Sustainable Development Goals (SDGs). Due to their strong impact on society and the environment, banks are forced to increasingly address social and environmental issues and actively integrate sustainable practices into their business models and / or align their corporate strategy with them. The implementation of such sustainable engagements or the offering of sustainable financial products is popularly referred to as "Sustainable banking". Although there is no standardized definition, examples of sustainable banking practices include i.e., offering green credit funds, use energy-efficient systems, encourage employees to use public transportation, provide financial access to people with disabilities, and choose suppliers who abide by environmental and social principles (Zimmermann, 2019).

Apart from political initiatives and public pressure, the topic of sustainable banking is also gaining more and more attention in scientific research, growing exponentially over the past decades. According to Aracil (2021), the average number of documents published on sustainable banking has ten folded between 1999 and 2019. During this time period, various external shocks like the global financial crisis have accelerated research and increased academic attention to sustainability issues in the financial sector (Aracil, 2021). Based on this observation, it is reasonable to assume that the COVID19 pandemic will also further push research and developments in this field to new heights.

In this fast-growing academic environment, there is already an extensive body of research looking at ESG factors and their impact on overall financial performance, with different hypotheses and results (Menz, 2010; Friede, 2015; Verheyden, Eccles and Feiner, 2016; Razak, Ibrahim and Ng, 2019; Barth, Hübel and Scholz, 2019; Tommaso and Thornton, 2020). From a theoretical point of view, most recent literature and investigations distinguish between two opposing theories on the relationship between ESG performance and corporate financial performance: The **risk mitigation view** and the **over-investment view**.

Following Utz (2017), the **risk mitigation view** describes a negative relationship between ESG performance and overall company risk as a risk management argument. Here,

companies with a better ESG performance are presented as having a better risk profile than comparable companies with a lower ESG performance score. It is argued here that higher ESG performance can reduce the likelihood of severe negative events at the firm level and thus better prepare a firm for times of crisis, uncertainty, and economic recessions. Thus, ESG investments provide insurance-like protection against a company's risk exposure by generating moral capital or goodwill among stakeholders. Moral capital is synonymous with internal resources and intangibles such as effective employee engagement, legitimacy with communities and regulators, trust with partners and suppliers, credibility and improved brand with customers, and increased attractiveness to investors (Utz, 2017). It reinforces stakeholder trust toward the company's operations and can lead to competitive advantages for investing in companies with high levels of ESG. This creation of intangible value, internal resources, and moral capital ultimately has a positive impact on a company's overall economic performance; it reduces financial and operational risk, as well as social risk. This ultimately means that companies with less irresponsible business activities are also less exposed to legal, regulatory and reputational risks, which subsequently means in lower volatility of cash flows, which ultimately also decreases a company's credit risk (Utz, 2017; Razak et al., 2020; Barth et al., 2019).

Then there is also the **over-investment view**. In contrast to the risk mitigation view, this explains ESG engagement and investments as a waste of scarce resources and describes a positive correlation between ESG and corporate risk. ESG investments and efforts are seen here as value-destroying, as companies have an obligation to many other stakeholders who are disadvantaged by an excessive preference for ESG investing. Thus, by increasing the complexity and cost of ESG engagement, profitability is negatively impacted, which ultimately increases income volatility, resulting in higher credit risk (Utz, 2017; Tommaso and Thornton, 2020).

According to (Friede et al., 2015), out of a scope of 2200 different empirical studies since the 1970s on the relationship between ESG and corporate financial performance, a percentage of 90% found a non-negative relationship between the two factors. This is a strong counterargument to the overinvestment theory. In addition, a significant positive correlation between the ESG and corporate financial performance could be demonstrated for non-equity assets, which reinforces the literature of the risk mitigation theory. Also, many recent individual studies on ESG in the area of debt financing also found that ESG

performance has a measurable impact on the spreads of corporate bonds (Bauer & Hann, 2010; Oikonomou et al., 2014), interests charged on corporate loans (Goss and Roberts, 2009) and issued corporate credit ratings (Devalle et al., 2017).

But there is also some evidence which supports the overinvestment theory in the academic ranks. Magnanelli and Izzo (2017) in an investigation of the relationship between CSP engagement and a company's cost of debt, were able to determine that, in general, CSP does not play a central role in the cost of debt definition process. Additionally, the study can derive a positive correlation between cost of debt and CSP performance. Thus, the results are considered to be in line with the findings of Goss and Roberts (2009) that so far banks do not perceive CSR engagement as significantly value-enhancing or risk-reducing. Thus, in summary, there is enough academic opinion to support both theories. But just as essential to understanding this topic as the results and how they fit into the consensus of the rest of the academic community, is the methodology used in those papers. When analyzing the two variables of ESG performance and corporate financial performance, there is quite little wiggle room for the ESG performance. Both the summarized products and services offered and the raw data of the ESG market are far from being as versatile and mature as, for example, the financial market. Corporate financial performance can be measured through many different financial products such as: Stocks, Bonds, Loans or Derivatives.

However, the need for an assessment between ESG performance and credit risk is particularly high. In many developed industrialized countries, some modern regulatory frameworks, such as the CERCLA (United States Environmental Protection Agency, 2021) in the U.S., are undergoing significant developments towards stronger punishment of environmentally or socially reprehensible corporate practices due to public pressure from the climate crisis or social inequality (Bauer & Hann, 2010). As these practices of inadequate management are increasingly penalized by the state, and are thus associated with costly liabilities such as fines, there is a growing global demand to connect sustainability with credit and default risk and therefore credit pricing to assess such risks through quick, direct and tangible metrics (S&P Global, 2020).

In previous research papers on the relationship between ESG performance and corporate credit risk, bonds (Bauer & Hahn, 2010; Oikonomou et al., 2014; Manganielli & Izzo,

2016), loans (Goss & Roberts, 2009) and credit ratings (Devalle et al., 2017) have been used as the primary financial instruments of reference for credit risk. But one financial product that has been comparatively little analyzed in the context of ESG performance is the Credit Default Swap (CDS). CDS are particularly interesting for researchers for an empirical analysis, as they represent a very clearly defined reflection of credit risk. They are highly standardized, which makes it easier to compare the CDS Spreads between different companies. In addition, they are traded much more frequently than comparable corporate bonds and are also updated more often than credit ratings (see Barth, 2018; Hermes Asset Management, 2019; Razak, 2020), they thus represent a variable that is easier to capture in time in order to react to ESG-related factors.

However, the few studies already conducted are promising. Already in 2018, Hermes Investment Management (2018) published a paper by creating a pricing model to prove the impact of ESG factors on CDS spreads. A Least Squares regression model was used to analyze how a self-calculated score, formed from internal company information and recognized sustainability rankings Sustainalytics[1] and MSCI ESG Rating[2], relates to the average annual CDS spreads of 365 companies from four different international CDS indices. The results were then processed according to the individual deciles of the ESG score calculated in-house and according to the separate sustainability categories (environmental, social, governance). They showed that a correlation between ESG performance and CDS spreads regardless the ESG category, the decil with the worst sustainability performance also faced the highest CDS spreads. The correlation between the two factors is not perfectly linear, but it can be assumed that higher ESG ratings are related to a lower CDS spread.

The topic has also already received attention from the scientific community. Barth et al. (2019) examined how the credit spreads of European companies relate to their environmental, social and governance performance. The sustainability data points used here are ESG ratings from the Thomas Reuters database, which contains more than 400 different ESG measures at company level. For CDSs, only 5-year CDSs on senior

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[1] Sustainalytics is a company that evaluates the sustainability of companies based on their environmental, social and corporate governance (ESG) performance (Source: Sustainalytics.com)
[2] MSCI ESG is a rating provided by Financial services provider MSCI, designed to measure a company's resilience to long-term, industry material environmental, social and governance (ESG) risks (Source: msci.com)

unsecured debt of non-financial firms from the euro area were taken and evaluated on a daily basis. The data analyzed following a Fama-MacBeth regression indicated that environmental ratings are associated with CDS spreads in the monthly cross section. The difference of the spreads between the best ESG performing companies and the worst performing ones was 25 basis points. Thus, it can be concluded that better environmental performance is associated with lower CDS spreads, i.e. lower credit risk. A correlation with the social and governance factors could not be clearly verified.

Another, even more recent study on the relationship between corporate CDS spreads and ESG performance was conducted by Razak et al. (2020). By analyzing 2094 global non-financial companies during 2013-2016, they found that certain ESG dimensions had a significant impact on corporate risk: climate change factors, natural resource use, human capital and corporate governance factors. More significant, however, is the finding that, together with the literature, corporations benefit particularly financially from a higher ESG performance when the company operates in a less sustainable country. This goes hand in hand with the assumption that the more environmental and social demands on a company in the country increase, the less financially lucrative the commitment is. Nevertheless, companies with ESG engagement are better off in more sustainable countries as well, since failure to meet social expectations and environmental standards entails increased costs in the form of legal, regulatory or reputational risks.

The influence of country-level ESG factors on the relationship between credit risk and corporate ESG performance is a possible factor that cannot be ignored. According to the Principles for Responsible Investment (2017), sensitivity of overall ESG performance, but also of individual ESG factors to credit risk strongly depends on region / geographical location. For example, environmental factors have a significantly stronger impact on credit risk in developing countries than in industrialized nations (USA and EU), but with a future tendency to also higher sensitivity in the industrialized nations. This hypothesis was also backed by Friede et al. (2015), who's research also confirmed that ESG outperformance opportunities exist in many regions of the market. In particular, they find that this holds true for North America and Emerging Markets.

To similar results comes Utz (2017), where high levels of CSR performance can be indicated to have a mitigating effect on stock return crash risk in Europe and the United

States, whereas in the Asia-Pacific region, the CSR over-investment view prevails which is accompanied by a higher crash risk.

For the geographical nature of the distribution of corporate credit risk together with ESG performance there is to my knowledge no further available research, especially not within the European union and on an individual country level.

In summary, the relationship between ESG performance and corporate financial performance is not an academic novelty. Many attempts have already been made with different approaches, theories and variables to establish an interdependent relationship between the topics of ESG performance and Credit Risk. However, in this rapidly growing academic environment, there are still many niche opportunities to make a scientific contribution to better understand the relationship and ultimately use it more effectively in the future to achieve the high-level goals of, for example, the Paris Climate Agreement. What particularly stands out from our literature review is the fact that too few studies have been conducted both at the company level and at the country level, that shed light on the relationship between ESG performance and credit risk. Although it has been suggested by some academics (Principles for Responsible Investments, 2017; Friede et al., 2015) that regional differences and have a strong impact on the ESG - credit risk relationship, to our knowledge, no individual studies have been conducted at the EU level that have analyzed these differences. In addition, financial companies have generally been regarded as a special market in previous studies (Razak et al., 2020), which is why we want to start here as well. This is what we want to tackle with our study, and try to shed some more light on this still rather untouched academic field.

3 Sample

3.1 Approach

In order to create an appropriate research sample for the empirical study that takes into account both the significance of our analysis for testing our hypotheses, but also the given limitations of the data available to us and the scope of a bachelor thesis, we have chosen to examine the two largest banks from each of the 4 largest EU economies plus the United Kingdom for their relationship between market-assessed default risk and their ESG performance. We have decided to include the UK in our analysis, as the country was still

part of the European Union during the period of our analysis and therefore also part of the European Single Market.

With this small but international scope we aim to offer additional findings on the relationship between corporate financial performance and ESG performance at a supranational EU-level (as of 2019) as well as at a national level.

The choice of the 5 elected countries was based on the criterion of annual gross domestic product, which is by far the most frequently used metric for the performance of an economy and considered to be an accurate predictor of economic activity of a region (Dynan & Sheiner, 2018; Liu et al., 2018) ,even though it has been repeatedly criticized in the past decades for its limitations especially in terms of social welfare and unobserved economic activities (Feige & Urban, 2008).

Based on this metric we end up with the countries of Germany, United Kingdom, France, Italy and Spain.

Nation	GDP (2020)
Germany	3.336.180
United Kingdom	2.283.737
France	2.278.947
Italy	1.651.595
Spain	1.121.698
Netherlands	798.674
Switzerland	655.977

Table 1: Gross Domestic Product (2020) of European Countries at current market prices (in million euros) – Source: Eurostat (2021)

In order to provide a holistic overview of our sample markets, in this chapter we summarize the most important characteristics of the banking sectors in the respective countries and additionally refer to the major developments of the past decades as well as upcoming potential challenges of the future of the banking industry in Europe.

3.2   Banking in Europe

Over the past decade, the banking sector in Europe has undergone major structural changes (Goddard et al., 2007). Changing conditions in the political, economic and technical environment are exacerbating the increasing pressure on margins and performance of banks and fueling restructuring dynamics in many countries, which in turn is reflected as rising market concentration in almost all EU member states (EBF). Through many

restructuring initiatives, like the recently published Guide on the supervisory approach to consolidation in the banking sector (2021), the EU institutions and their member states hope to reduce overcapacity, increase profitability through mergers and acquisitions and add size. The process of consolidation in the European banking landscape has gained tremendous momentum, especially after 1998 (Goddard et al., 2007), and this trend can still be observed in today's times (European Banking Federation, 2020). The most significant indicators of further increasing market consolidation in the banking sector most obviously include a strong downward trend in number of credit institutions, accompanied by shrinking number of bank branches and employees.

Between 2009 and 2019, one in four credit institutions has disappeared from the European Banking sector, an average annual decline of 2.6% (European Banking Federation, 2020), accompanied by a significant reduction in the number of bank branches and bank staff. Of the traditional bank branches, almost 30% have also disappeared since the financial crisis, and this trend only seems to have accelerated in recent years, driven in part by strong growth in the digital banking sector (European Banking Federation, 2020). Together with the branches, many employees were cut. In 2018, European banks still employ around 2.7 million people in the EU, but which marks a reduction of around 600,000 jobs since 2008. And the remaining workforce is strongly concentrated, as around 67% is employed in the major financial centers of the EU (Germany, France, the UK, followed by Italy and Spain). The previously described developments in the EU banking sector have affected the individual countries in our sample to varying degrees. In France and the UK, the 2 countries in our sample with the largest banking industry in terms of total assets (Eurostat, 2021),the banking sector is a key industry for the national economy. Here, we find a particularly strong consolidation of the banking sector. Despite the financial crisis in 2007, the total assets of the 5 largest banks in these countries still increased significantly compared to Germany, while the number in Germany decreased (Goldstein & Véron, 2011). In the UK, for example, around 80% of total customer lending and deposits went through the country's 6 largest banks ((Bank of England, 2010). The major banks in these countries are the hubs for financial transactions of both private individuals, companies, but also institutional investors and therefore largely control the market activity.

While these consolidation developments are also clearly observable in Spain and Italy (European Banking Federation, 2020), a different picture emerges in Germany. In contrast

to neighboring countries in the EU, the classic three pillar system is still largely intact in Germany, with the savings banks and public banks (also known as "Landesbanken") still holding a strong dominance, especially in more rural regions and among SMEs. This three pillar system has coexisted for more than 150 years with little structural change over time and is expected to do so in the short- and medium-turn future (Behr & Schmidt, 2015). From this brief analysis of the respective market structure of the banking industries in our sample countries, we can make a bold assumption that the significance of our empirical results on a country-by-country basis for the UK and France may be more applicable to a general trend of the respective banking sector, since we already cover a larger part of the individual banking sector with our analysis here than in Germany. This may give us additional leeway in the conclusion of our paper.

3.3 Challenges and Outlooks for the European banking industry

The general uncertainty caused by the COVID-19 crisis and the climate crisis, together with previous industry issues such as long-term low interest rates, regulatory changes, and the advancing digitalization and the emergence of new market players, pose major challenges for traditional banks in the years to come (Diener & Špacˇek, 2021).

Digital transformation in particular is a challenge for banks. New key technologies such as artificial intelligence or blockchain encryption are omnipresent, affect all areas of a corporate processes of a bank, from sales and marketing to IT security and investment strategies, and are strongly pushed by online-based digital banks in competition with the big banks. The study by Diener & Špaček (2021) describes the dominance of the topic of digital transformation at the management levels of German banks. In particular, the topics of corporate strategy and (digital) customer experience were identified by executives as hot topics on which the banking sector is currently putting most of its focus.

These challenges lead to unavoidable adaptations, which require large investments, accompanied by significant structural costs. Thus, the weight of depreciation and overheads represents a heavy burden on efficiency, unless compensatory adjustments are made to other expense items and/or recurring margins are widened. This particularly affects the current major banks, as transforming the business model and implementing these rapidly growing trends is a particular challenge here due to the sheer size.

These large banks, as previously defined, will make up our sample set. However, we need a more precise definition of "large banks", because when measuring the size of a bank, there is no standard variable like GDP for a country.

We are basing our analysis here on a paper published by Deutsche Bank Research (2017). According to the researchers at Deutsche Bank, individual financial factors are not sufficient to assess the "size" of a bank; several indicators are needed to reliably determine size. The result of the paper is a framework that divides the determinators for the size of a bank into Tier 1 to 3 categories:

- Tier 1: Revenue (gross revenues minus interest expenses)
- Tier 2: Equity capital (Book value of equity)
- Tier 3: Market Capitalization and Total Assets

Deutsche Bank argues that revenue is the more reliable and overall, the single best measure of bank size, being cash-flow based and independent of the business model of the bank or the financial structure. Equity Capital is reasoned to be a stable indicator, mostly immune to measurement problems or differences in business models but suffers from valuation problems and is usually not up-to-date. Deutsche Bank also considers Total assets as a decent measure of gross nominal volume, but usually struggles with valuation methods and can't account for differences in individual business models. And Market Capitalization is a very timely accurate value, but primarily quantifies success and not size.

We use all the metrics of Revenue, Total Assets and Market Capitalization as qualifiers for our bank selection since we only found consistently reliable and publicly available data on these 3 variables. The data was drawn from Bloomberg Terminal.
So when measured and categorized by the amount of Revenue, Total Assets, and Market Capitalization, the following banks are the largest and most influential in each of the states are the following:

Company	Country	Revenue	Total Assets	Market Capitalization
Deutsche Bank	Germany	39.579	1.348.137	14.399

Commerzbank	Germany	13.108	462.386	7.242
Santander	Spain	72.849	1.459.271	64.508
BBVA	Spain	38.248	676.689	30.909
HSBC	UK	76.324	2.558.124	129.610
Barclays	UK	24.654	1.321.948	36.898
Unicredit	Italy	24.971	832.172	22.065
Intensa Sanpaolo	Italy	23.455	787.790	33.965
BNP Paribas	France	60.895	2.040.836	49.336
Credite Agricole	France	39.424	1.624.394	27.031

Table 2: Financial Data on the biggest banks in the EU – Data Source: Bloomberg Terminal (2021)

As a result, in this part of our study we have shed some more light on our sample of companies and the respective countries, selected them on the basis of well-founded assumptions and estimates, and shed additional light on certain underlying dynamics or characteristics that will help us in particular in our analysis of the results of our quantitative study as well as in anticipating future developments.

4   Empirical Study

In our empirical study, we perform two statistical analysis procedures. The first part of our analysis consists in performing a Pearson correlation analysis between the two variables. This correlation method (usually denoted by r), is a common technique for measuring how strongly and in which direction two variables are related to each other.

The Pearson correlation coefficient is the most widely used correlation coefficient and is suitable for our two ratio-scaled variables, which is why represents in this case the simplest method to analyze the initial relationship between our variables (Statistic book).

The mathematical formula of the Pearson correlation is:

$$r = \frac{Cov(x_i, y_i)}{s_x \cdot s_y} = \frac{\sum_{i=1}^{n} (x_i - \bar{x}) \cdot (y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n} (x_i - \bar{x})^2} \cdot \sqrt{\sum_{i=1}^{n} (y_i - \bar{y})^2}}$$

Figure 1: Calculation Method for Pearson Correlation – Source: Mooi et al., 2018

For the assessment of the calculated values, we follow the Rule of Thumb established by Cohen (1988), which describes an absolute correlation (Mooi et al., 2018):

- of less than 0.3 indicates a weak relationship
- between 0.3 and 0.49 indicates a moderate relationship
- and above 0.49 indicates a strong relationship

And in addition to this correlation analysis, we also analyze the correlation for linear or non-linear patterns with a scatter plot analysis. Here we plot all of our observations in a graph where the x-axis represents the Monthly Sustainalytics ESG Score for an observation, and the y-axis represents the associated monthly mid CDS spread, which offers a graphical illustration of the distribution of a correlation around a linear trend line.

Our statistics analyses are carried out and evaluated via the statistical software SPSS from the company IBM.

Additionaly, we examined the literature that preceded us for their research methodology. The summarized results can be seen in Table 3.

The overwhelming majority of the studies we analyzed followed a regression analysis in its methodology. Regression analysis is a market research analysis technique that attempts to express a cause-and-effect relationship of one characteristic (Y) from another characteristic (X) as a linear relationship through an equation (Mooi et al., 2018).

Thus, regression analyses are able to show in what way one variable affects another variable, or how changes in one variable affect another variable. These predictions that a regression analysis brings can be of great benefit, for example because, as in the case of Barth et al. (2019), it can provide quantitative insights into how many basis points higher credit spreads are recorded by companies that can demonstrate the worst ESG performance in an industry. These quantitative predictions are very useful in a practical sense, as they provide, in this example, a direct implication for both investors and standardized financial investment models.

However, other statistical models are similarly powerful in their explanatory power, and do not require so much lengthy and complicated procedure of calculations and analysis. The basic hypothesis of our work was to find a relationship between ESG rating scores and CDS spreads in our sample at both supranational and national levels. Thus, for confirming or refuting a relationship between our two variables, a correlation analysis is quite sufficient. It allows us to quantify both the direction of a relationship between two variables and its strength.

Study	Methodology	Risk Instrument	Data Collection	Sample	Time Period
Bart, Hübel and Scholz (2019)	Quantitative (Farma-MacBeth Regression)	Credit Default Swaps	Thomas Reuters Database	108 European companies	July 31, 2009 – December 31, 2016
Razak, Ibrahim and Ng (2020)	Quantitative (Generalized method of moments)	Credit Default Swaps	Thomas Reuters Data Base	592 global non-financial corporates	2013 - 2016
Bauer and Hann (2010)	Quantitative (OLS regression)	Cost of debt financing, bond ratings, long-term issuer ratings	KLD STATS database	582 U.S. public companies	1995 - 2005
Goss and Roberts (2009)	Quantitative (Single Equation Regression, Simultaneous equations model)	Corporate Loans	KLD STATS database	1,534 companies	1991-2006
Devalle, Fiandrino and Calentino (2017)	Quantitative (Ordered logistic regression)	Credit Ratings	Thomas Reuters / Moody's	56 public companies from Spain and Italy	2015
Pavelin & Oikonomou (2017)	Quantitative (OLS Regression)	Corporate Bond spreads, corporate bond ratings	KLD STATS and Thomas Reuters	742 companies	1993 - 2008

Cooper & Utz (2015)	Quantitative (Multi-regression model)	Stock Returns	KLD and Bloomberg	229 firms from Asia-Pacific region, 836 firms in Europe, 397 from Japan, 1117 firms from the U.S.	2003-2015
Li, Zhou and Xiong (2020)	Quantitative (Logistic Regression analysis)	Bond Default Rate	China Stock Market & Accounting Research Database	1200 non-default industrial bonds	2014-2019
Menz (2010)	Quantitative (OLS regression, fixed and random effect model)	Corporate Bond Spreads	MSCI, KLD Stats	498 euro bonds	2005-2012

Table 3: Research Methodologies of similar studies – Sources: Refer to bibliography

5 Explanatory Variables

5.1 Credit Default Swaps

In this study, we use credit default swap spreads as a market-based measure of credit risk. The credit default swap is a bilateral contract in which a periodic fixed fee or a one-time premium is paid to a protection seller in return for which the seller makes a payment upon the occurrence of a specified credit event. (Fabozzi et al., 2003). The swap may relate to a single asset, referred to as a reference asset, reference entity or underlying, or to a basket of assets. Overall, therefore, the credit default swap allows one party to transfer its credit risk exposure to another party.

In its basic form, the spread of a credit default swap reflects the price that has to be payed in order to insure against the risk of default of a reference entity. Recent literature suggests that the CDS market runs ahead of the bond market or credit ratings (Longstaff et al., 2005).

The CDS financial instrument represents what is considered to be the most accurate and appropriate proxy for market-based credit risk, as this derivative essentially reflects the true probability of an issuer's default risk, rather than the trading level of secondary spreads of existing debt capital market instruments as other financial products do (Longstaff et al., 2005). They are traded more frequently than corporate bonds and are much more standardized in terms of maturity, debt seniority levels, and restructuring events (Barth et al., 2019), making CDS a temporally accurate and consistent measure of a company's default risk across firms. Against this background, CDS are also often used as a reference

point when pricing the credit spread of new debt capital market instruments, which indicates the relevance and the expressiveness of this derivate.

For our study, hand in hand with the literature preceding us (Razak et al., 2020; Barth et al., 2019), we analyze the 5-year annual CDS spreads of, as this is the contract with the highest liquidity, and thus it is most accurately priced.

We obtain our daily CDS data from the Bloomberg terminal for the time period between January 01, 2015 and December 31, 2019. The period is limited until the end of 2019, as we try to measure our results in regular market conditions and thus, they should not be affected by the economic consequences of the COVID-19 pandemic (Barth et al., 2019).

Again, following the previous research by Razak et al., 2020 and Barth et al., 2019, we analyze only single-name CDS with a maturity of 5 years and referring to senior-unsecured debt.

As a proxy score for credit risk in our empirical study, we take the month-end mid spreads of the CDS contracts. These are calculated as a geometric monthly mean from the daily bid–ask spreads which we obtain with Bloomberg "generic" prices, signifying a consensus among market participants regarding the price premium paid to insure against the default of a company (Longstaff et al., 2005).

The CDS sample of our analysis consists of 10 different standard CDS contracts, every one of each belonging to a single company European bank.

5.2   ESG Rating Scores

Banks have a central role to play in the development of an ecological and sustainable financial sector. Increased public attention and government interest in the sustainable performance of banks calls for objective, external intermediaries that can provide the necessary information services on ESG performance, so-called sustainability ratings, or ESG ratings. They are an essential prerequisite and foundation especially for offering sustainable financial services and realizing sustainability-oriented investor behavior (Olmedo et al., 2019)

The ESG rating industry has matured much during the last decade and underwent a major transformation through many merger and acquisition processes (Berg et al., 2021). As a

result, the industry is now significantly larger and more professionally positioned, with a strong connection to finance-service companies. This consolidation was particularly facilitated by the 2008 financial crisis, which was triggered by primarily unethical and unsustainable human behavior, and which brought corporate sustainability factors to greater prominence (Olmedo et al., 2019)

This professionalization was also accompanied by an expansion of the criteria to be analyzed and a more robust scientific foundation of the assessment models. However, some researchers continue to criticize the transparency of the criteria used and the assessment process (Olmedo et al., 2019; Berg et al., 2021).

Well-known names in this industry include MSCI ESG Research, Sustainalytics, FTSE Russel ESG Ratings, RobecoSAM, and Bloomberg.

Due to limited availability of individual ratings, this study will use the data available from the Bloomberg terminal platform, which ICADE students have access to. Bloomberg as a financial data provider offers various ESG-related info. As part of our holistic approach to ESG performance, we only consider whole ESG rating and not individual ESG factors or ratios. In addition, for the empirical study we can only factor in on quantitative rating scores. Thus, our selection will be based on the rating scores of the Sustainalytics ESG Ranking. S&P RobecoSAM Global ESG Ranking was also considered by us. It has a robust data set with a scope of over 9000 companies in the world, which according to the website cover about 95% of the global market capitalization. In addition, it is also rated on a 0-100 rating scale, the value of which is calculated depending on the company's industry. Unfortunately, however, the frequency of updates of the ranking scores is too low for our small sample with only once a year, as we would have too few observations to analyze statistically significant relationships. We have therefore decided not to include it in our study, and are therefore only guided by the ESG scores of the company Sustainalytics. Bloomberg's in-house ESG Disclosure Score is unfortunately also not suitable for our comparisons, as it only takes into account the reporting qualities of a company with regard to ESG factors and does not evaluate its actual ESG performance.

According to the Sustainalytics.com (2021)**,** Sustainalytics is an independent ESG and corporate governance research, ratings and analysis firm. It covers over 4000 companies across 42 sectors. Following the limited information that sustainalytics published about

their internal processes, the rating is usually updated only once a year, but in a preliminary analysis on Bloomberg, we found that for the banks in our sample, the rating was changed on average almost every month. According to Sustainalytics, this is only done as soon as there is a significant reason to adjust the rating immediately. Thus, it can be assumed that banks, as highly publicized stakeholders from all sides of the population and the public, are often in situations that attract attention and therefore need a more frequent adjustment in their ranking.

Similar to other well-known sustainability rankings, Sustainalytics evaluates and publishes its assessments of ESG risk on a rating scale of 0 - 100, with 0 representing the worst possible rank and 100 the best possible rank. The calculated scores are compared and adjusted on a sector basis (Sustainalytics.com, 2021)

Sustainalytics ESG data is divided into the three ESG categories. Depending on the industry / sector of the company to be analyzed, both the selection of ESG factors and the respective weighting differ. At least 70 factors per industry are always considered. The evaluation of every single ESG factor depends on 3 dimensions:

1. Preparedness: Assessment of existing monitoring and management systems and internal company policies (for example a Code of Conduct) that contribute to the management of ESG risks.
2. Disclosure: Evaluation of the company's ESG reporting and its transparency regarding it.
3. Performance: ESG performance based on quantitative / scientific metrics and qualitative assessment of the company regarding controversial incidents and events in which the company may have been involved.

Thus, Sustainalytics provides a versatile and reliable way to measure and compare ESG performance across different companies over time. Of course, there are also many criticisms of these standardized rankings, for example that in some cases they rewrite their historical data over longer periods of time, which could torpedo a time-based comparison with other variables (Berg et al., 2021).
Nevertheless, we accept this risk, since it is still appropriate for the scope of a bachelor thesis.

We also obtain the data for our ESG performance scores from Bloomberg. We chose 01.01.2015 as the start date of our analysis, as there was no reliable ESG data available for the companies we selected on Bloomberg, neither from Sustainalytics nor from S&P and RobecoSam.

Our final company variables to be analyzed by the empirical study can be observed in Table 4.

Name of the company	Variable for Credit Risk	Variable for ESG Performance
Banco Santander, S.A	SANTA CDS EUR SR 5Y D14 Corp	Sustainalytics ESG Score
Banco Bilbao Vizcaya Argentaria, S.A.	BBVA CDS EUR SR 5Y D14 Corp	Sustainalytics ESG Score
Deutsche Bank AG	DB CDS EUR SR 5Y D14 Corp	Sustainalytics ESG Score
Commerzbank AG	CMZB CDS EUR SR 5Y D14 Corp	Sustainalytics ESG Score
UniCredit S.p.A.	ISPIM SPA CDS EUR SR 5Y D14 Corp	Sustainalytics ESG Score
Intesa Sanpaolo S.p.A.	UCGIM CDS EUR SR 5Y D14 Corp	Sustainalytics ESG Score
BNP Paribas S.A.	BNP CDS EUR SR 5Y D14 Corp	Sustainalytics ESG Score
Crédit Agricole S.A.	LCL SA CDS EUR SR 5Y D14 Corp	Sustainalytics ESG Score
HSBC Holdings plc	HSBC BK CDS EUR SR 5Y D14 Corp	Sustainalytics ESG Score
Barclays plc	HSBC BK CDS EUR SR 5Y D14 Corp	Sustainalytics ESG Score

Table 4: Reference table of the Variables of Interest – Source: Bloomberg Terminal

6 Results

6.1 Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Monthly Mean Sustainalytics ESG Risk Score	558	43	98	79	13
CDS 5Y SR Monthly Mean Mid-Spread	558	19	224	89	43
Valid N (listwise)	558				

Table 5: Descriptive Statistics of the sample – Source: Own Analysis

With a total of N=558 observations, we have a comprehensive data set, and the minimum and maximum values indicate that our variables do not seem to contain erroneous data entries that could in the end wrongfully distort our empirical results.

Figure 1 describes the development of the spread of the respective CDS contracts for the individual banks in our sample group between the years 2015 and 2019. As is always the case with credit default swaps, the higher the spread, the higher the risk of default of the reference entity as assessed by the market.

6.2   Graphical analysis
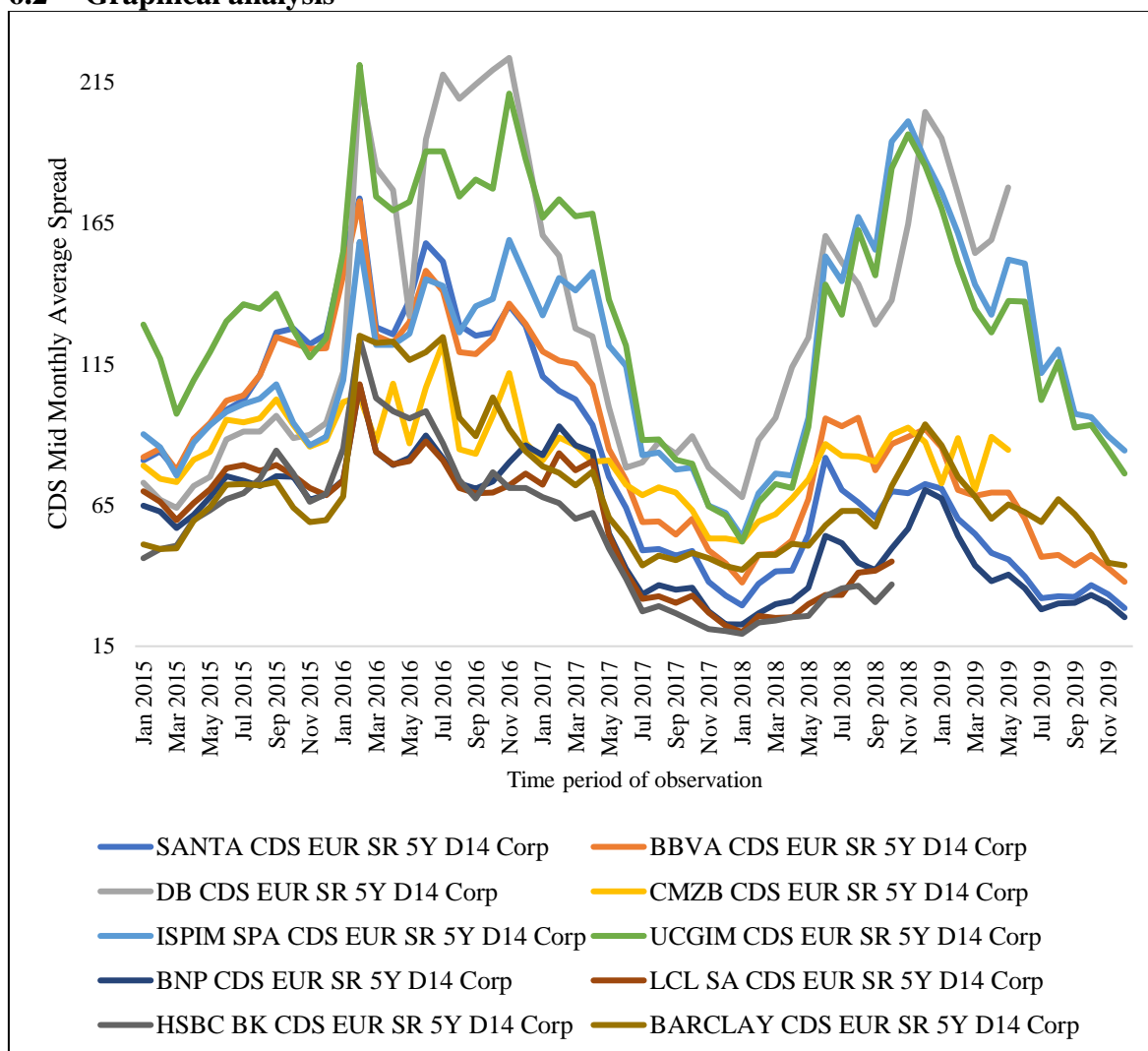
Figure 2: Historical Development of CDS Spreads of the Sample Banks – Source: Bloomberg Terminal

On the one hand, we can see the strong fluctuation of the market. Such parallel movements can be explained by regular market-based determinants of CDS spreads, which are e.g. general market volatility, average market return (indices) or also determined by the risk-free rate. (Barth et al., 2019). They affect almost all CDS spreads across countries and at the same time, but to different degrees. Table 5 shows us in more detail the average CDS spreads of our sample companies on an annual and 5-year basis, as well as their average volatility.

	2015	2016	2017	2018	2019	2015 - 2019	Volatility
SANTA CDS EUR SR 5Y D14 Corp	103,1	139,3	68,0	57,9	42,9	**82,2**	3,7%
BBVA CDS EUR SR 5Y D14 Corp	102,7	134,4	78,6	73,5	57,4	**89,3**	3,6%

DB CDS EUR SR 5Y D14 Corp	130,6	189,8	103,0	130,7	172,3	**145,3**	3,1%
CMZB CDS EUR SR 5Y D14 Corp	85,1	98,3	72,3	76,4	81,2	**82,7**	2,6%
ISPIM SPA CDS EUR SR 5Y D14 Corp	92,6	135,8	104,3	131,1	126,2	**118,0**	3,6%
UCGIM CDS EUR SR 5Y D14 Corp	123,5	183,6	116,6	125,4	118,4	**133,5**	3,6%
BNP CDS EUR SR 5Y D14 Corp	68,4	81,8	52,9	42,9	38,0	**56,8**	3,6%
LCL SA CDS EUR SR 5Y D14 Corp	71,7	79,3	48,8	32,1	X	**58,0**	3,1%
HSBC BK CDS EUR SR 5Y D14 Corp	64,6	87,6	41,1	29,0	X	**55,6**	2,6%
BARCLAY CDS EUR SR 5Y D14 Corp	62,2	105,3	57,7	60,6	62,4	**69,6**	3,6%

Table 6: Historical Annual Development and Volatility of CDS Spreads of the Sample Banks - Source: Bloomberg Terminal

Here, the average CDS spreads of the individual companies can be compared a lot easier. Deutsche Bank has the highest CDS spread and is therefore theoretically at the highest risk of default, followed by the major Italian banks ISPIM and Unicredit. The French and British banks have the most solid credit quality. Possible indicators for the high pricing of Deutsche Bank are most likely recent internal corporate scandals, which may have severely damaged the bank's reputation and also its creditworthiness (DW.com, 2020). Apart from this exceptional case, a certain similarity can be observed in the average spreads of the individual countries. Thus, the differences between the spreads of banks within a country are "only" 7, 15, 1 and 14 basis points for Spain, Italy, France and the UK, respectively.

In addition to our previously analyzed CDS data, we can now also take a closer look at the course, structure and results of the ESG Ranking Scoring by Sustainalytics on a monthly basis. In the chart Figure 2 we can see the quite frequent fluctuations of the ESG scores for our bank sample. Particularly noticeable is an increased volatility for the banks BBVA, Unicredit and Barclays. However, it is difficult to conjecture about the origins of this

observation.
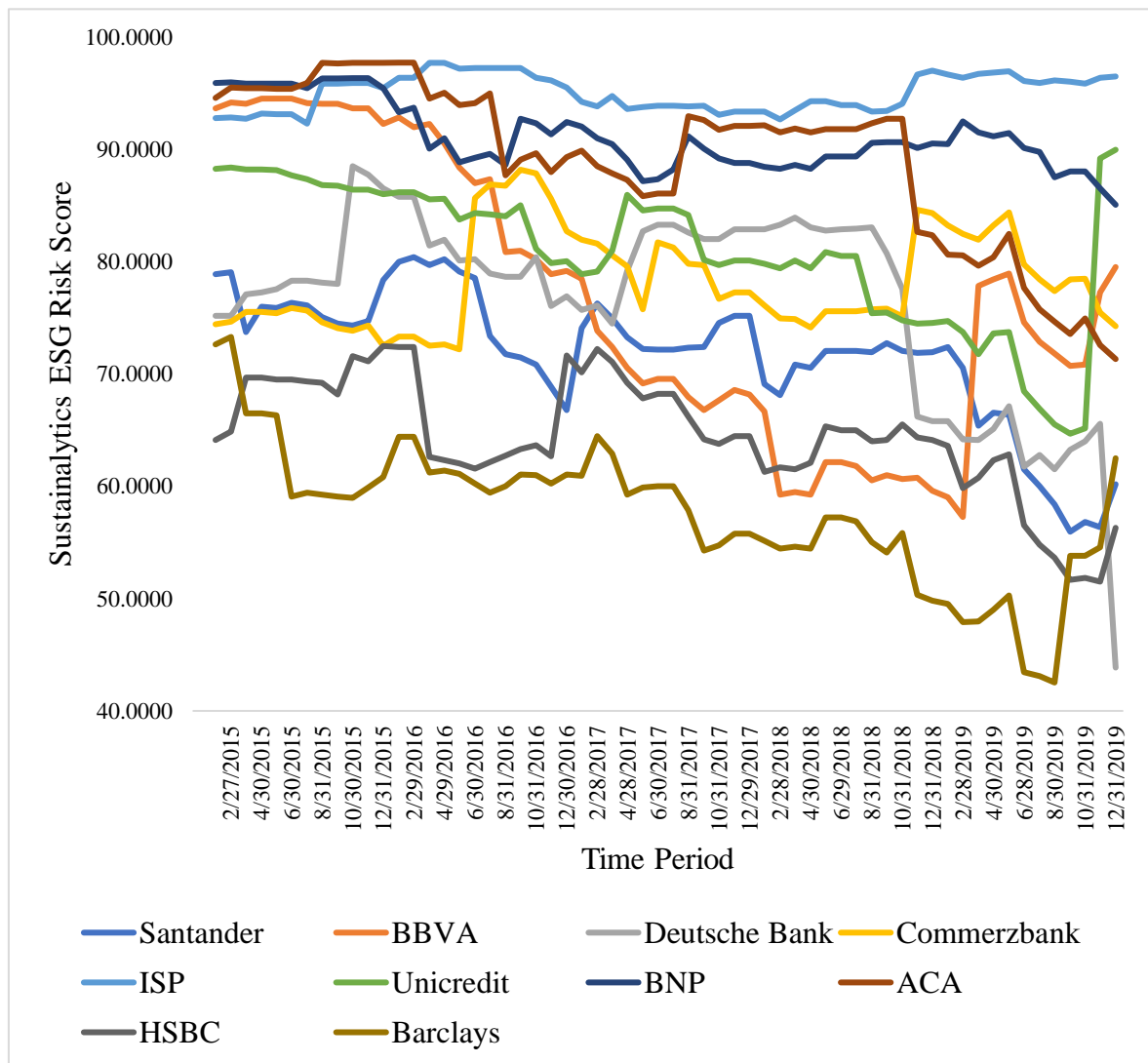
Figure 3: Historical Monthly Development of the ESG Rating Score of the Sample Banks Source: Bloomberg Terminal

However, it is easier to identify and assess the average annual ESG rating scores of our sample banks and the average development of these scores over our five-year period on an individual basis.

The development of the ESG score of the banks ISP and Commerzbank stands out in particular, as they are the only banks from our sample that did not significantly deteriorate during the monitoring period. The general prevailing negative trend of the ESG rating scores of major banks can only be interpreted in the light of the calculation of the Sustainalytics Score in such a way that other players in the banking / financial market have caught up disproportionately in this period in terms of sustainability metrics and thus led to the slight decline of the banks listed here.

By far the best ESG level was maintained by Bank ISP from Italy, which was the only bank to consistently remain above 90. This generally observable low fluctuation in contrast to the CDS spreads could lead to complications in the empirical analysis, as a correlation only measures the extent to which two variables measured at the same time relate to each other.

	2015	2016	2017	2018	2019	Change over Time Period
Santander	76,09	74,97	73,75	71,29	62,34	-6%
BBVA	93,98	85,75	70,18	61,10	72,08	-18%
Deutsche Bank	79,72	80,40	80,56	79,36	62,11	-4%
Commerzbank	74,72	80,38	79,43	76,84	79,76	5%
ISP	94,12	96,91	93,84	94,26	96,42	1%
Unicredit	87,43	83,84	81,94	77,94	72,73	-8%
BNP	96,01	91,12	89,48	89,56	89,37	-5%
ACA	96,38	92,63	89,43	90,41	76,97	-7%
HSBC	69,09	64,85	67,47	63,67	56,98	-7%
Barclays	63,30	61,30	58,76	54,55	49,58	-9%

Table 7: Historical Annual Development of the ESG Rating Score and Change over Time Period of the Sample Banks - Source: Bloomberg Terminal

Our statistical analysis for significant relationships between CDS spreads and ESG rating scores is conducted at 3 different sample levels, each pursuing 2 different statistical analyses.

Our sample levels are 1) the whole sample with N=558 to investigate a cross-country relationship between CDS and ESG, 2) at country level with N = 106 to 120, and third at company level with N between 46 and 60.

6.3 EU-Level

In our analysis of the whole sample data of 10 different banks from 5 countries, we can observe a first tendency.

6.3.1 Pearson Correlation

		Monthly Sustainalytics ESG Risk Score	CDS 5Y SR Monthly Mid-Spread
Monthly Sustainalytics ESG Risk Score	Pearson Correlation Coefficient	1	**.199****
	p - value		.000
	N	558	558
CDS 5Y SR Monthly Mid-Spread	Pearson Correlation Coefficient	**.199****	1
	p - value	.000	
	N	558	558

** Correlation is significant at the 0.01 level (2-tailed).

Table 8: Pearson Correlation Analysis – EU-level – Source: Own analysis

Across our sample, we can observe a very slight positive correlation between the end month mid CDS spread and the Sustainalytics rating score, with a Pearson correlation coefficient of 0.199. However, the significance of this value is limited.

6.3.2 Scatter Plot Analysis

To get a better overview of the mutual behavior of the two variables, we additionally apply a scatter plot analysis. This allows us to better illustrate the nature of the detected low correlation and whether it follows a linear pattern, a non-linear pattern or no pattern at all.
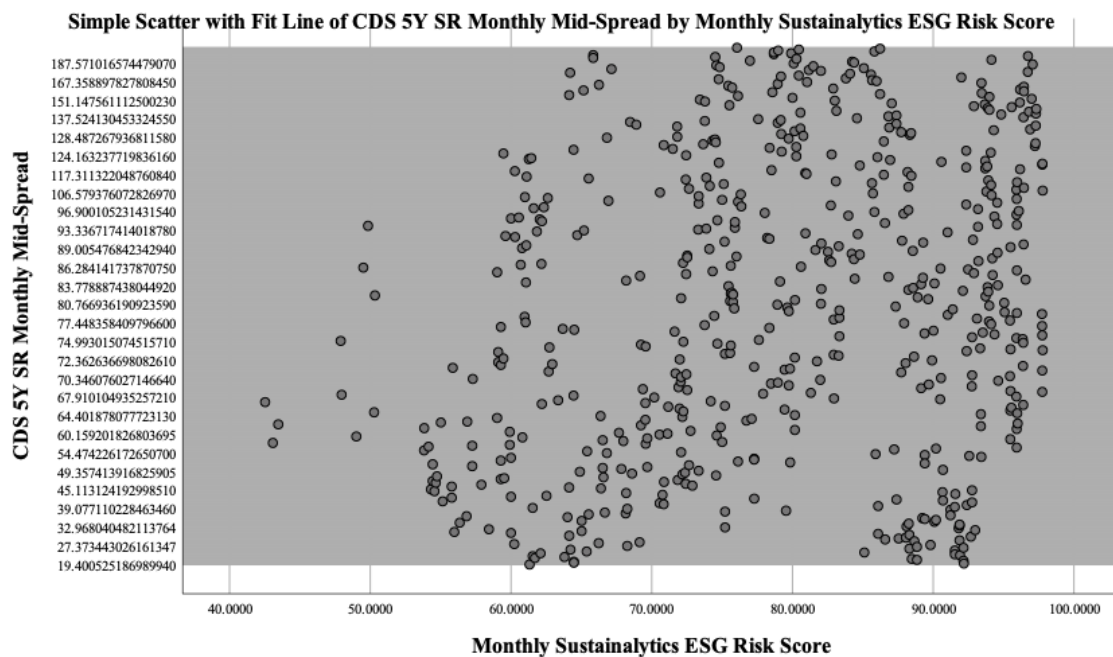
Figure 4: Scatter Plot Analysis – All Sample – Source: Own Analysis

Our observations from the scatter plot analysis did not suggest a linear or nonlinear association pattern between the two variables.

This first conducted analysis of our EU-level dataset suggests that a European bank's default risk, as measured by the spread of a CDS contract on unsecured debt, is in our sample unrelated to its ESG ranking from Sustainalytics.

6.4 Country Level

As a second analysis, we examine each of the 5 countries for their relationship between ESG rating and CDS spreads.

6.4.1 Pearson Correlation

The correlation analysis of our variables at the country level provides us with very interesting insights. In Spain and France, we find a significant positive relationship between ESG scoring and CDS spread (Figure 5 and 6). In UK and also Italy we cannot observe any correlation of the variables. Germany is particularly noteworthy in this case. Based on the N = 106 data points, we can observe a slightly negative correlation of our factors, which leaves Germany alone in our sample.
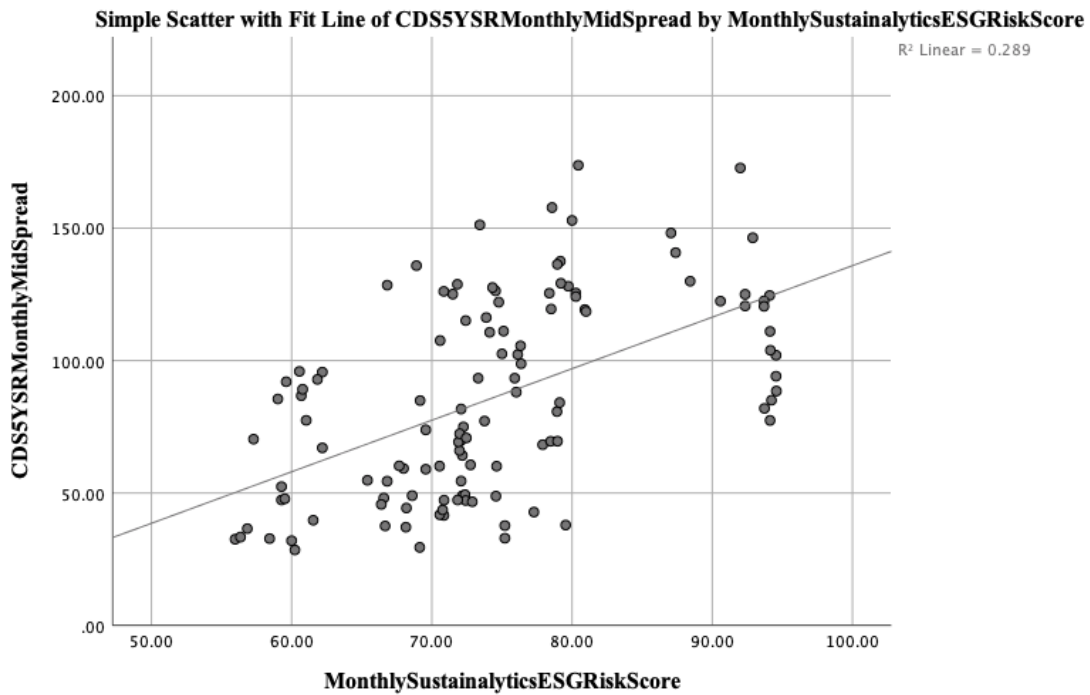
6.4.2   Scatter Plot Analysis

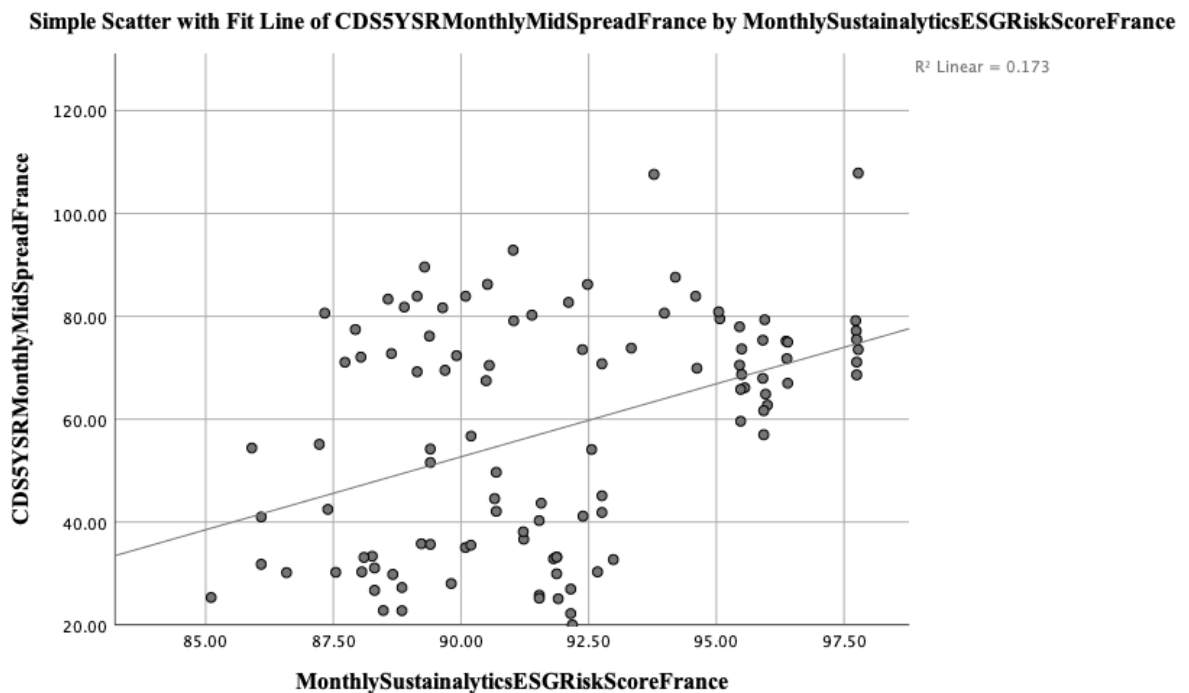**Figure 5: Scatter Plot Analysis for the Spanish Banks**

Figure 6: Scatter plot analysis for the French Banks

To examine the observed correlations of Spain, France and Germany graphically for linear or non-linear patterns, we again perform a scatter plot analysis. Surprisingly, we find a slightly linear pattern in Spain and France, with a coefficient of determination of 0.289 in Spain, which is much stronger than in France (0.173). In the German sample, a very weak negative linear pattern can be detected, but this is not sufficient to make a conjecture here.

6.5   Company Level

6.5.1   Pearson Correlation

However, in addition to our supranational and country-based analysis of the dataset, we will now look at the relationships between our variables of interest on an individual company basis to describe possible underlying patterns. Due to the very small sample from the country level, we are expected to be able to recognize patterns similar to those at the company level.

Correlations

		Santander Sustainalytics Score
SANTA CDS EUR SR 5Y D14 Corp	Pearson Correlation	.631**
	P-Value	.000
	N	60
		BBVA Sustainalytics Score
BBVA CDS EUR SR 5Y D14 Corp	Pearson Correlation	.557**
	P-Value	.000
	N	60
		Deutsche Bank Sustainalytics Score
DB CDS EUR SR 5Y D14 Corp	Pearson Correlation	-.372**
	P-Value	.006
	N	53
		Commerzbank Sustainalytics Score
CMZB CDS EUR SR 5Y D14 Corp	Pearson Correlation	.209
	P-Value	.134
	N	53
		ISP Sustainalytics Score
ISPIM SPA CDS EUR SR 5Y D14 Corp	Pearson Correlation	.445**
	P-Value	.000
	N	60
		Unicredit Sustainalytics Score
UCGIM CDS EUR SR 5Y D14 Corp	Pearson Correlation	.029
	P-Value	.827
	N	60
		BNP Sustainalytics Score
BNP CDS EUR SR 5Y D14 Corp	Pearson Correlation	.512**
	P-Value	.000
	N	60
		ACA Sustainalytics Score
LCL SA CDS EUR SR 5Y D14 Corp	Pearson Correlation	.314*
	P-Value	.034

		HSBC Sustainalytics Score
HSBC BK CDS EUR SR 5Y D14 Corp	Pearson Correlation	.281
	P-Value	.058
	N	46
		Barclays Sustainalytics Score
BARCLAY CDS EUR SR 5Y D14 Corp	Pearson Correlation	.129
	P-Value	.324
	N	60

Table 9: Pearson Correlation Analysis – Company Level – Source: Own analysis

The Pearson correlation reduced to the individual companies shows us similar indications as our country analysis.

Significant correlation can be observed for 6 of the 10 sample banks, of which we find strong correlations for Santander, BBVA and BNP with coefficient values above 0.5 and moderate correlations for Deutsche Bank, ISPIM and HSBC with coefficient values ranging from 0.3 to 0.49. To now go into more detail about the relationship revealed here, we again apply an individual scatter plot analysis for the 6 companies in question.

6.5.2   Scatter Plot Analysis

The scatter plot analysis reveal that the relationship between CDS spread and ESG rating of the 6 selected companies illustrate mildly discernible linear trends between CDS and ESG performance. In addition, we can observe that 5 out of the 6 significant analyses show a positive correlation between CDS spreads and ESG rating. The only exception in this case is Deutsche Bank, where we can see a negative correlation between the two variables of interest over the last 5 years. As suggested earlier in our data analysis, this outlier could be related to the highest average CDS spread of Deutsche Bank from our sample, which may have been particularly driven by public investigations and media attention surrounding scandalous company practices (DW.com, 2018)

7   Conclusions

On the basis of the results derived from our empirical study, it is now important to engage in a thorough discussion of the form in which this empirical study was carried out, how the procedure can be evaluated, what the significance the results obtained, and how they can

ultimately be interpreted in the context of the related literature and the actual financial world.

7.1 Approach of the study

The scope and approach of the empirical study can be traced back to many different influences. First and foremost, the aim of this study was to use a simplified, but statistically clean and meaningful methodology, which both has to meet the scientific requirements of a bachelor thesis but also can be implemented and interpreted with the statistical methods learned during the course of studies.

The size of our sample for the empirical analysis, with 10 different credit institutions and their monthly performance in the CDS and ESG variables, is rather small with N=558. This is due to several factors. First of all, reliable and publicly available ESG data is still a rare commodity despite an increasing trend of interest in this field (Quelle). With the platforms accessible to us, as well as the approach of a rating-financial comparison, rather than an individual variable-financial comparison, the accessible ratings were limited in total number to 2 and in time span to post-2015. Additionally, the amount of data is reduced by the relatively low-frequency reporting of this data, in the case of Sustainalytics per month. In addition, by deciding to analyze banks from the (then still) EU, we entered a hitherto rather disregarded part of academic research on ESG-CFP performance, precisely because this niche had not been studied before, although it seemed important to me for the consensus around general sustainability and private sector responsibility. Because of this new approach, the sources of inspiration or studies with which the work could have been compared to were also limited.

7.2 Execution of the study

The research question of the study was to investigate the relationship between the achieved ESG scores and the spreads of credit default swaps of the largest European banks, in order to draw conclusions on whether the risk perception with regard to sustainability factors of financial companies is related to their default probability assessed by the market, in order to subsequently illustrate possible influences and dependencies both on a supranational and on a company level. Our approach to the analysis of the obtained data is clearly defined in its framework, but equally limited in the results and their significance.

7.3   Results

Without immediately going into the individual results of our correlation analyses, it is again important to point out the limitations of this empirical method. Even with significantly observable linear relationships between two variables, a correlation can never be said to be causal in its relationship. This can only be determined by much more minituous analysis techniques and a more meaningful data set. Our correlation data can only serve as circumstantial evidence that in there to some degree a demonstrable relationship between the variables.

With this clarification, we can now turn to the actual results of our study:

Based on our observations at the EU level, the very low positive correlation observable in the sample, as well as the subsequent unsuccessful investigation for linear or nonlinear patterns, could be a possible indication that the general perception of risks from low sustainability does not yet significantly influence investors in the banking sector. Furthermore, it might offer an additional incentive for a discussion between the opposite facing risk mitigation and overinvestment theories. A non existing correlation between ESG performance and default risk could possibly be an indicative supporting factor of the risk mitigation theory, namely that increased ESG engagement, regardless the possible indicated costs, is offset through the gained intangible value, which performance difference is at least at the level of the arguably economically inefficient resource use of the ESG engagement, therefore not significantly affecting higher costs, lower profits, higher volatility, and ultimately the credit risk.

However, the fact that linearly significant relationships between ESG scores and CDS spreads can be observed at the country levels of Spain and France and not in the other countries suggests another possible direction. Based on the very cross-regional, supra-national research methodology of many of our predecessor studies, this result could be seen as a supportive indication that the influence of sustainability metrics on credit risk or possibly other corporate financial performance indicators is regionally dependent, even in what one would think is a rather homogeneous market like the EU. This hypothesis underlines the results of Principles for Responsible Investment (2017) and Friede et al. (2015) studies describing regional differences in the impact of ESG factors on corporate financial performance. However, to the best of my knowledge, this is the first study whose sample does not only analyze at the level of a common market, but also makes regional (and in this case national) differences in the analysis.

In addition, the positive nature of the relationship between ESG performance and credit risk in the countries Spain and France provides additional points to the over-investment theory described earlier. Based on the data obtained in Spain and France, it could be argued that this positive relationship is evidence that ESG engagement is primarily related to additional costs, which could be mainly due to the waste of scarce resources and the neglect of other stakeholders.

In addition to the EU-level and country-level analysis of our data set, the results of the correlation analysis conducted at the company level also need to be evaluated. The factor that stands out here are the fluctuations of the results. The wide variation in the relationship between the two variables of interest, both at the positive/negative correlation level and in the significance of the results raises some questions.

This may be an overriding indication that at the company level, the implementation of ESG value improvement initiatives affects the overall performance of a company in very different ways, so that, for example, some initiatives have a very positive impact on ESG ratings, but subsequently, in hand with the overinvestment theory, negatively depress overall performance, while other companies (in this case, for example, the German bank) with less costly initiatives and the incoming improvement in ratings the public might be able increase their credibility in the CDS market, and thus a negative correlation prevails.

7.4 Future Investigation

Overall, our study can only be seen as a possible starting point for many more, and especially statistically more meaningful, analyses. The observed differences in ESG-CFP performance leave new papers with an incentive for future studies that analyze significantly more in detail the regional and also company-based differences and effects of ESG factors on corporate financial performance and in specific also credit risk. A possible regional preference for implementation could be Europe in particular, as it is a market where ESG performance and corporate financial performance historically could only be demonstrated weakly or only in niche groups. Here, it will be particularly important to consider much more comprehensive ESG metrics and variables as the ratign used in this paper's analysis. It will be particularly exciting to observe which factors ultimately make a possible regional or intra-company difference, and to what extent they can be integrated into future risk assessment models.

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