THE ENVIRONMENT IN THE EUROSTOXX50 LISTED COMPANIES

EMPIRICAL STUDY ON THE RELATIONSHIP BETWEEN CO_2 PRODUCTION AND THE CORPORATE RISK

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ABSTRACT

In the present socio-economic context, customers and consumers increasingly value the environmental variables and ecology for decision making, so these become a crucial factor for companies. The aim of this project is to research, through an empirical analysis, a possible link between the variations of CO_2 productions and the relation of the variations in productions of CO_2 and the corporate risk in major European firms. To this end, I have analysed forty-seven companies within the EuroStox50 from 2014 to 2015.

The large number of researches shows how relevant this topic is. However, there is hardly literature analysing the environment with the corporate risk. When analysing the model, we make special emphasis on the variations in productions of CO_2 and the financial companies, stressing that they are not meaningful in the analysis of the corporate risk. Finally, a brief conclusion closes the work with the results obtained and the references.

KEY WORDS: EUROSTOX50, environment, production of CO_2, risk, corporate risk, European companies.

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1 INTRODUCTION

The existing pollution in the large cities, global warming or health problems are merely a few examples of the serious issues associated with the CO_2 emissions. Indeed, governments and citizens are increasingly concerned about such problems. In practice, and more specifically in the case of Volkswagen, we have been able to observe how the irregular emissions from their vehicles have had a detrimental effect on their quotations, as well as on the different type of risks.

With this idea in mind, the aim of this project is to find said relation with an econometric analysis, which directly links the corporate risk with the environmental variable in the large European companies. To that end, the emissions of CO_2 produced by the companies quoted in the EuroStox50 have been taken into account as a variable within the corporate risk model.

This study has been developed with the premise to show the null hypothesis of the existence of a meaningful association between the emissions of CO_2 produced by the great European companies (EuroStox50) and their corporate risk. Nevertheless, after undertaking a detailed analysis, the results show that the production of CO_2 does not have a significant impact on the corporate risk. Therefore, the null hypothesis is dismissed, in favour of the alternative assumption, which indicates the lack of a significant relation between the CEP variable and the corporate risk.

The study has been developed by Pool Data (Pool Dates) for making estimations of the Ordinary Least Squares. In order to measure the risk, I have used the Return on Assets standard deviation (SD ROA) and the STOCK RETURN standard deviation (STOCK RETURN). However, as the SD ROA analyses are of greater significant for this topic, the results obtained from SD STOCK RETURN are not shown in this project.

2 LITERATURE REVIEW

At present, people are increasingly concerned about the rising temperatures and the effect of human activity on the environment. There are numerous researches which have found this association. Cook (2016) analysed a total of 11944 research projects about the relation between climate change and human activity, finally concluding that there is scientific unanimity about the relation of these two factors.

In the 28 European countries which hold greater weight in the economy, from 1990 emissions have decreased by 22.9%, which leads to an equivalent reduction of 1136 millions of tons of CO_2 (European Commission, 2016). However, the fact is that these emissions remain very high and have meant a huge number of disadvantages in the urban context. Among the main sources of greenhouse gas, we can find fugitive emissions and the burning of fuels (energy process, 55.1%), the transport (including aviation, 23.2%), agriculture (9.9%) and from industrial activity (8.5%) (European Commission, 2016).

The scientific recognition of the fact that business activities affect the environment has led to large sectors of population to consider companies as the main culprit of the environmental damage (Dunlap, 1991). Therefore, on the one hand, companies are considered as pollutant elements and extremely harmful to the ecosystem. However, on the other hand, there is a reasonable hope in having a transition that will freely lead to a more efficient production, reducing or eliminating the emissions which produce greenhouse gases (Rivera, 2000).

All in all, from a business point of view the environment has expanded to become a strategic variable (Throop et al., 1993; Aragón, 1998; Bansal and Roth, 2000; Brio and Junquera, 2001), so the environmental management and policies might give competitive advantage to both governments and companies (Hibbitt and Kamp-Roelands, 2002). In addition, the size of the company and the way it acts in relation to the environment have come to play a critical role in its own evolution and development (Florida, 1996; Alberti et al., 2000; Lepoutre et. Al, 2006)

Following this, the reasons justifying the environment as a strategic variable are numerous. These include: the proliferation of national and Community rules and regulations, social pressure or creating competitive advantage related to the environment (Angell and Klassen, 1999; Brío and Junquera, 2001; hibbit and Kamp-Relands, 2002). It is of particular importance to change the production processes in order to reduce emissions and wastes for those specific sectors that have always had a great impact on the environment (Shrivastava, 1995a).

Murillo, Garcés and Rivera (2004) go further and indicate that among the corporate profits arising from the environment sensitivity we may find the related ones with environmental costs, more chances to seek out new opportunities and business activities, access to more demanding or environmental restricted markets, the improvement of the general impression of the Company and access to certain type of contracts (public contracts).

Moreover, the environment is, without any doubt, an important factor when it comes to defining the image of the company. Therefore, it has become a current issue which is also highly influential in the business demands. The need of analyzing the environmental impact of the production processes has increased steadily, since in the global markets, the environmental profile of the Brand may directly affect the demand of products (Vastag et al., 1996; Vastag et al., 1996b). This means that the environmental requirements can represent a very good chance to improve the results and revenues of the company (Flannery and May, 2000), for instance, through access to new emerging markets of environmental products and technologies and the development of new combinations of products-market (Shrivastava, 1995b).

Very often, an appropriate management of the environmental risks benefits the application of the environmental regulations, in such a way that it reduces the risks involved in fines and penalties for breaking the law (Bensal and Roth, 2000)

On the other hand, in a more specific form several studies have tried to link the increases and reductions of CO_2 to the risk in the company, showing an empirical evidence between the emissions of CO_2 and the decreases of the operational risk (Feld-man, Soyka, & Ameer, 1997; Spicer, 1978; Sun & Cui, 2014). The emissions have an effect on the image and reputation of the company, becoming a very important factor for investors (Russo & Fouts, 1997). Whiteman (2011) goes much further and argues that, in the case of large companies, with a greater number of emissions, the operational risks is more susceptible and it is increasing. In this same regard, many other studies have showed in their researches that reducing the emissions can decrease the cost of capital (Feldman et al., 1997; Sharfman & Fernando, 2008; El Ghoul, Guedhami, Kwok, & Mishra, 2011)

Spicer (1978) in particular looked into the paper industry of the United States from 1978 to 1973, finding out in their results an increase in the systematic risk arising from a poor control of the emissions. He argues that the companies with a greater control over their emissions are less subject to penalties, thereby reducing the risk and cost of capital.

Sharfman and Fernando (2008) undertook an analysis of 267 companies of the United States showing in their study that the reduction in the greenhouse gases carried out by

the company decreases the cost of capital through the lowering of the systematic risk and the increase in the rate of profit. Several years ago, Fieldman et al. (1997) analyzed a sample of 300 public companies and found convincing evidence that the perceived risks are decreased and the share price increased through the investment in updating the processes of production in order to reduce the environmental impact.

2.1 .- CONTRAST OF HYPOTHESIS

In this section, the parameters to carry out the analysis are established, in such a way that after studying in a serious, practical and precise manner the analysis of the model, we will be able to accept or dispel the null hypotheses. As the literature shows, there are numerous authors who find out in their experiments a relation between the environmental approaches that the companies follow and some of their results. The aim of the formulation of these hypotheses in the present project is to go a step further in this direction to check out if within a developed business system as the European, the production of CO_2 as environmental variable may explain the variations in the corporate risk.

• H_0: Increases in the CO_2 productions have a negative impact on the corporate risk by a statistically significant extent.

Orlitzky and Benjamin (2001) argue in their study that the investment can prevent and reduce the risk of the company, apart from foreseeing in a better way the cash flows when decreasing different levels of risk. For his part, Spicer (1978) studied the effect of the pollution in the American paper industry from 1968 to 1973. Therefore, his results showed that this pollution was negatively related to the systematic risk. The core of his argument is linked to the following statement: the greater control over its residues a company has, the less subject this is to perform environmental infringements. In such a way that it may reduce the cost of capital.

Alipur (2016) in the article “From Iran: Does Improvement in Corporate Environmental Performance Affect Corporate Risk Taking?” finds in his results a negative relation between CEP and the corporate risk. These results are in line with what Salama et. (2011) concluded, showing an inverse relation between the systematic risk and CEP.

In addition, Whiteman shows in his study that the reduction in the emissions of greenhouse gases decrease the environmental risks and consequently, increases the profitability (Whiteman et al., 2011). On the other hand, there are many other studies which show the relation between the decreases in the production of Co2 and the

reduction of the cost of capital (Feldman et al., 1997; Sharfman & Fernando, 2008; El Ghoul, Guedhami, Kwok, & Mishra, 2011).

This hypothesis goes in consonance with the positive synergy theory. According to Preston and O'Bannon (1997), there may be a positive synergistic relation between the CSR (Corporate Social Responsibility) and the financial results, in such a way that greater levels of CSR improve the financial results. Moreover, greater financial results improve the levels of CSR. This approach is confirmed by Waddock and Graves (1997) and by Orlitzky, Schmidt and Rynes (2003)

In the research of Cornell and Shapiro (1987) and their social impact hypothesis, there is a direct relation between the levels of SCR of the company and its financial results, in such a way that the greater the levels of CSR are, the better the financial results will be. While, low levels of CSR would cause worse financial results. That is to say, the SCR determines the financial results through a direct and positive relation. Such positive connection is based on the fact that the SCR satisfies several participants in the company, which provides a better reputation to the company and this has positive repercussions in its financial results. On the other hand, the lack of proper levels of SCR provides a bad reputation, causing the worsening of the financial results. This theory is supported by Waddock and Graves (1997) and it has been broadly contrasted by numerous recent authors, among them are Orlitzky, Schmidt and Rynes (2003), Tsoutsoura (2004), Allouche and Laroche (2005) or Ammann, Oesch and Schmind (2010). From that point of view, it is obvious that the benefits arising from proper levels of SCR should more than offset how much they cost. According to Rodríguez (2008), the social impact of the SCR is not limited exclusively to the reputation aspect. Thus, in order to fully understand the concept of SCR we must consider this factor as a business case.

• H_1: Increases in the production of CO_2 variable has no a significant influence on the corporate risk of the company in a systematic way.

The last two decades several studies have come up trying to relate the Corporate Social Responsibility with the financial results, and to prove that there is not a significant relation or that their results are inconclusive, McWilliams and Siegel (2000), Hillman and Kelm(2001), Moore(2001), Alsayed Paton (2005), Barnett ySalomon (2006)

These results are in line with the hypothesis of the “moderating” variables: according to Gómez García (2008), another possible theory would argue that there is not an independent relation between the CSR and the financial results. Otherwise, on the contrary, such relation depends on other variables, such as the R+D expenditures, in

such a way that, such variables may increase, decrease or even eliminate the existing relation between the CSR and the financial results. This approach is corroborated by Surroca (2010).

Hoje, J and Na, H (2012) carried out a study about the relation between the Corporate Social Risk and the risk of the company. This examination explores a great simple of companies of the industrial sector in the United States. They are divided in two groups, one with companies which cause controversy such as the tobacco ones, alcohol distilleries, gambling businesses, among others. The second group was formed by companies engaged in less controversial activities. Their study shows results very interesting, while the sample of companies with controversial activities shows that there is a clear and significant relation between the Corporate Social Risk and Risk, the another sample, on the contrary, indicates that this relation is not significant for companies doing activities less controversial.

2.2. - EUROSTOXX50 LISTED COMPANIES

In order to empirically verify this model, we have used the data of the companies which are included in the EuroStox50, given that they are the most representative in the Euro Market. Such data have been obtained from the annual accounts and the sustainable memories of the respective companies. In addition, the contributions of them have been extracted from the web page Yahoo Finance. Of the total of 50 companies, we had to exclude Fresenius and Vinci due to the fact that it has been impossible to gather all the necessary data for carrying out a complete analysis.

The following table shows the 47 companies we have analysed and also included in this model.

TABLE OF COMPANIES ANALIZED OF EUROSTOXX50

X Nº	Dum-my	Firm	Nº	Dum-my	Firm	Nº	Dum-my	Firm
1	0	**BMW**	17	0	**IBERDROLA**	33	0	**VIVENDI**
2	0	**MERCEDES**	18	0	**INDITEX**	34	0	**NOKIA**
3	0	**ADIDAS**	19	0	**AHOLD**	35	0	**AB INBEV**
4	0	**AIR BUS**	20	0	**LOREAL**	36	0	**CRH**
5	0	**AIR LIQUIDE**	21	0	**LVMH**	37	0	**VOLKSWAGEN**
6	0	**ASML**	22	0	**ORANGE**	38	1	**ALLIANZ**
7	0	**BASF**	23	0	**PHILIPS**	39	1	**AXA**
8	0	**BAYER**	24	0	**SAINGOBAIN**	40	1	**BBVA**
9	0	**DANONE**	25	0	**SANOFI**	41	1	**BNP PARIBAS**
10	0	**DEUTS. TELE-COM**	26	0	**SAP**	42	1	**DEUTSCHE BANK**
11	0	**DPDHL**	27	0	**SCHNEIDER**	43	1	**INTESA SAN.**

12	0	**ENEL**	28	0	**SIEMENS**	44	1	**MUNICH**
13	0	**ENGIE**	29	0	**TELEFONICA**	45	1	**SANTANDER**
14	0	**ENI**	30	0	**TOTAL**	46	1	**SOCIE. GENERALE**
15	0	**EON**	31	0	**UNI BAIL**	47	1	**ING GROUP**
16	0	**ESSILOR**	32	0	**UNILEVER**			

In order to compose the function which measures the corporate risk we are going to use as a basis the work of Khairollahi, Shahveisi, Vafaei and Alipour (2016). The aim of all of these authors was to find the relation between the production of Co2 of the Iranian companies and their corporate risk. Our adaptation is based on the use of the simplified model, making use of the companies of EuroStoxx50.

The difference between the models is found in some of their variables, in both models the growth variable is used. However, in every model we use the growth market reference. In relation with the dummy variable, in the model used in this project the financial sector is used as a reference, given its importance in this field. On the other hand, I have been considered necessary to remove the liquidity variable, because of its simplicity and problems in the uniformity of the calculation of such rate.

2.3. - VARIABLES

2.3.1. - DEPENDENT VARIABLE

The dependent variable is based on previous researches (Eisenmann, 2002; Kanagaretnam, Lim, & Lobo, 2013, Khairollah, Shahveisi, Vafaei and Alipour (2016), who used two measurements to study the corporate risk. The first one they used is the standard deviation of NOI (Net Operating Profit), which served as a measure of the risk implied in the business activities (John, Litov, & Yeung, 2008) and indicates the volatility of the levels of corporate incomes (Li, Griffin, Yue, & Zhao, 2013). A higher volatility suggests a high risk.

The second measurement is the standard deviation of the returns on shares (SD RETURN). It is highly important to take into account that the standard deviation of NOI measures the accounting risk (Wright, Kroll,Krug,&Pettus, 2007), while the second one measures the market risk.

2.3.2. - INDEPENDENT VARIABLE

The CEP (production of CO_2) variable of the company evaluates in environmental terms the behaviour of the assets and it may improve the environmental management and the achievements in the strategic advantages (Young & Rikhardsson, 1996). The CEP variable has been studied as a measure, including the natural sources and the emissions (Figge & Hahn, 2004), others studied the emissions of Co2 and added the toxic risk (Tyteca et al., 2002), the reductions of Co2 (Hart & Ahuja, 1996; Sariannidis et al., 2013), and the decreases in pollution and the environmental control (King & Lenox, 2001; Klassen & Whybark, 1999; Wagner, 2005).

In line with Fuji et al. (2013) and Nishitani and Kokubu (2012), Khairollah, Shahveisi, Vafaei and Alipour (2016), this research uses the reductions in emissions of Co2 to evaluate CEP. The efficiency in the emissions is calculated as the net sales by emissions of Co2 in tons.

2.3.3. - THE CONTROL VARIABLES

This type or variables are more controversial and each model can incorporate different variables. Nevertheless, after concluding the revision of all the literature, the variables I have chosen are commonly used in the different empirical researches which measure the corporate risk of the companies.

Size of the company: Usually, bigger companies tend to have more risk than the smaller ones, so they are more subject to this risk and to fall down in bankruptcy than the companies of bigger size (John et al., 2008), and the size of the company is inverse to the risk, Ho, Lai, & Lee, 2013; Perez-Quiros & Timmermann, 2000).

Leverage: It is the whole debts between the assets. The firms with a greater debt in its structural capital show a greater volatility in their incomes than others with minor debts (Modigliani and Miller, 1958). In addition, the firms with lower debts are less subject to fall down in bankruptcy than others which have higher levels of debt (Kuang & Qin, 2013). Other studies relate in a positive way the leverage with the risk (Cohen et al., 2013). In order to calculate the leverage variable, we will use the leverage on book rate. The whole debt between the total of assets.

Return On Assets (ROA): It will be used as a profitability measure. This is the ratio of the net incomes between the total of assets. A higher level of risk is associated in a positive way with profitability. The companies need to take a greater level of risk in order to achieve better financial results.

Book value (M/B): This ratio will be used as a measure of the effect on the investment opportunity in the corporate risk (Cohen et al., 2013). It is calculated as the

market value of the assets (market value of the Net Assets more than the total of assets, less than the book value of the Net Assets) divided by the assets value at the end of the fiscal year. The ratio of book value is related in a positive way with risk.

The GDP (Gross Domestic Product) growth: This variable will be used as indicator of the effect the economic development has in the corporate risk. We will use as a variable the developed growth by the German GPD, which we will use in all the companies as a growth reference in Europe.

This variable is used to analyze the economic development of the country in the corporate risk. This ratio measures the real annual changes in the GDP per capita at the national level. The GDP variable is related in a positive way with the corporate risk. Delis and Kouretas (2011) find out that a great economic development leads to a high level of corporate risk, given that large companies are willing to get high returns on better economic conditions.

2.2 MODEL

The model used as a measure of the operating risk is in equation number 1:

$$\textbf{[E.1]} \quad RISK_{it\_} = \alpha_i + \beta_1 EP_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 M\!/\!B_{it} + \beta_5 GDP_{it} + \beta_6 ROA_{it} + \varepsilon_i$$

The variables which has been used to create the model are earlier mentioned in the section 2.2 Variables. At present, there are few authors who have analysed the corporate risk incorporating the production of CO_2 variable in the equation. Therefore, there is not a huge literature which facilitates its realization. However, after studying carefully the issue, it has been used as a reference the model of Alipour et al. (2016) in "Does Improvement in Corporate Environmental Performance Affect Corporate Risk Taking? In such model, the liquidity variable has been removed because of its simplicity and conflicts in measuring it with the different sectors.

3 RESULTS

TABLE 2. MATRIX CORRELATION OF THE VARIABLES

CORRELATION MATRIX							
	CEP	GDP	FINANCIAL_BUSINESSES	LEV	MB	ROA	SIZE
CEP	1.000000	0.006501	-0.289303	-0.088920	0.087828	-0.157854	-0.077109
GDP	0.006501	1.000000	-0.082599	-0.082962	-0.016260	-0.069640	-0.119640
FINAN._BUS.	-0.289303	-0.082599	1.000000	0.579312	-0.053911	-0.385091	0.811666
LEV	-0.088920	-0.082962	0.579312	1.000000	-0.114702	-0.526235	0.698846
MB	0.087828	-0.016260	-0.053911	-0.114702	1.000000	-0.412065	-0.039934
ROA	-0.157854	-0.069640	-0.385091	-0.526235	-0.412065	1.000000	-0.557884
SIZE	-0.077109	-0.119640	0.811666	0.698846	-0.039934	-0.557884	1.000000

Source: Own development.

In the first place, after having done the correlations of Pearson between the different couples of variables, a clear correlation between some of them has been found, as the table 1 shows. The size variable (SIZE) is broadly correlated with the dummy variable (FINANCIAL BUSINESS), the financial leverage (LEV) and the return on assets (ROA). On the other hand, the financial sector (DUMMY) is highly correlated with the financial leverage (LEV).

In this model, the standard deviation of ROA and the standard deviation of STOCK RETURN have been used as a way of measurement to analyze the risk. However, when analyzing both samples of risk measurement, the SD ROA has been selected, given that this has proved to be more representative as a risk measurement.

At the same time, the following table (table 2) shows a summary of the different models used to observe the significance of them and checking out which one is most suited to our purpose. In order to carry out the analysis I have used the estimate method of Least Squares through Pool Data (Pool Datos), taking samples of the companies of EuroStox50 from 2014 to 2015. Finally, the CEP variable of 2014 and 2015 have been taken into account as well.

TABLE 3. SIGNIFICANCE OF THE MODELS

	SD ROA 2014		SD ROA 2015		SD ROA 2014/2015	
VARIABLES	**Value**	**Sign.**	**Value**	**Sign.**	**Value**	**Sign.**
ALL	2.0914	0.155062	-	-	-	-
CEP, GDP,LEV, M/B,C	-	-	18.51482	0.00	-	-
LEV, M/B, C	-	-	36.03836	0.00	-	-
CEP, GDP, LEV, M/B, C	-	-	-	-	15.51324	0.00
CEP, LEV, M/B, C	-	-	-	-	20.64294	0.00
FINAN._BUSIN., M/B, C	-	-	-	-	22.83184	0.00
LEV, M/B, C	-	-	-	-	29.18180	0.00

Source: Own development

It is important to note that at first the model selected to carry out the analysis was based on a panel-data regression, since this solves the heterogeneity problems which are non-observable between the companies, and increases the degrees of freedom. Nevertheless, such method could not have been implemented, since it needs a minimum number of temporal variables, being a requirement which this present project cannot meet.

In order to solve this problem, I have used an alternative model of analysis, which allows us to work with temporal series of shorter duration. The model used is the Constant Coefficients one or the Pool Data model. In this model, the coefficients are constant in time and for all individuals. That is to say, the solution to this model would be considering all the information without distinction between individuals or temporal periods, estimating with the Ordinary Least Squares method.

The possible differences between individuals and different time moments are therefore assimilated to the random term, it is therefore assimilated to the random term, in the equation number 2:

$$[E.2] \quad Y_{it} = \alpha + \beta_2 X2_{it} + \beta_3 X3_{it} + U_{it}$$

Problems of auto correlation may be found in these models due to the fact that the variance of the disturbances may be different in relation with individual, in time or heteros-

cedasticity. These problems can be solved through the application per MCG, however such method has not been studied during the degree.

Even so, the following tables show the constant coefficients model (Pool Data), per each one of the years' analysed, as well as taking into account the CEP variable of 2014, using the accounting data collected in 2015.

TABLE 4. RESULTS OF THE MODELS 2014 AND 2015

SAMPLE 2014					SAMPLE CEP 2014 WITH SAMPLE 2015				
Variable	Coeff.	Std. Error	t-Stat.	Pro-ba.	Variable	Coeff.	Std. Error	t-Stat.	Pro-ba.
CEP	**0.000115**	**7.92E-05**	**1.446.159**	**0.1551**	LEV	**-0.026834**	**0.006054**	**-4.432.567**	**0.0000**
C	**0.007661**	**0.002478**	**3.091.426**	**0.0034**	MB	**8.43E-08**	**1.49E-08**	**5.672.721**	**0.0000**
					C	**0.026877**	**0.004293**	**6.261.217**	**0.0000**

R-squared	**0.044411**	R-squared	**0.390748**
Adjusted R-squared	**0.023176**	Adjusted R-squared	**0.377358**
S.E. of regression	**0.014813**	S.E. of regression	**0.011763**
Sum squared resid	**0.009874**	Sum squared resid	**0.012591**
Log likelihood	**1.323.078**	Log likelihood	**285.7701**
F - statistic	**2.091.375**	F – statistic	**29.18180**
Prob (F – statistic)	**0.155062**	Prob (F – statistic)	**0.000000**

Mean dependent var	**0.009417**	Mean dependent var	**0.009417**
S.D. dependet var	**0.014988**	S.D. dependet var	**0.014907**
Akaike info criterion	**-5.545.013**	Akaike info criterion	**-6.016386**
Schwarz criterion	**-5.466.283**	Schwarz criterion	**-5.935217**
Hannan – Quinn criter.	**-5.515.386**	Hannan – Quinn criter.	**-5983600**
Durbin – Watson stat	**0.000000**	Durbin – Watson stat	**0.981233**

Source: Own development.

In the data of the table 3 we can observe the analyses of the sample of 2014, and the sample formed by the production of Co2 variable of 2014, with the accounting data of 2015. In this last model (CEP 2014 / accounting data 2015) a delay is applied in order to best fit the model and increase its significance.

However, after studying the analysis of both models, the 2014 one shows that the production of Co2 variable is not very significant, with an Adjusted R-Squared very low: 0.023176. On the other hand, in the model where we combine the data of 2014 and 2015 a greater significance is displayed, since the variables of leverage (LEV) and

Market to Book (M/B) have a stronger effect within the model. Nevertheless, considering the results obtained in the model of 2015 that table 5 show, we may observe how the significance is highly increased without cross-checking data and the delay. The following table of data (Table 5) shows more specifically the results obtained.

RESULTS OF MODEL 2015

SAMPLE 2015

Variable	Coeff.	Std. Error	t-Stat.	Proba.
LEV	-0.025416	0.007579	-3.353.661	0.0016
M / B	8.60E-08	1.21E-08	7.114.000	0.0000
C	0.024910	0.005278	4.719.311	0.0000

R-squared	0.620940
Adjusted R-squared	0.603710
S.E. of regression	0.009435
Sum squared resid	0.003917
Log likelihood	154.0367
F - statistic	36.03836
Prob (F – statistic)	0.000000

Mean dependent var	0.009417
S.D. dependet var	0.014988
Akaike info criterion	-6.427094
Schwarz criterion	-6.382654
Hannan – Quinn criter.	-6.382654
Durbin – Watson stat	0.000000

Source: Own Development.

In light of the results obtained, the risk model of the sample of 2015 is the one which shows the most significant results. When using MB and LEV as regressor variables both of them are significant but, this model also has as a whole higher goodness of fit. That is to say, the squared adapted R is higher than the one in the previous models, reaching a value of 0.603710, and a F – Statistic of 36.038. For this reason, the variables which were most correlated to each other (P Value >0.05) have been removed, therefore the constant (C) is increased, since this assumes all the variables removed.

Thus, this model indicates than the variance measured by the standard deviation of the economic profitability (ROA) decreases when the leverage (LEV) increases in a unit, having a specific reduction of 0.002 per cent. Furthermore, when the market value of the company increases in relation of the book value, the variance or volatility of Market to Book slightly increases in 0.000000086. The 60% of the variance of the profitability of the company is explained by the variables of leverage (LEV) and Market to Book (MB), therefore the relevance of both variables is highlighted in the measure of risk. It is important to note that the constant (C) is significant and hence within the constant (C), we can find the less explanatory variables which may cause problems of heteroscedasticity and multicollinearity.

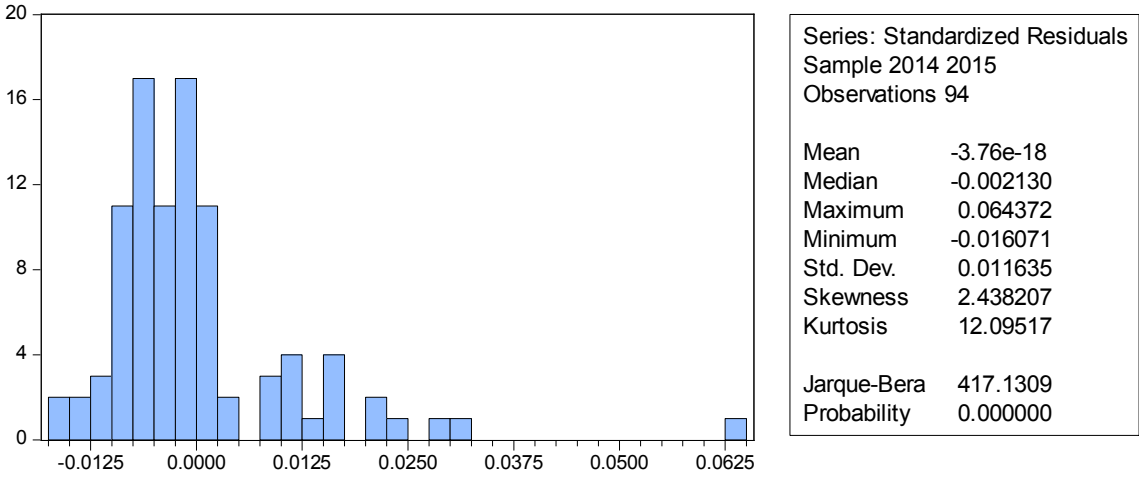
Looking at the statistics more carefully, the Akaike info criterion and Schwarz criterion statistics inform us about the significance of the different models analysed within a total of models obtained from the same data. Besides the information obtained and as an alternative to the selection criterion of Akaine info and Schwart, the Hanna-Quinn criterion has also been applied to the different models in order to find out which one of them is the most significant, obtaining results very similar to the Akaine and Schwarz ones. Lastly, the Durbin-Watson stat test has been carried out, showing a statistic value of 0.00000, far from two, therefore we must **refuse** the null hypothesis which indicated that the production of Co2 variable is statistically significant in the analysis of the corporate risk. Such rate also shows the existence of positive auto correlation.

The average of the leverage variable (LEV) is of 0.6876, which reflects some excellent results of indebtedness of the important European companies. Thus, the average found in the US companies. Therefore, the average found in the US companies is of 1.38 according to Oikonomou, Brooks and Pavelin (2012), which is also 1.38 the average of the Iranian companies according to a statistical study conducted by Alipour, Khairollahi, Shahveisi and Vafaei (2016). On the other hand, Ali, Liu, and Su (2016) have also found remarkable figures in the Australian companies with a value of 0.454, and on the contrary Brammer and Pavelin (2006) indicate in their study the high level of indebtedness of the British companies with an average of 24.6.

The average of the Market to Book variable is 1.387575264 (M/B), and it is used to compare the value in the market of the company with the accounting value. This ratio shows how well-balanced the market of EuroStox50 is in relation with the accounting values. Nevertheless, other studies show how these patterns may be quite different in different markets. Alipour et al. (2016) show in their results that the Iranian companies have a much higher Market to Book, reaching 6.24. Meanwhile Oikonomou et al. (2012) still found the ratio of Market to Book even higher in the US companies.

Following there are the tests performed in order to check if there are problems with the heteroscedasticity and the distribution of the models. More specifically, I have carried out the Jarque Bera test ant the representation of the residuals or errors of the model for the different companies.

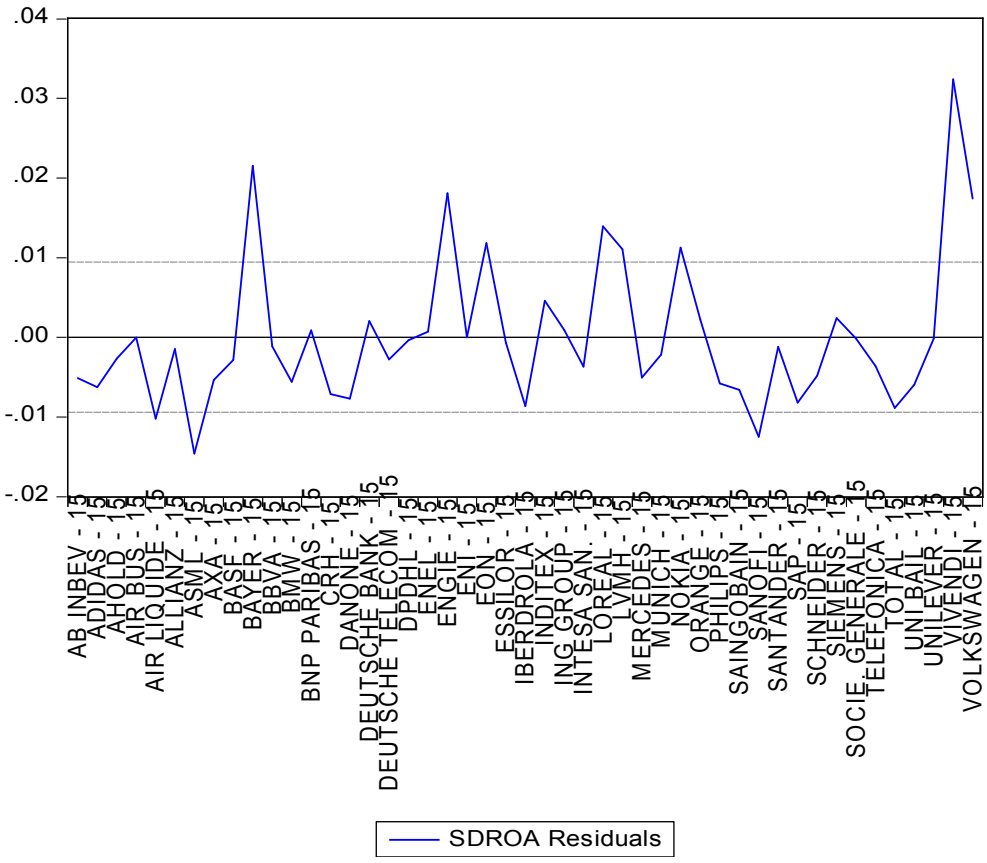
GRAPHIC 1. RESULTS OF THE RESIDUALS OR ERRORS IN THE MODEL



Source. Own development.

This test indicates us that the residuals do not have a normal distribution, so the null hypothesis is refused of the Jarque Bera test. That is to say, the data collection of the residuals does not follow a normal distribution. This test has been applied to the different models used, obtaining in them similar results in the different samples.

GRAPHIC 2. RESULTS DISTRIBUTION GRAPH



Source. Own Development.

The graphical 1 shows the representation of the residuals or errors of the model for the different companies seems to have a random behaviour, which has not caused heteroscedasticity problems. In the graphical 2, despite the fact that the model shows that the no distribution of errors does not follow a normal distribution (becomes less significant), does not show problems of heteroscedasticity, and reveals a great sense.

To conclude the results, it is important to talk about the dummy variable or companies from the financial sector, given that this is a very transcendent within the EuroStox50, and of a great relevance within the degree of finance and accounting. Within the dummy variable we can find great companies belonging to such sector Allianz, Axa, Banco Bbva, Bnp Paribas, Deutsche Bank, Intesa Santa Pola, Munich, Banco Santander Societé Generale and ING Group.

The variable named dummy which reflects the financial sector, shows us that there is no significant relation between her and the corporate risk. That is to say, the financial sector companies, do not have a greater corporate risk in a significant way, it also does not have a especially significant relation with the production of CO_2 variable. In fact, the data collected in the sustainability reports show that the emissions produced directly by the financial sector are considerably lower than the ones produced by other relevant sectors such as the industrial or energy sectors.

Nevertheless, the data show consequently the logic, since this is a sector which does not produce CO_2 directly and massively. On the other hand, the study does not show the indirect relation existing, which is also important, since the companies from all sectors, to a greater or lesser extent are producers of CO_2, obtain mostly bank financing.

4 CONCLUSION

At present, the environment and more specifically climate change concern both the world leaders and the high-growth companies. A recent study by A.T. Kearney indicates that share prices of the companies committed to the sustainability were 15% higher than the average of their respective industries.

Despite the fact that the literature about the environment and the company is broad, it is true that the relation between the emissions of CO_2 and the corporate risk has not been carefully studied, therefore I would like to provide a view of the great European companies and their corporate risks.

In this project, we have used several samples of companies who belong to the EuroStox50. The sample is taken with the data collected from 2014 and 2015. The most significant and analysed model is the one made from de data of 2015, because of both their accounting data and emissions produced in the same period.

The results obtained in the analysis have not showed a significant relationship between the variations in the productions of Carbon Dioxygen companies within the European sector. However, it does find a relevant relation between the variations in risk and the Market to Book (M/B) and company indebtedness (LEV) variables. More specifically, the variations in corporate risk are explained by these two variables in a 60%, which shows its importance within the corporate risk model.

On the other hand, these results are in line with the ones obtained by Bhagat, Bolton and Lu (2015), which find a positive and significant relation between the growths in the indebtedness and the increases in the risk on the companies within the financial sector. Gale (1972) already used the leverage variable (LEV) as a risk measurement in the companies, stating that depending on the sector of the industry, the balance of indebtedness may vary, however, it is always important to a greater or lesser extent.

The results obtained linked to the Market to Book (M/B) do not show extraordinary results, since there are numerous studies which show this relation. More specifically, Lewellen (1999) finds a strong relation with the risk and indicates that changes in risk are associated to Market to Book (M/B). Previously, the results of Fama and French (1993) move in the same direction, since the same relation is found in their study.

Finally, to conclude this project, it is important to highlight that despite the fact that in this study we have not found a significant relation between the emissions of Co2 and

the corporate risk in EuroSto50 in a short period of time, which is only an indicative of the market of the large European companies, which show some special features.

These special features are the result of a way to establish the companies who make up the EuroStox50, which restricts the participation in this market to all the companies, except the most important ones in the main European stock markets. In practice, this means placing in the same market large companies, with great image and benefits, which makes them reduce some risks and get others increased.

However, the importance of the environment and the sustainability of the company is increasing, as we have learnt in the literature reviewed. In the present business context, where customer satisfaction is essential and we have a society which is both well informed and trained, the demand for environmentally friendly products and services is increasing, so the environmental variable is a factor which must be considered in the future and in the present.

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