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Operating Risk (Cost-Volume-Profit) and Economic Value Added (EVA®)

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Abstract: Today, it is unquestionable the importance that organizational management is supported by indicators. Also, knowledge of value creation and operating risk are information that differentiates this management support. This study aimed to verify the relationship between the value creation generated by companies included in the sample and the indicators used in operating risk (cost-volume-profit analysis). In the literature review the concept of value creation and the indicators usually used to measure operating risk, break-even point, margin of safety, and degree of operating leverage, were presented and characterized, as well as the Economic Value Added (EVA®), which was the value-based performance measure used in the study. The sample consists of 27 non-financial companies listed in Euronext Lisbon and the period analyzed was the one between 2014 and 2018. The data were obtained through the consolidated annual accounts of the sample companies, and its analysis was performed using the multivariate statistical analysis technique, linear regression. The results showed that the estimated multiple linear regression model allowed, with a very reasonable quality, to estimate the impact that the break-even point and the margin of safety variables have on the variation of the value of EVA®. This study gives significant information showing how operating risk indicators affect value creation, which is considered one the main objectives of companies.

Keywords: Operating Risk, Value Creation, Break-even Point, Margin of Safety, EVA®

1. Introduction

Combining information given by indicators obtained through the information provided by financial accounting and management accounting allows us to study whether there is a relationship between value creation generated in companies and their break-even analysis.

From this perspective, characterizing each of the indicators we will use, EVA®, as a performance measure to access value creation and the break-even point, operating margin of safety and degree of operating leverage, to measure operating risk (also known as cost-volume-profit analysis), we will perform a study based on a multiple linear regression model using a sample of the companies listed in Euronext Lisbon, at the time of the study. The analysis will cover the period from 2014 to 2018.

The study aimed to verify the relationship between value creation generated by the sample companies and the operating risk they present.

The accounting information provided by financial accounting, summarized in the balance sheet and income statement, is the basis for the calculation of many indicators to perform different analyses, such as economic and financial or value creation. Value creation has gained prominence both in the academic community, by the number of surveys conducted [1], and in the business environment, where managers are pressured to maximize the company's value in a context shareholders' value creation [2]. Thus, the study reveals its importance by analyzing factors that may maximize or condition value creation.

As an information system, management accounting can be used in organizations to ascertain the formation of the overall result or by cost centers, per activity, facilitate the control process through the forecast component, which is associated

with budget preparation and deviation analyses, or to perform a cost-volume-profit analysis, classifying costs into variables and fixed stemming from the activity, to access operating risk. Its success as an information system depends on its ability to respond to its users' needs [3]. Even because, those responsible for managing an organization, need to know cost formation, incomes, and results, are associated with the various objectives to which it proposes [4].

In this sense, classifying all costs, in relation to the volume of activity, in fixed and variable, allows to obtain information about an organization, which becomes fundamental to its success, as well as to calculate indicators from which we highlight the break-even point, operating margin of safety and degree of operating leverage since these indicators "measure operating risk that is associated with the management of the company's operating activity" [5].

Currently, traditional performance measures must be combined with the analysis of value creation, only thus allowing knowing the true business performance of an organization [6]. Thus, it is crucial to know how certain indicators affect value creation.

The study is organized into five points, starting with the introduction. In the second point, the literature review is presented, in the third point the methodology used is described, in the fourth point the results obtained in the study are presented, in the fifth and last point, the conclusions are described. In the end, we have the study's references.

2. Literature Review

2.1. Value Creation and Operating Risk

Value creation is currently seen as one of the main objectives of companies, it underlies the idea that in order for a company to be sustainable it is not enough to make a profit, it is necessary that the profit is higher than the expected return by investors of all invested capital. That is, the profitability generated should be able to compensate for the expectations of all of the company's financiers, whether they are creditors or the shareholders themselves.

However, for a company to create value it is not enough to have as its main objective the creation of value for the shareholders, it needs to adopt strategies aimed at value drivers in order to maximize this value creation [7]. Thus, it is necessary to understand how several factors that affect the company's activity can also affect its value creation.

The operating risk seen as the uncertainty regarding the evolution of operating results can affect the profitability component of the company, considered by several authors as one of the main value drivers, so its study combined with value creation is quite important.

2.2. Value Creation Measured by Economic Value Added (EVA®)

According to Assaf Neto [8], Bahsin [9], and Rappaport [10], the main objective of any company should be value creation for its shareholders. Assaf Neto [8], considers the value approach, in company valuation, as the most comprehensive since it considers all of the capital invested. Ferreira [11] also considers that value creation should be one of the main objectives in the management of any company. The author considers that the value creation from the shareholder's perspective has led to a greater valuation of companies, through their price shares, also leading to better financing conditions and greater employees' motivation.

Thus, managers are now focused on value-based management, which, as per Elgharbawy and Abdel-Kader [12], became popular in the mid-1980s, with the publication of Alfred Rappaport's book *Creating Shareholder Value*. "Value-based management is concerned with medium and long-term cash flows and not just monthly profits. The manager should seek investment opportunities with profitability higher than the opportunity cost of capital and implement throughout the organization this type of management philosophy [13]."

Traditional valuation measures, based on accounting profit, have been used for business performance assessment [14]. However, these have been considered inadequate, since the main long-term objective of companies has become shareholder value creation [15]. Thus, in a value-based management context, performance measures based on value creation should be adopted. Several consulting firms and researchers have proposed various measures to calculate value creation, such as Economic Value Added (EVA®); Market Value Added (MVA®); Refined Value Added (REVA); Cash Value Added (CVA), Market equity to book value (MBV); Tobin's Q Ratio; Total Shareholders Return (TSR); and Cash Flow Return on Investment (CFROI).

Economic Value Added (EVA®) will be the value-based performance measure used in the study, being one of those that has had greater attention in academia and business. EVA® is an easy measure to apply and understand, even by those who do not have specific knowledge in the financial area [16]. EVA® is a trademark by Stern Stewart & Co., which according to Sharma and Kumar [17], represents a revised version of residual profit. As stated by Stewart [18], EVA® is the measure that best measures a company's economic profit.

EVA® has gained international acceptance as a measure of business performance assessment, since companies and their managers are more focused on creating value, using EVA®, not only as an evaluation measure but also as a strategic business management instrument [19, 20]. Ferreira [21] considers EVA® as an evaluation model in line with the new financial theory, focusing on value creation.

Despite gaining popularity in the 1990s, EVA® remains one of the most widely used measures to assess value creation, used in much of the research on companies' shareholders' value creation [1]. Stancu, ObrejaBraşoveanu, Ciobanu and Stancu [22] claim that EVA® is the most used measure by companies in the business performance assessment.

2.2.1. Calculation of EVA®

The consultancy firm Stern Stewart & Co. recommends making around 160 adjustments to the accounting statements before calculating EVA®. These adjustments aim to convert NOPAT and the capital from an accounting value to economic value [23]. However, making these adjustments have not yet reached a consensual opinion.

Several authors believe that making the adjustments makes the calculation of EVA® too complex [6]. As stated by Martin, Petty and Wallace [23], usually, companies only make between 5 to 10 adjustments. Sirbu [24] also considers that in practice, few of the suggested adjustments are actually made. Neves [13]), consider that the adjustments proposed to the financial statements for calculating EVA® have only a marginal effect. Thus, the analyst, when deciding to make a certain adjustment or not, should consider whether or not it is materially relevant, that is, whether it influences the shareholder value [16].

As mentioned by Young and O'Byrne [25], EVA® corresponds to the difference between the return obtained on the capital invested in a company and the cost in obtaining this capital. It has as fundamental difference with accounting profit, the fact that it considers in its calculation the cost of all capital (Equity and Debt).

Stewart [18], says that EVA® can be calculated by deducting the cost of invested capital, using NOPAT – Net operating profit after taxes or ROI – Return on investment, according to the following formulas (1 e 2). Operating results are deducted from income tax in order to approximate the operating result to an economic result [26].

$$EVA® = NOPAT - (CI * C) \quad (1)$$

where: NOPAT - Net Operating Profit After Taxes; C - Cost of capital; CI - Total invested capital

$$EVA® = (ROI - C) * CI \quad (2)$$

where: ROI - Return on investment; C - cost of capital; CI – Total invested capital

This last formula, in which the cost of capital is subtracted from ROI, is known as EVA® spread. The expression [ROI – C], is also known as residual ROI, indicating the return value after deduction of the charges with invested capital. It is also called economic spread [8]. When ROI > C, the value of EVA® is positive, so the company generates profitability higher than the cost of total invested capital, therefore there is value creation.

Neves [13] considers the use of operating results when calculation value creation more advisable in a division analysis since division managers are not responsible for the financial and fiscal management of the company, but for a global analysis of the company, the author suggests another form of calculation starting from the net result (3):

$$EVA® = RLSAF - (CI * C) \quad (3)$$

where: RLSAF - Net income without financial leverage (operating results + financial income + non-current results); C - Cost of capital; CI – Total invested capital

From the value obtained based on either form of calculation of EVA®, three situations may occur, which relate to shareholder value [16]:

a) If EVA® > 0 (i.e., EVA® positive), the company has profitability higher than the weighted average cost of capital; therefore, there is value creation. The positive value of EVA® shows an efficient use of investors' capital.
b) If EVA® = 0 (i.e., EVA® neutral), the company has profitability equal to the weighted average cost of capital, that is, the company has not added or destroyed value for its shareholders.
c) If EVA® < 0 (i.e., EVA® negative), the company has profitability lower than the weighted average cost of capital, so there is no value creation. Shareholders could probably have gotten a higher return on another investment at the same risk. The negative value of the EVA® indicator shows an inefficient use of capital and a decrease in the value of the company.

As deduced by the EVA® formula, prior to its calculation, the value of the invested capital and capital cost must be obtained, in addition to profitability.

The invested capital is the total investment made in the activity by creditors and shareholders [13], which corresponds to the sum of equity and debt used to finance the economic assets [26]. Young and O'Byrne [25] refers to the capital invested as the sum of shareholders' net worth with short and long-term financing belonging to creditors.

The cost of capital, according to Stewart [18], is the minimum acceptable return on investment. The cost of capital corresponds to the sum of the cost of debt with the cost of equity weighted by its relative weights in the financing structure [8, 27]. This definition corresponds to the so-called weighted average cost of capital (WACC).

As per Neves [28], the cost of debt is the interest rate negotiated by the company for its financing. If it is not possible to obtain it, it can alternatively be calculated by dividing the value of financing expenses considered in the income statement by the value of the financial debt considered in the balance sheet.

The cost of equity also known as opportunity cost, refers to the return that the investor expects to obtain on the investment. From the investor's point of view, it will be the most important cost to analyze in the calculation of EVA® [26]. It is not a cost possible to obtain through the public information available in the financial statements, so it will be necessary to calculate it using estimation models, such as [8, 28]:

a) Capital asset pricing model (CAPM).
b) Arbitrage pricing theory (APT).
c) Gordon Model.
d) Model of the practicals.
e) Investor's profitability rate.

2.2.2. Advantages and Disadvantages of EVA®

The EVA® indicator shows advantages as well as

disadvantages. EVA® advocates consider that its added value is to consider the economic profits and economic capital resulting from making adjustments to the accounting statements [17]. Nagarajan [16], mentions as advantages of EVA® being a simple measure of application that needs only the Balance Sheet and Profit and Loss Statement, so it can be applied to any company that presents financial statements that genuinely reflect its economic and financial situation. As stated by Sharma and Kumar [29] and Nagarajan [16], EVA® is the performance measure that has the highest correlation with the market value of the company and leads to the reduction of agency problems when linked to the managers' compensation system. Nagarajan [16] also states that it is the performance measure that most closely approximates to the actual value of the cash flows of the company under analysis.

Ferreira [21] and Nagarajan [16], emphasize as a limitation of EVA® the fact that it is a short-term measure that does not consider future expectations. Another limitation pointed out by Nagarajan [16], refers to the situation in which a company that has many new assets can present negative EVA®, but be profitable in the long term. Guni and Munteanu [26] consider as one of the most important limitations, the calculation methodology, the lack of a standard model, and the large number of suggested adjustments.

2.3. Break-even Point, Margin of Safety and Degree of Operating Leverage as Indicators that Measure Operating Risk

Classifying costs according to their variation in function of the volume of activity is fundamental for both decision making and profitability analysis, that is, it is very important to know its behavior in relation to volume and to verify which are fixed and which are variable [4]. Organizing costs according to this perspective, allows us to make a profit and loss statement in variable costing (table 2).

2.3.1. Operating Risk

According to Neves [28], operating risk is associated with the company's operating activity and can be defined as the likelihood that the operating result will be inadequate to meet the company's objectives. The same author states that demand instability, price volatility, the volatility of costs' factors, the impact of costs into sales prices, and the company's cost structure are the main causes of the volatility of operating results. Furthermore, operating risk is not only different from activity sector to activity sector, but also, within each activity sector, beeing enough that they have different costs structure. As main operating risk measures, Neves [5] and Teixeira and Daniel [30] suggest the indicators, operating break-even point, operating margin of safety, and degree of operating leverage.

2.3.2. Fixed and Variable Costs and the Income Statement Based on Variable Costing

In the short term, a cost is said to be fixed if it does not change when the activity changes. Examples thereof are depreciations when calculated by the straight-line method, or a rental income on a building. Fixed costs are characterized by providing, in a given period, the ability to produce or sell and can normally be linked, to the physical capacity given by buildings or equipment, the organizational capacity and financial capacity of the company [4]. Therefore, if an organization is using only 70% of its capacity, the fixed costs associated with this capacity will be allocated to a smaller number of units, so its unit cost will be higher than it would be if the organization was using its capacity at a level of 100%. Thus, from a short-term perspective, the amount of fixed costs remains constant, regardless of the level of activity carried out [31, 32].

A cost is said to be variable whether it increases or decreases with the increase or decrease in the volume of activity. These costs usually result from the use of the ability to manufacture or sell, such as the raw material consumed in the production and the electric energy spent by the functioning of a machine [4]. Given its characteristics, the total variable costs will depend on the level of activity, therefore these costs only exist if there is an activity [31, 32].

One of the advantages of analyzing variable costs separately from fixed costs is the possibility of, in the short term, to use the installed capacity, to sell below the total cost, because the difference between the sale price and the variable cost still provides a surplus that helps to cover fixed costs [4, 32].

"The total cost (total fixed costs + total variable costs) will be equal to fixed costs when the activity is null and will be the sum of fixed costs with variables for each level of activity effectively performed" [31].

From the perspective of variable costing, the company's result (profit or loss) (I) is equal to revenue (Sales S) minus total variable costs (Vc) minus total fixed costs (Fc), and revenue results from the multiplication of the sale price per unit (pv) by the quantity sold (Q), total variable costs results multiplying the variable costs per unit (gv) by the same quantity (Q) and fixed costs that are the ones that remain constant and are therefore equal, regardless of the quantities sold/produced, within the limits of installed capacity [4, 30].

$$I = S - Vc - Fc \text{ or } I = (Q \times pv) - (Q \times gv) - Fc \quad (4)$$

If fixed costs do not include interest expenses, we will be referring to operating profit. The difference between the sales value ($Q \times pv$) and variable costs ($Q \times gv$) is called the contribution margin (CM). The contribution margin per unit (mc) corresponds to the difference in the sales price per unit and the variable cost per unit.

2.3.3. Break-even Point, Margin of Safety and the Degree of Operating Leverage

a) The operating break-even point (BEP) corresponds to the sales amount (S*) for which the operating profit is null, or is the quantity sold for which the operating profit is null. Thus, if operating results are equal to zero, it is because the contribution margin is equal to the fixed costs (without interest expenses), which allows you to calculate the break-even point per units (quantity) (Q*), dividing fixed

costs by the contribution margin per unit (5). That is:

$$Q^* = \text{Fixed costs} / (pv - gv) \quad (5)$$

When the value of sales price per unit and variable costs are not known, the operating break-even point can be calculated by the following formula (6), giving us the total amount in sales needed to achieve a zero loss or profit.

$$\text{BEP} = \text{Total fixed costs (Fc)} / \text{Contribution margin \% (CM \%)} \quad (6)$$

So, the higher the value of the break-even point, the more quantity/amount a company needs to sell to achieve a zero result (neither loss or profit). Sales below the break-even point, lead to losses, so sales above the break-even point allow for profits. Of course, the higher the fixed costs, the higher the break-even point, and therefore the greater the operating risk.

b) Operating margin of safety (MS) corresponds to the value obtained from the difference between current sales (in quantity or value amount) and operating break-even point sales (in quantity or value amount). It can be calculated using the following formulas (7) e (8):

$$MS = V - V^* \text{ or } MSq = Q - Q^* \quad (7)$$

It can also be calculated as a percentage:

$$MS\ \% = V - V^* / V \quad (8)$$

Therefore, the higher the margin of security, the greater the possibility of lowering the sales, before having a result equal to zero (neither profit or loss), and then, the lower the operating margin of safety, the greater the operating risk.

Analyzing the operating margin of safety in relative value allows for comparisons between companies regarding their operating risk, not taking into account the size (revenue), but only its cost structure.

c) The degree of operating leverage (DOL) is measured by the ratio (9):

$$DOL = \text{Contribution margin} / \text{Operating income} \quad (9)$$

The value obtained in this ratio shows the impact that a variation in the company's sales will have on its operating income. Its value is as higher, as higher the weight of fixed costs in total expenses. Thus, when a company has a high DOL, it means that if the change in sales is to increase, the operating leverage is favorable, "to the extent that a growth in sales implies a more than proportional growth in operating results", but if its variation is to decrease, the "operating leverage is unfavorable because a decrease in sales leads to a more than proportional decrease in operating results" [4]. The same author highlights that the closer the organization's sales volume is to the break-even point, the higher the DOL will be.

3. Methodology

3.1. Research Objective

The present study aimed to verify the relationship between value creation generated by the sample companies and the operating risk they present, that is, to understand how the operating break-even point, operating margin of safety, and the degree of operating leverage influence the value of EVA®.

3.2. Research Method and Technical Procedures

With the research, it is intended to know and describe the objective under study [33]. The research is applied in terms of its nature and quantitative as to the approach to the problem. According to Prodanov and Freitas [33], in quantitative research, everything can be quantifiable, which means translating into numbers opinions and information and thus analyzing them. The use of statistical techniques was used, which, as considered by several authors like Prodanov and Freitas [33], constitutes an essential aid for research in social sciences.

As for the technical procedures, the bibliographic was used in the literature review, which was conducted from published material, like books and scientific articles [34]. In the empirical study, the case study was used as the technical procedure. The case study allows us to obtain and analyze information about a given object or group, in order to allow its broad and detailed knowledge, according to the objective of the research [35, 36].

3.3. Population, Sample and Period

The study's population consists of the companies listed in Euronext Lisbon [37], at the time of the study, since they are a group of companies of national reference from which it is possible to obtain the necessary financial information through their websites.

Financial companies, football clubs, CTT, companies that did not present value in some of the variables necessary for the study, as well as companies with negative equity, were removed from the population since they could distort the analysis of the values obtained for value creation. Thus, a final sample of 27 non-financial companies belonging to various sectors of activity was obtained, which corresponds to 69% of the population, as shown in Table 1. The sector of activity indicated corresponds to the Industry level, as classified on Euronext Lisbon according to the ICB (Industry Classification Benchmark).

The period analyzed corresponded to five years, starting from the last year available of consolidated annual reports, between 2014 and 2018.

Table 1. *Companies included in the sample.*

Company name	Industry
Altri	2000, Industrials
Cofina	5000, Consumer Services
Corticeira	3000, ConsumerGoods

Company name	Industry
EDP	7000, Utilities
EDP Renov	7000, Utilities
Estoril Sol	5000, Consumer Services
Galp	0001, Oil & Gas
Glintt	9000, Technology
Ibersol	5000, Consumer Services
Impresa	5000, Consumer Services
Inapa	1000, BasicMaterials
J. Martins	5000, Consumer Services
Média Capital	5000, Consumer Services
Mota Engil	2000, Industrials
Nos	5000, Consumer Services
Novabase	9000, Technology
Ramada	1000, BasicMaterials
Reditus	9000, Technology
REN	7000, Utilities
Semapa	1000, BasicMaterials
Sonae	5000, Consumer Services
Sonae Com	6000, Telecommunications
Sonae Ind.	2000, Industrials
Teixeira Duarte	2000, Industrials
The Navigator	1000, BasicMaterials
Toyota	2000, Industrials
Vista Alegre	3000, ConsumerGoods

Source: Authors' computation, data obtained in https://www.bolsadelisboa.com.pt/

3.4. Data Collection and Processing

The data needed for the study were obtained through the consolidated annual accounts reports of the sample companies. Data was also collected from Professor Aswath Damodaran's website, http://pages.stern.nyu.edu/~adamodar/.

The financial statements analyzed in the study refer to companies listed in Euronext Lisbon, and are therefore prepared in accordance with current accounting standards and subject to the auditing process. The consolidated annual accounts were previously prepared by the authors in order to meet the objective of the research, so in order to obtain the indicators that measure the operating risk, an income statement in variable costing was prepared, according to table 2, that shows the variable and fixed costs of the company. The functional balance sheet was also prepared, from the balance sheet included in the financial statements, to obtain the amount of invested capital necessary for the calculation of value creation. The data were processed using Microsoft Excel software.

Table 2. *Income statement in variable costing.*

	Amount	
	Year	Year
Revenue		
Variable costs		
Contribution margin		
Fixed costs		
Operating profit		

Source: Authors' computation.

The data were analyzed using statistical analysis techniques. Descriptive statistics were used to characterize the sample and the variables to be studied. The multivariate statistical analysis technique, multiple linear regression, was used to study the question that the study intends to answer. As stated by Pestana and Gageiro [38] multiple linear regression is a statistical, multivariate, descriptive, and inferential technique, which analyzes the relationship between a dependent variable (Y) and a set of independent variables (X's). It is, therefore, adequate to the objective of the study.

Statistical analysis was performed using statistical analysis software SPSS (Statistical Package for the Social Sciences). The level of significance (p-value) used to validate the tests was 0.05.

3.5. Calculation of Indicators

3.5.1. Value Creation - EVA®

The based-value performance measure used in value creation was EVA® because it is an easy-to-use value creation measure, which can be obtained through the accounting data available in public annual accounts reports, which can be applied to any type of company and because it is the most widely spread.

It was calculated using the formula (1), proposed by Stewart [18], already mentioned in the literature review: EVA® = NOPAT - (CI * C).

Stern Stewart & Co., owner of the registered trademark EVA® proposes some adjustments that should be made to the accounting statements, however, as already addressed in the literature review, several authors are of the opinion that only a few of the suggested adjustments are actually made, which does not distort the results obtained but may, in fact, render the calculation of EVA® too complex in a way that exceeds the benefit in its use as mentioned by several authors like Obaidat [6]. Thus, it was decided not to make the proposed adjustments.

For the calculation of EVA®, it is necessary to know the value of NOPAT, invested capital and the weighted average cost of capital (WACC).

NOPAT corresponds to the operating result of the activity, deducted from income tax and was obtained through the income statements.

The value of the total invested capital was obtained through the preparation of the functional balance sheet. This document allows obtaining the capital invested in the company's activity and how the company financed itself. The invested capital considered in the study corresponds to the sum of equity and financial debt. The simple average of the initial and final value of each economic year was used [28].

The cost of capital corresponds to the sum of the cost of the debt and the cost of equity. In its calculation, the weighted average cost of capital (WACC) was used, which was obtained through the following formula (10) [27]:

$$WACC = K_e \, x \, E / (D + E) + K_d \, x \, (1 - T) \, x \, D / (D + E) \quad (10)$$

where: E - Equity; D - Debt; K_e - Cost of equity rate; Kd - Cost of debt rate; T - Effective income tax rate.

The cost of debt rate was obtained through the quotient

between the interest expenses, indicated in the income statement and the value of the financial debt, obtained in the functional balance sheet (it was used the simple average of the initial and final value of each economic year).

The cost of equity is a cost that is not always possible to obtain through the information contained in the financial statements, so it had to be estimated. Thus, we used the mean value calculated by Professor Aswath Damodaran, available on his website, for Western Europe, by activity sector, whose rates are shown in Table 3. This equity cost rate was computed using CAPM model.

Table 3. *Cost of equity rate (K_e).*

Company name	2014	2015	2016	2017	2018
Altri	10.64%	10.70%	10.05%	8.40%	10.89%
Cofina	10.84%	9.56%	8.50%	8.82%	8.77%
Corticeira	8.11%	7.16%	7.55%	6.37%	7.27%
EDP	9.13%	9.10%	9.82%	9.21%	9.93%
EDP Renov	9.13%	9.10%	9.82%	9.21%	9.93%
Estoril Sol	9.79%	9.33%	7.93%	7.62%	8.96%
Galp	13.22%	15.78%	15.01%	13.61%	13.08%
Glintt	8.70%	8.19%	8.08%	8.22%	10.40%
Ibersol	9.07%	8.48%	7.61%	7.21%	7.97%
Impresa	12.51%	9.96%	9.19%	9.56%	9.53%
Inapa	9.66%	8.75%	8.98%	7.14%	9.03%
J. Martins	10.00%	10.85%	9.75%	8.12%	8.13%
Média Capital	12.51%	9.96%	9.19%	9.56%	9.53%
Mota Engil	11.56%	11.11%	9.86%	9.46%	10.75%
Nos	10.32%	10.84%	13.20%	11.74%	11.13%
Novabase	8.70%	8.19%	8.08%	8.22%	10.40%
Ramada	13.51%	13.14%	12.37%	10.35%	12.28%
Reditus	8.70%	8.19%	8.08%	8.22%	10.40%
REN	9.13%	9.10%	9.82%	9.21%	9.93%
Semapa	10.64%	10.70%	10.05%	8.40%	10.89%
Sonae	10.00%	10.85%	9.75%	8.12%	8.13%
Sonae Com	12.43%	10.58%	10.68%	9.10%	10.01%
Sonae Ind.	11.56%	11.11%	9.86%	9.46%	10.75%
Teixeira Duarte	11.56%	11.11%	9.86%	9.46%	10.75%
The Navigator	10.64%	10.70%	10.05%	8.40%	10.89%
Toyota	14.54%	13.33%	13.71%	12.57%	11.64%
Vista Alegre	7.81%	9.07%	8.86%	7.79%	8.58%

Source: Authors' computation, data obtained in http://pages.stern.nyu.edu/~adamodar/.

Table 4 shows the values obtained for EVA®, considering the assumptions made in its calculation, as described above.

Table 4. *EVA® values per company.*

Thousand of Euros.

Company name	Industry	Economic value added (EVA®)				
		2014	2015	2016	2017	2018
Altri	2000, Industrials	1572	89,763	44,780	76,154	117,874
Cofina	5000, Consumer Services	4,196	3,813	4,510	3,309	3,903
Corticeira	3000, ConsumerGoods	17,187	32,454	40,176	49,888	45,790
EDP	7000, Utilities	-53,029	79,304	48,183	238,417	-536,293
EDP Renov	7000, Utilities	-369,294	-292,236	-445,314	-136,906	-280,859
Estoril Sol	5000, Consumer Services	-6,410	-601	2,476	7,586	7,845
Galp	0001, Oil & Gas	-796,924	-794,793	-736,710	-245,719	23,527
Glintt	9000, Technology	-8,526	-13,281	-3,556	-5,414	-7,082
Ibersol	5000, Consumer Services	-2,882	1,950	6,459	19,574	8,503
Impresa	5000, Consumer Services	-4,682	-7,135	-9,565	-31,369	-8,522
Inapa	1000, BasicMaterials	-15,167	-12,629	-14,379	-10,884	-17,420
J. Martins	5000, Consumer Services	154,975	20,370	443,283	247,806	268,426
Média Capital	5000, Consumer Services	274	4,029	7,148	7,021	8,186
Mota Engil	2000, Industrials	112,301	18,166	-18,798	57,355	38,849
Nos	5000, Consumer Services	-24,888	-29,478	-38,989	-16,357	30,399
Novabase	9000, Technology	-3,781	-680	-6,256	-1,419	-2,875
Ramada	1000, BasicMaterials	564	1,937	3,437	5,024	-7,414
Reditus	9000, Technology	-2,095	-2,566	-4,694	-3,321	-5,218
REN	7000, Utilities	1,208	21,809	-4,233	13,159	-34,609
Semapa	1000, BasicMaterials	-29,349	35,619	11,163	99,027	74,515
Sonae	5000, Consumer Services	-94,442	-113,049	-73,100	-81,824	-86,027

Company name	Industry	Economic value added (EVA®)				
		2014	2015	2016	2017	2018
Sonae Com	6000, Telecommunications	-134,962	-115,541	-121,596	-102,267	-113,007
Sonae Ind.	2000, Industrials	-35,097	-11,368	-6,561	-799	-8,857
Teixeira Duarte	2000, Industrials	-1,688	-32,040	8,804	12,192	-25,236
The Navigator	1000, BasicMaterials	25,955	70,873	39,132	105,287	103,910
Toyota	2000, Industrials	-14,761	-10,823	-11,300	-6,367	-2,972
Vista Alegre	3000, ConsumerGoods	-8,964	-4,505	-1,101	-215	1,981

Source: Authors' computation.

From the analysis of table 4, which shows the values of EVA®, in thousands of Euros, in the years 2014 to 2018, of the companies in the sample, we can see that 10 companies present a negative value of EVA®, in any of the years, therefore have destroyed value. On the other hand, six companies present, in any of the years, positive values of EVA®, that is, they have created value.

3.5.2. Indicators Used in Operating Risk Analysis

As mentioned before, to obtain the values of the operating risk indicators, an income statement in variable costing was prepared with variable and fixed costs for each company. As this study is being conducted from an external analyst perspective, information on fixed and variable costs is not available, so it was necessary to estimate them.

The cost of goods sold, and the materials consumed (COGS) is usually considered a variable cost [28]. According to the same author, external supplies and services (ESS), may include fixed and variable costs, in this case, we chose to consider them as variable costs in its entirety. The remaining operating costs, such as personnel expenses, taxes, impairments, provisions, and amortizations and depreciations, were considered in their entirety as fixed costs.

To measure the operating risk, the operating break-even point (BEP), the margin of safety (MS) in % and value and the degree of operating leverage (DOL) were used, as analyzed in the literature review.

The operating break-even point was calculated as per formula (6), which values are presented in table 5.

Table 5. *Break-even Point (BEP).*

Thousand of Euros.

Company name	Industry	Break-even point				
		2014	2015	2016	2017	2018
Altri	2000, Industrials	306,656	241,203	267,633	244,611	259,207
Cofina	5000, Consumer Services	77,921	73,391	72,891	69,892	61,099
Corticeira	3000, ConsumerGoods	389,810	418,460	384,468	441,311	504,311
EDP	7000, Utilities	9,179,402	8,892,135	8,641,408	9,842,460	10,709,016
EDP Renov	7000, Utilities	798,997	1,007,954	1,021,358	954,417	966,309
Estoril Sol	5000, Consumer Services	169,779	182,254	186,455	203,097	215,848
Galp	0001, Oil & Gas	15,548,809	11,249,562	9,287,546	8,416,963	7,546,098
Glintt	9000, Technology	73,406	76,919	60,393	69,360	83,888
Ibersol	5000, Consumer Services	165,186	175,825	219,164	377,881	388,146
Impresa	5000, Consumer Services	162,900	177,670	170,358	234,692	139,665
Inapa	1000, BasicMaterials	852,597	823,595	808,113	798,114	793,819
J. Martins	5000, Consumer Services	9,278,562	11,188,567	9,772,779	12,154,730	13,221,900
Média Capital	5000, Consumer Services	114,995	111,859	106,818	100,723	107,659
Mota Engil	2000, Industrials	1,631,733	1,889,239	2,028,784	2,055,214	2,278,049
Nos	5000, Consumer Services	1,068,566	1,107,806	1,174,815	1,230,775	1,133,603
Novabase	9000, Technology	206,692	210,875	132,379	127,282	139,057
Ramada	1000, BasicMaterials	62,862	63,515	78,760	91,587	78,587
Reditus	9000, Technology	109,170	108,396	44,903	40,253	32,822
REN	7000, Utilities	462,088	523,885	460,889	461,068	474,290
Semapa	1000, BasicMaterials	1,336,353	1,386,626	1,484,635	1,466,154	1,505,546
Sonae	5000, Consumer Services	4,590,333	4,924,664	5,273,980	5,822,113	5,298,795
Sonae Com	6000, Telecommunications	120,340	148,814	165,248	163,697	194,199
Sonae Ind.	2000, Industrials	972,148	932,563	167,454	157,685	166,030
Teixeira Duarte	2000, Industrials	1,140,477	1,167,124	828,968	799,330	814,560
The Navigator	1000, BasicMaterials	827,680	832,884	958,932	914,200	936,731
Toyota	2000, Industrials	279,058	304,660	326,246	349,763	388,400
Vista Alegre	3000, ConsumerGoods	76,220	75,280	69,793	73,380	83,172

Source: Authors' computation.

From the analysis of table 5 that presents the values (in thousands of Euros) of the operating break-even point of the companies in the sample for the period 2014 to 2018, we can see that, when we compare the first year (2014) with the last year (2018) of the study, 11 of the companies saw a reduction in the value of sales for which the result is zero, therefore they show a greater ease in reaching the operating break-even point and therefore, present greater facility to achieve

positive results. Therefore, these companies present less operating risk.

The operating margin of safety was calculated in value and % according to the formulas (7) and (8) respectively, and the values obtained that are shown in Table 6.

Table 6. *Margin of safety in value and % (MS and MS%).*

Thousand of Euros %.

Company name	Industry	Operating safety margin				
		2014	2015	2016	2017	2018
Altri	2000, Industrials	246,202	423,622	344,863	412,234	525,624
Cofina	5000, Consumer Services	28,157	26,421	25,043	20,643	27,540
Corticeira	3000, ConsumerGoods	189,591	213,462	254,181	277,578	302,524
EDP	7000, Utilities	7,516,759	7,449,548	6,359,008	6,940,526	5,142,604
EDP Renov	7000, Utilities	524,627	696,255	689,308	967,710	922,337
Estoril Sol	5000, Consumer Services	5,942	10,615	12,408	18,425	20,300
Galp	0001, Oil & Gas	2,577,662	4,367,120	3,953,046	6,893,037	9,776,902
Glintt	9000, Technology	10,217	-5,109	9,669	6,147	7,265
Ibersol	5000, Consumer Services	24,405	40,083	53,778	86,209	73,093
Impresa	5000, Consumer Services	74,880	53,252	35,639	-36,427	32,498
Inapa	1000, BasicMaterials	89,920	86,128	73,705	116,152	94,024
J. Martins	5000, Consumer Services	3,401,653	2,318,715	5,070,567	4,149,458	4,134,806
Média Capital	5000, Consumer Services	64,778	62,297	66,677	64,740	74,150
Mota Engil	2000, Industrials	730,079	478,632	210,529	490,100	562,554
Nos	5000, Consumer Services	315,368	336,499	334,206	331,007	436,117
Novabase	9000, Technology	15,934	20,517	3,229	12,179	11,555
Ramada	1000, BasicMaterials	49,799	51,145	57,579	66,633	50,846
Reditus	9000, Technology	10,824	10,169	-15	1,794	-377
REN	7000, Utilities	293,534	294,492	277,248	281,549	247,129
Semapa	1000, BasicMaterials	705,936	819,209	658,744	734,904	794,399
Sonae	5000, Consumer Services	906,291	773,357	860,667	681,640	830,614
Sonae Com	6000, Telecommunications	842	-16,928	-37,758	-21,476	-22,411
Sonae Ind.	2000, Industrials	74,961	118,467	78,621	80,441	64,496
Teixeira Duarte	2000, Industrials	561,533	324,147	404,791	305,042	180,891
The Navigator	1000, BasicMaterials	731,464	839,300	656,560	725,673	818,314
Toyota	2000, Industrials	33,483	57,051	53,584	89,979	105,661
Vista Alegre	3000, ConsumerGoods	-8,513	1,451	8,350	14,470	22,737

Company name	Industry	SM %				
		2014	2015	2016	2017	2018
Altri	2000, Industrials	44.53%	63.72%	56.30%	62.76%	66.97%
Cofina	5000, Consumer Services	26.54%	26.47%	25.57%	22.80%	31.07%
Corticeira	3000, ConsumerGoods	32.72%	33.78%	39.80%	38.61%	37.50%
EDP	7000, Utilities	45.02%	45.59%	42.39%	41.35%	32.44%
EDP Renov	7000, Utilities	39.64%	40.86%	40.29%	50.35%	48.84%
Estoril Sol	5000, Consumer Services	3.38%	5.50%	6.24%	8.32%	8.60%
Galp	0001, Oil & Gas	14.22%	27.96%	29.86%	45.02%	56.44%
Glintt	9000, Technology	12.22%	-7.11%	13.80%	8.14%	7.97%
Ibersol	5000, Consumer Services	12.87%	18.56%	19.70%	18.58%	15.85%
Impresa	5000, Consumer Services	31.49%	23.06%	17.30%	-18.37%	18.88%
Inapa	1000, BasicMaterials	9.54%	9.47%	8.36%	12.70%	10.59%
J. Martins	5000, Consumer Services	26.83%	17.17%	34.16%	25.45%	23.82%
Média Capital	5000, Consumer Services	36.03%	35.77%	38.43%	39.13%	40.78%
Mota Engil	2000, Industrials	30.91%	20.21%	9.40%	19.25%	19.80%
Nos	5000, Consumer Services	22.79%	23.30%	22.15%	21.19%	27.78%
Novabase	9000, Technology	7.16%	8.87%	2.38%	8.73%	7.67%
Ramada	1000, BasicMaterials	44.20%	44.61%	42.23%	42.11%	39.28%
Reditus	9000, Technology	9.02%	8.58%	-0.03%	4.27%	-1.16%
REN	7000, Utilities	38.85%	35.98%	37.56%	37.91%	34.26%
Semapa	1000, BasicMaterials	34.57%	37.14%	30.73%	33.39%	34.54%
Sonae	5000, Consumer Services	16.49%	13.57%	14.03%	10.48%	13.55%
Sonae Com	6000, Telecommunications	0.69%	-12.84%	-29.62%	-15.10%	-13.05%
Sonae Ind.	2000, Industrials	7.16%	11.27%	31.95%	33.78%	27.98%
Teixeira Duarte	2000, Industrials	32.99%	21.74%	32.81%	27.62%	18.17%
The Navigator	1000, BasicMaterials	46.91%	50.19%	40.64%	44.25%	46.63%
Toyota	2000, Industrials	10.71%	15.77%	14.11%	20.46%	21.39%
Vista Alegre	3000, ConsumerGoods	-12.57%	1.89%	10.69%	16.47%	21.47%

Source: Authors' computation.

The analysis of table 6, where the absolute value (thousands of Euros) and the relative value of the operating margin of safety for the five years of the study, carried out in the sample companies, show that in 2014 only one company is selling below the operating break-even point and therefore, presents a negative value. On the other hand, in the other 4 years, the number of companies that have sales volume below the sales of the operating break-even point are two, being verified that the company of the Industry "Telecommunications" group presents in the last 4 years, always a negative operating margin of safety and therefore, has a volume of sales insufficient to have income.

From the analysis of the operating margin of margin in percentage, it is noteworthy that, of the companies that sell above the break-even point, the one with the lowest value is Estoril Sol, belonging to the Industry, "Consumer Services", with 3.38% in 2014 and the one with the highest value is Altri, which belongs to the Industry, "Industrials", which in 2018 presents an operating margin of safety of 66.97%, that is, it is the one that presents the lowest risk, given that, to have results equal to zero, its sales have to decrease this percentage value.

The degree of operating leverage (DOL) was obtained by the formula (9), which values are shown in Table 7.

Table 7. *Degree of Operating Leverage (DOL).*

Company name	Industry	Degree of operating leverage (DOL)				
		2014	2015	2016	2017	2018
Altri	2000, Industrials	2.25	1.57	1.78	1.59	1.49
Cofina	5000, Consumer Services	3.77	3.78	3.91	4.39	3.22
Corticeira	3000, ConsumerGoods	3.06	2.96	2.51	2.59	2.67
EDP	7000, Utilities	2.22	2.19	2.36	2.42	3.08
EDP Renov	7000, Utilities	2.52	2.45	2.48	1.99	2.05
Estoril Sol	5000, Consumer Services	29.57	18.17	16.03	12.02	11.63
Galp	0001, Oil & Gas	7.03	3.58	3.35	2.22	1.77
Glintt	9000, Technology	8.18	-14.06	7.25	12.28	12.55
Ibersol	5000, Consumer Services	7.77	5.39	5.08	5.38	6.31
Impresa	5000, Consumer Services	3.18	4.34	5.78	-5.44	5.30
Inapa	1000, BasicMaterials	10.48	10.56	11.96	7.87	9.44
J. Martins	5000, Consumer Services	3.73	5.83	2.93	3.93	4.20
Média Capital	5000, Consumer Services	2.78	2.80	2.60	2.56	2.45
Mota Engil	2000, Industrials	3.24	4.95	10.64	5.19	5.05
Nos	5000, Consumer Services	4.39	4.29	4.52	4.72	3.60
Novabase	9000, Technology	13.97	11.28	41.99	11.45	13.03
Ramada	1000, BasicMaterials	2.26	2.24	2.37	2.37	2.55
Reditus	9000, Technology	11.09	11.66	-2,942.12	23.43	-86.12
REN	7000, Utilities	2.57	2.78	2.66	2.64	2.92
Semapa	1000, BasicMaterials	2.89	2.69	3.25	3.00	2.90
Sonae	5000, Consumer Services	6.06	7.37	7.13	9.54	7.38
Sonae Com	6000, Telecommunications	143.98	-7.79	-3.38	-6.62	-7.67
Sonae Ind.	2000, Industrials	13.97	8.87	3.13	2.96	3.57
Teixeira Duarte	2000, Industrials	3.03	4.60	3.05	3.62	5.50
The Navigator	1000, BasicMaterials	2.13	1.99	2.46	2.26	2.14
Toyota	2000, Industrials	9.33	6.34	7.09	4.89	4.68
Vista Alegre	3000, ConsumerGoods	-7.95	52.87	9.36	6.07	4.66

Source: Authors' computation.

Table 7 shows the value of the degree of operating leverage of the companies in the sample, for the period from 2014 to 2018. Neves [5] states that DOL "will be as higher as closest the company's sales volume to the operating break-even point" and that some authors prefer to work with break-even point and margin of safety to measure operating risk.

4. Results

The study's objective is to understand how break-even point, the margin of safety and degree of operating leverage influence EVA® and whether it is somehow possible to build a multiple linear regression model that enables to predict the value of EVA® through these variables.

The analysis was performed globaly and by sector, however, due to the small dimension of the sectors, in order to ensure asymptotic normality, only two of them were analyzed, sector 5000 - Consumer services and Sector 2000 - Basic materials.

We start by making a brief statistical description of the variables involved. Table 8 shows the statistics for the entire sample, and in tables 9 and 10 for each of the sectors analyzed individually.

Table 8. *Statistics - Global Sample.*

		EVA®	BEP	MS	DOL
N	Valid	135	135	135	135
	Missing	0	0	0	0
Mean		-24268.139	1767964.386	803607.648	-15.992

	EVA®	BEP	MS	DOL
Standard Deviation	155635.572	3270915.634	1765458.263	254.232
Minimum	-796924.211	32821.929	-37757.7494	-2942.124
Maximum	443282.777	15548809.148	9776901.798	143.977

Source: Authors' computation.

Table 9. *Statistics - Sector 5000 - Consumer Services*

		EVA®	BEP	MS	DOL
N	Valid	40	40	40	40
	Missing	0	0	0	0
Mean		15918.041	2282703.907	646162.806	6.058
Standard Deviation		100224.750	3800814.973	1283697.768	5.443
Minimum		-113048.523	61099.011	-36426.915	-5.443
Maximum		443282.777	13221900.443	5070566.651	29.571

Source: Authors' computation.

Table 10. *Statistics - Sector 2000 - Basic Materials.*

		EVA®	BEP	MS	DOL
N	Valid	25	25	25	25
	Missing	0	0	0	0
Mean		16185.657	799871.830	278303.585	4.894
Standard Deviation		43500.734	683592.500	204631.817	3.086
Minimum		-35097.368	157684.815	33483.497	1.493
Maximum		117874.126	2278048.513	730079.370	13.969

Source: Authors' computation.

Through a brief analysis of the descriptive statistics measures, it is easily observed that in any of the cases studied, and for all the variables involved, there is a great dispersion of the data which will affect the construction of the estimated linear regression model and consequently its quality. With regard to the DOL variable, the existence of several "outliers″(moderate and severe) was also detected, which were most likely the cause of this variable not being statistically significant in any of the models.

We also emphasize that although in the global sample, the value of EVA® is negative, the same does not happen in the two sectors evaluated individually.

In a first approach, a model was built considering all the information collected (n=135, and the variables BEP, MS and DOL):

$$EVA® = b_0+b_1*BEP+b_2*MS+b_3DOL \quad (11)$$

We found that in any of the cases studied (global, sector 2000-Basic Materials, sector 5000-Consumer Services) the independent variable DOL was never considered statistically significant, so the option was to remove it from the model.

In this way, the final model became:

$$EVA® = b_0+b_1*BEP+b_2*MS \quad (12)$$

We now present the results associated with the global sample.

Table 11. *Model adjustment.*

Model	R	Square R	Square r set	Default estimation error
1	.321[a]	.103	.090	148506.360

a. Predictors: (Constant), MS, BEP.
Source: Authors' computation.

Table 12. *Coefficients[a].*

Model		Non-standard coefficients		Standardized coefficients	t	Himself.
		B	Error Error	Beta		
1	(Constant)	-3358.012	14543.299		-.231	.818
	BEP	-.026	.007	-.536	-3.705	.000
	MS	.030	.013	.342	2.360	.020

a. Dependent Variable: EVA®.
Source: Authors' computation.

Through the analysis of table 11 and table 12, we can conclude that the two independent variables are individually significant at a significance level of 0.05, thus concluding that the model is globally significant. The coefficient of determination (whose value is 0.103), is relatively low but follows the patterns of the analyses involving this type of

variables. This value is also due to the fact that in the sample very diverse sectors of activity are involved.

Regarding the estimated model:

$$EVA® = -3358,012 - 0,026*BEP0,03*MS \quad (13)$$

We emphasize that the signs of the estimated regression coefficients for both independent variables are as expected. Interpreting the model obtained, we have that for the increase of 1 thousand Euros in the BEP, the EVA® will decrease 0.026 thousand of Euros, keeping the MS unchanged; similarly, for the increase of 1 thousand euros in the MS, the EVA® will increase 0.03 thousand Euros, keeping the PBEP unchanged.

Since the quality of the adjustment of the model obtained was not the best it was decided to make an analysis by sector. We found that by dividing the sample by sectors only for sector 5000 - Consumer Services we were able to obtain a sub-sample greater than 30 (40 observations), necessary to ensure asymptotic normality, given that the data do not have a Normal distribution.

We now present the results obtained for sector 5000 - Consumer Services.

Table 13. *Model adjustment.*

Model	R	Square R	Square r set	Default estimation error
1	.961[a]	.924	.920	28324.654
a. Predictors: (Constant), MS, BEP				

Source: Authors' computation.

Table 14. *Coefficients[to].*

Model		Non-standard coefficients		Standardized coefficients	t	Himself.
		B	Error Error	Beta		
1	(Constant)	-8703.518	5280.151		-1.648	.108
	BEP	-.034	.003	-1.283	-10.696	.000
	MS	.158	.009	2.018	16.832	.000

a. Dependent Variable: EVA®.
Source: Authors' computation.

Given these results observed in tables 13 and 14, we can conclude that working by sector allows us to obtain a model with much better quality. The coefficient of determination, whose value is 0.924, is excellent, and we can state that the model can explain approximately 92% of the variation in the value of EVA®. Clearly, a statistically significant model was obtained, with both variables also individually significant for any of the usual significance levels.

For the model obtained:

$$EVA® = -8703,518 - 0, 034*BEP+0,158*MS \quad (14)$$

We emphasize that the signs of the regression coefficients estimated for both independent variables are as expected. As for the interpretation of the model obtained, we have that for the increase of 1 thousand Euros in the BEP, the value of EVA® will decrease 0.034 thousands of Euros, keeping the MS unchanged; analogously, for the increase of 1 thousand Euros in the MS the value of EVA® will increase 0.158 thousands of Euros, keeping the BEP unchanged.

We then decided to analyze the model behavior for the 2000-Basic Materials sector, although, in this case, we have a sample of only 25 observations. The results obtained were as follows:

Table 15. *Model adjustment.*

Model	R	Square R	Square r set	Default estimation error
1	.846[a]	.716	.690	24225.498

a. Predictors: (Constant), MS, BEP.
Source: Authors' computation.

Table 16. *Coefficients[to].*

Model		Non-standard coefficients		Standardized coefficients	t	Himself.
		B	Error Error	Beta		
1	(Constant)	-18584.445	8663.210		-2.145	.043
	BEP	-.031	.009	-.488	-3.595	.002
	MS	.214	.029	1.008	7.422	.000

a. Dependent Variable: EVA®.
Source: Authors' computation.

The analysis of the two previous tables (table 15 and table 16) allows us to conclude that also in this sector the quality of the adjustment is quite good, the coefficient of determination, whose value is 0.846, allows to say that the estimated model can explain approximately 85% of the EVA® value's variation. We continue to obtain a globally

significant model, with both independent variables individually significant for any of the usual significance levels.

For the estimated model:

$$EVA® = -18584.445 - 0{,}031*PCV+0{,}214*MS \quad (15)$$

Again, it is verified that the signs of the regression coefficients estimated for both independent variables are as expected. Interpreting the model obtained, we have that to increase 1 thousand Euros in BEP, the value of EVA® will decrease 0.031 thousand of Euros, keeping the MS unchanged; similarly, for the increase of 1 thousand Euros in the MS the value of EVA® will increase 0.214 thousand of Euros, keeping the BEP unchanged.

It was decided not to analyze any more sectors as the sample size for any of them is very small.

Given the results obtained we believe we can conclude that the estimated model allows us to evaluate the impact that the variables BEP and MS have on the variation of the value of EVA®, thus obtaining a model that allows us to estimate, with some quality, the value of EVA®. It also allowed us to conclude that the analysis will have to be done by sector or using another variable that divides companies taking into account some common characteristics between them. Analyzing globally, companies with very diverse characteristics will hardly allow building a model with quality.

5. Conclusion

The study aimed to analyze the relationship between value creation generated in the sample companies and the operating risk they present. It began with a literature review on EVA® as an indicator to measure value creation and on operating risk, where it was characterized and presented the operating break-even point, the operating margin of safety, and the degree of operating leverage, as indicators to measure, this risk.

Subsequently, after the presentation of the methodology, which showed the population and the sample of the case study, a multiple linear regression model was performed based on the calculations of the values obtained for EVA®, break-even point and the margin of safety, since the degree of operating leverage was abandoned, because it was not statistically significant. The abandonment of this indicator does not influence the validity of the study, because the degree of operating leverage "will be as higher as closest the company's sales volume to the operating break-even point" so, some authors prefer to work with the break-even point and margin of safety [5].

The study concluded that the estimated model allowed, with very reasonable quality, to estimate the impact that the break-even point and the margin of safety variables have on the variation of the value of EVA®. The results obtained indicate that an increase in break-even point will have a negative impact on the value of EVA®, while an increase in the margin of safety will have a positive impact on the value of EVA®. The study also allowed us to conclude that the analysis will have to be made by sector or by using another variable that divides the companies taking into account some common characteristics between them. Analyzing globally, companies with very diverse characteristics will hardly allow building a model with good quality.

The study's limitation was the sample size, which because it was too small invalidated to perform statistical analysis for all sectors. Also, the large dispersion of the data conditioned the results. In terms of future research, it is recommended to work with a larger sample. A larger sample will allow to group companies with similar characteristics, thus trying to reduce data dispersion.

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