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Practical Model for Firm's Capital Structure

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***Abstract*—** *Since they offer an opportunity to create value for shareholders, a company's capital structure decision is crucial for its existence and performance and, therefore, has been addressed by several studies in the finance area. However, there is no unanimous answer determining the most efficient capital structure for a given organization and there is a lack of evidence regarding the use of optimal structure models in the daily lives of companies. The methodology in this work is composed of four phases to propose a practical method for decision-making on a company's structure. First, it is defined the problem that will be simulated. Then, using the FCD and SMC techniques, the company's value is calculated and the insolvency risk is quantified. And finally, in the fourth phase, discussions are developed regarding the ideal capital structure for the company. The results simulated through the selection of an object study show the increase in the company's value from indebtedness, presenting opportunities to create value for its managers.The model has as a limitation the case study of only one segment, and can be expanded to other sectors in future works.Still, the proposal must be understood as beneficial for all stakeholders involved, since more competitive companies can provide products and/or services with superior quality and lower prices, being, therefore, a direct social contribution of the present proposal.*

I. INTRODUCTION

The capital requirement of a company can be met by external capital or internal capital and its proportions represent the capital structure of the company (Anastasia and Lorenza, 2019). According to Ehrhardt and Brigham (2011), a company's capital structure decision is crucial for its existence and performance.

Opler, Saron and Titman (1997) highlight that capital structure decisions offer an opportunity to create value for shareholders. Certain technical attributes are relevant when companies select their capital structure (Perobelli and Famá, 2003; Serrasqueiro, Armada and Nunes, 2011). For Perobelli and Famá (2003), among them are: the size of the company; degree of business growth; asset structure (tangible versus intangible); uniqueness of the products

offered; profitability; and volatility of operating results, among others. These attributes are capable of influencing the costs and benefits associated with the issue of shares or debt. In this context, it is noted that the optimal capital structure is highly complex and finding the structure that will minimize the company's cost of capital and, consequently, maximize the company's value has been debated by several authors since the pioneering work of Modigliani and Miller (1958).

Several approaches on the subject have been developed.Nevertheless, there is no unanimous response determining the most efficient capital structure for a given organization. For Graham and Leary (2011), research is being developed, mainly in two traditional views. The first concerns the trade-off theory in which companies seek the leverage that optimizes the benefits and costs of the debt. The second view refers to the pecking order of Myers and Majluf (1984) and Myers (1984), a theory that suggests that there is a hierarchy to minimize the costs of financing assets. Thus, Myers (1984) argues that companies initially prefer to reinvest their profits and, when these funds are exhausted, they resort to financing with bank debts and finally, to the stock market.

In relation to the trade-off theory, it is assumed that there is an optimal capital structure capable of maximizing the company's value, considering the tax benefits of debt and the costs of financial difficulties that may arise with indebtedness. This type of decision must take numerous factorsinto account, such as the direct and indirect costs of a possible bankruptcy (e.g.bankruptcy cost and operational weakness), conflict of information, tax savings provided by debt contraction and transaction cost, among others.

The contradiction created by the benefits and disadvantages of the debt opened the possibility for the present research to analyze the maximum level of indebtedness that would provide the optimization of the value of a firm. Therefore, the possible risk of bankruptcy is taken into account, which would result in extra costs for the company as well as a reduction in its value given the increased return required by the company's internal and external financers in addition to its operational weakness.

Therefore, the objective of this article is to propose a practical method for decision making regarding the company's capital structure by using the Discounted Cash Flow (DCF) technique and risk quantification through the Monte Carlo Simulation (SMC). As the object of study and simulation of the proposed method, Grendene, a company listed on the Brazilian stock exchange inserted in the footwear segment,which features a low financial leverage policy with a debt level below 1%, was selected,.

The main empirical contributions of this article refer to the methodology developed in order to assist managers in making capital structure decisions, using concepts of company valuation and respecting indebtedness limits while avoiding situations of financial difficulties and potential operational weakening. Methodologically, the article proposes a structure of wide application for all segments of companies, contributing directly to the reduction of the company's cost of capital and, development of more competitive companies in the creation of value. Therefore, this contribution favors consumers and society as a whole on another level, creating a sustainable synergy between institutions and consumers.

In addition, this article uses the concepts of risk, through Value at Risk (VaR) and Conditional Value at Risk (CVaR), in the context of the company's cash flow.

This article is divided as follows: in the second chapter, a review of the trade-off theory and studies using VaR and CVaR are presented. Then, the proposed model to aid decision making is presented in chapter three. In the fourth chapter, a study developed in order to test the applicability of the proposed model and its results are discussed. Finally, conclusions related to the proposed model along with its advantages and limitations are exposed.

II. LITERATURE REVIEW

2.1 Trade-off

As previously mentioned, the trade-off theory assumes that there is an optimum level of indebtedness that maximizes the value of companies, considering the costs and benefits arising from indebtedness. According to Sardo and Serrasqueiro (2017), the trade-off theory suggests that companies adjust their debt level through an ideal debt target. Debts are usually less costly ways of financing the company than using equity since interest is tax deductible and dividends are not (Opler, Saron and Titman, 1997). However, Myers (1984) explained that despite the aforementioned tax benefit resulting from indebtedness, the increased cost of financial difficulty must be taken into account. In this context, Myers (1977) reports for a common mistake when underestimating such costs as compared with the costs saved with the indebtedness.

Despite the existence of numerous applied studies, empirical research generally diverges regarding the determinants of the capital structure regarding the trade-off theory (Bastos and Nakamura, 2009). One of the most famous discussions on the subject is reported in Modigliani and Miller (1958) and likewise in Modigliani and Miller (1963)years later. In the first approach, the authors considered that the market value of each company

is independent of its capital structure. However, in the article published in 1963, the authors relaxed the assumption of perfect competition and recognized the tax advantage caused by indebtedness as well as the existence of other relevant factors in financial decisions.

In their work, Opler, Saron and Titman (1997) sought the optimal capital structure of companies via a model that found the financing mix which minimized the discounted sum of future tax payments, costs of financial difficulties and costs of financing. 10,000 iterations were carried out through SMC with 20-year projections. The authors conclude that leveraged companies lose more value in the face of the market crisis when compared to conservative companies. In addition, Opler, Saron and Titman (1997) claim that the financial difficulties are reflected in the stakeholders (suppliers, workers, and customers) since suppliers do not extend credits to these companies leaving workers to require higher wages and customers are not willing to paying high prices for the product.

Serrasqueiro, Armada and Nunes (2011) used a sample of small and medium-sized companies (SMEs) and large companies to analyze whether there was a difference in their capital structure decisions through the theory of trade-off and pecking order. The authors concluded that capital structure decisions in SMEs are considerably different from other types of companies since SMEs resort to debt more as a consequence of the lack of internal cash for financing and less concern with the objective of reaching the ideal debt index.Therefore, SMEs are closer to the assumptions of the pecking order theory than the trade-off ones.

Through a link between agency theory and capital structure, Chang, Chou and Huang (2014) used dynamic models to examine the influence of corporate governance practices on the speed of adjustment of the capital structure in cases in which companies have alevel of indebtedness that is far from ideal. Thus, using a regression model, the authors concluded that weak governance firms, whether over-leveraged or under-leveraged, adjust more slowly when compared to firms with strong governance.

In turn, Devos, Rahman and Tsang (2017) examined the speed of adjustment of the capital structure, conditioned to the existence of covenants related to a company's debt structure. The test results show that the speed of adjustment is hindered by the restrictive debt clauses. The authors find that the speed of adjustment in relation to the company's optimal debt ratio is about 10 to 13% lower when a company has covenants compared to companies that do not.

Fischer, Heinkel and Zechner (1989) developed a dynamic capital structure decision model taking into account recapitalization costs. Therefore, capital structure decisions depend on the tax benefits of indebtedness and the potential cost of indebtedness in addition to financial difficulties, asset variability, interest rates and recapitalization costs.

2.2 *VaReCVaR*

The VaR measure was developed to obtain the maximum potential for a loss or worse outcome for an investment in a certain period of time within a confidence level of interest to the decision maker, such as 1% or 5% (Bilan et al., 2020 and Charnes, 2007). According to Charnes (2007), VaR can be used by both regulators and managers as a basis for risk-management decision making.

However, VaR does have some disadvantages. Sharifi, Kwon and Jardini (2016) highlighted that the referred technique presented limitations of applicability and difficulties in optimization scenarios. Charnes (2007) reported that the VaR did not present information on the extent of the loss that could occur above the threshold level. To overcome these limitations, CVaR can be used, especially in cases in which the analyzed returns are not normally distributed. CVaR can be simply defined as the average of all values in addition to VaR (Sharifi, Kwon and Jardini, 2016 and Charnes, 2007).

Additionally, there are several studies found in the literature that have used these techniques in the most varied objects of studies. Nakamura, Martin and Kayo (2004) proposed a practical model to be implemented by the financial managers of companies to find the level of indebtedness that maximizes the value of the company so as not to exceedthe present value of the operating cash flow of the companyfor a given confidence level. In order to find the maximum loss expected from an investment given a confidence level of (95%) and a predetermined period, the authors used the concept of VaR in the context of the company's operational activity.

Based on the scenario of major crises faced by the real estate market, Barañano, De La Peña and Moreno (2020) assessed the risk of this market using an internal model in conjunction with VaR for a confidence level of 99.5%, obtained through SMC.

Li and Cai (2017) proposed a multi-objective optimization structure to determine the capital structure for private financing in infrastructure projects in order to align the interests of creditors and shareholders. The methodology used by the authors consisted of three stages. The first involved the use of SMC for project valuation and CVaR to measure project risk. In the second stage, the authors develop a multi-objective optimization problem in which the first objective is to maximize the net present value while minimizing the at-risk cash flow from the

shareholder's perspective. The second objective was to maximize the rate of return on loans while minimizing the risk of default by shareholders from the lender's point of view. In the third phase, the authors carried out a sensitivity analysis in order to provide managerial and financial information.

Sharifi, Kwon and Jardini (2016) presented a stochastic approach based on programming for the evaluation of performance-based contracts. In this study, VaR and CVaR risk measures were computed for different levels of budgets in order to provide estimates of the worst case of expected operational availability of contracts for certain confidence levels.

III. RESEARCH METHOD

This section intends to describe the proposed method which, inspired by the work developed by Nakamura, Martin and Kayo (2004), consists of proposing a framework to find the capital structure that will allow the company to maximize its value, taking into account that excessive levels of indebtedness can cause high costs associated with financial difficulties and operational weakness. Thus, indebtedness must respect, within a degree of probabilistic confidence, the maximum level that ensures the company's solvency situation.

This approach aims to support decision making in providing a support structure for managers to find the level of capital structure that will allow maximization of the company's value while guaranteeing its solvency situation. Figure 1 presents a structure for the decision-making process. As can be seen, the first phase consists of defining the problem. In this phase, the variables that will be used in the model are defined. That is, which characteristics are selected to determine the ideal capital structure are defined. The second phase of the method consists of calculating the company's Free Cash Flow (FCFF). In the present study, the FCFF estimate takes the assumptions of Damodaran (2012)into account.

The next step consists of the selection and parameterization of the model's stochastic variables. Through the Monte Carlo Simulation, using the CrystalBall® software, the most sensitive variables of the model are analyzed and finally, the company's value for the 95% confidence level is found, this being the VaR of the Model. Still in the third phase, the expected average value at risk (CVaR) is calculated. Finally, the capital structure that would maximize the company's value is defined.

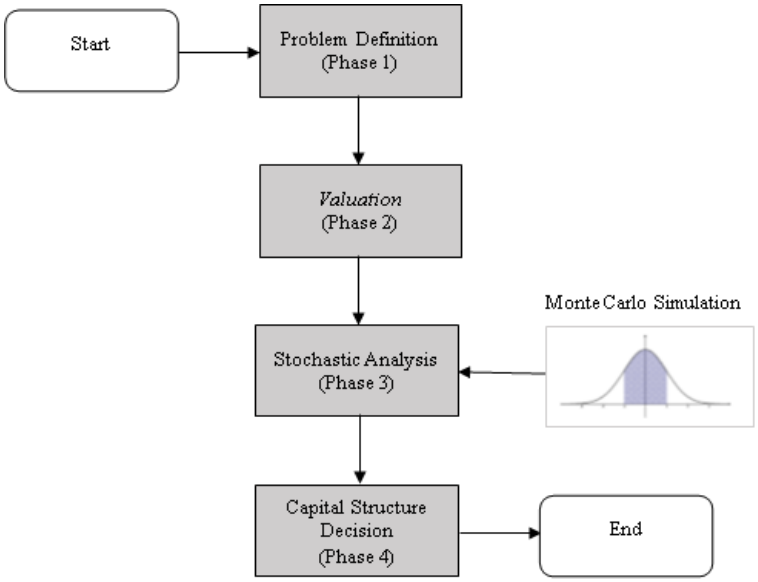

Fig.1: Decision-making process for capital structural

Source:Prepared by the authors

3.1 Problem Definition

According to Martinez, Scherger and Guercio (2019), the capital structure decision is concerned with the way in which a company finances its operations using different sources of financing. However, determining the optimal capital structure given the benefits and difficulties inherent in indebtedness has been widely discussed in the literature. In this sense, this research seeks to develop a framework for capital structure decisions in order to maximize the value of the company, taking into account the trade-off inherent in indebtedness. More specifically, it aims to

determine the maximum indebtedness that a company can contract in order to not incur financial difficulties.

3.2 *Valuation*

The next step consists of calculating the company's value (valuation) by using the DCF method, calculated according to Damodaran (2012). According to the aforementioned author, the value of a company that reaches a steady state after n years and grows at a steady growth rate of g_n after thatcan be written as:

$$Firm\ Value = \sum_{t=1}^{t=n} \frac{FCFF_t}{(1+WACC)^t} + \frac{\left|\frac{FCFF_{n+1}}{(1+WACC-g_n)^n}\right|}{(1+WACC)^n} \quad (1)$$

$FCFF_t$:Free Cash Flow of the Company in the period t;WACC: Weighted Average Cost of Capital;*t*: period; g_n:*Perpetuity Expected Growth*.

This approach is used because according to Damodaran (2012), this is a good alternative when it comes to a company in the process of changing leverage, the central theme of this study. To calculate the WACC, the formulation used was that ofBrealey et al. (2018).

$$WACC = k_d D(1-\tau) + k_e E \quad (2)$$

$k_d$is the debt cost;*D*represents the indebtedness, or portion of the debt (third party capital) in the investment τis the income tax rate;$k_e$is the cost of equity;and*E*represents the fraction of total capital represented by shareholders' equity (%).

For calculating$k_e$the Capital Asset Pricing Model (CAPM) is used, according to the following equation.

$$k_e = R_f + \beta\left(R_m - R_f\right) \quad (3)$$

$R_f$is the risk-free interest rate;$\beta$is the non-diversifiable risk;and $R_m$the market rate of return.

According to Damodaran (2012), the most critical variable to be calculated, especially in companies that have high growth rates, is the growth rate of revenues and profits. According to the author, there are three ways that are most commonly used to estimate this growth rate. The first refers to the historical growth rate, which can be by means of arithmetic, geometric means or forecasting models. The second way is through studies developed by analysts who follow the company under analysis.

Finally, it was also possible to estimate the growth rate from the company's fundamentals. Essentially, according to this last theory, a company's growth rate depends on its reinvestments and their quality. There is consensus in some studies that expert analyses are usually more effective than predictions from historical data and that revenue growth is often more predictable than profit since accounting decisionmaking has less influence on revenue than on profits.

Thus, based on the company's fundamentals, the growth rate (TC) andoperating profit (EBIT) can be described according to Equation 4 (Damodaran, 2012).

$$TC = RR\ x\ ROC \quad (4)$$

RRis the Reinvestment Rate, ameasure to analyze how much the company is reinvesting to generate future growth and ROC is the Return on capital.

$$RR = \frac{CAPEX - Depreciation + \Delta Necessity\ of\ Ret}{EBIT\ (1-\tau)} \quad (5)$$

$$EBIT = \frac{(1-\tau)}{Capital\ Invested} \quad (6)$$

CAPEX is the *Capital Expenditure*and τis the company's tax rate.

3.3 Stochastic Analysis

The third stage consisted of the identification of the model's stochastic variables and their probability distributions. In order to do so, the sensitivity of each variable in the company's value result is first analyzed by using the CrystalBall® software. Thus, the most impactful variables in the company's valuation are included in the VaR analysis.

The most impactful variables of the valuation result selected in the previous phase are inserted in the model for SMC and also through the CrystalBall® software. Thus, through the VaR theory used in the context of valuing companies, the worst result for the company's value is found at a 95% confidence level. In other words, the objective of this stage is to find the company's risk value for a 5% chance of occurrence. In addition, as a way of quantifying the average loss that occurs beyond VaR, CVaR will provide relevant information about the end of the distribution

From the results found of the maximum level of indebtedness, confidence level, sensitivity of the variables and variation in the value of the company, it was possible to provide more accurate information that will assist the

financial manager in making decisions regarding the ideal capital structure of the company.

3.4 Object of the Clinical Study

In order to present the applicability of the structured model developed in the present work, a company that will be called object of study is selected. It is worth noting that the analyses were based on the financial statements, explanatory notes and comments on the performance of 2019 available on the B3 website.

Among the companies listed on the Brazilian stock exchange (B3), a company in the footwear segment draws attention due to its low level of indebtedness, justified by a low leverage policy instituted in the company. As a result, the company object of study is Grendene SA, which was founded in 1971 and is currently one of the largest producers of footwear in the world in addition to being the owner of brands such as Melissa, Grendha, Zaxy, Rider, Cartado, Ipanema, Pega Forte, Grendene Kids and Zizou.

IV. RESULTS

After analyzing the company Grendene, it was possible to note that the company makes minimal use of third-party capital since its market debt ratio is approximately 0.74% and its Net Debt / EBITDA ratios were negative from 2017 to 2019, being -2.74 in 2017, -2.70 in 2018 and -2.68 in 2019. This shows that in addition to having little debt, the company retains a considerable amount of cash and financial investments.

In comparison with companies in the same segment (Alpargatas, Cambuci and Vulcabrás), it is observed that this policy of low financial leverage is recurrent in two of these companies (Alpargatas and Vulcabrás). On the other hand, Cambuci has a debt ratio of approximately 27.5%, a value significantly higher than that found in other companies in the segment.

Thus, in the following steps, we sought to investigate whether the company's capital structure significantly impacts the value result of Grendene SA and what would be an ideal level for the company to go into debt with a focus on maximizing value, considering the risk perspectives for using the VaR and CVaR theory.

4.1 *Valuation*

The first step developed to calculate the company's value was to develop the company's FFCF for the last 5 years (2015 to 2019) available in the databases of the B3 website, as shown in Table 1.

Table1: FFCF Grendene (in thousands of reais)

	2015	2016	2017	2018	2019
Sales revenue	2165.21	2013.87	2251.97	2333.45	2071.03
Cost of Sales (CMV)	1134.91	1048.58	1151.21	1227.32	1126.51
Gross profit	1067.88	996.52	1100.75	1106.12	944.52
Operational expenses	667.15	596.93	635.16	649.16	590.99
EBIT	400.73	399.59	465.59	456.96	353.52
(-) Taxes	43.76	34.15	43.18	30.31	36.64
Profit after Tax	356.96	365.43	422.40	426.65	316.88
(+) Depreciation	53.65	57.87	60.63	65.76	77.22
(-) Working Capital Need	38.57	37.19	136.96	64.38	19.90
(-) CAPEX	72.50	64.80	98.20	71.71	52.17
(=) Free Cash Flow	299.53	395.70	247.86	356.31	322.02

Source: Prepared by the authors

EBIT forecasts from 2020 to 2026 were based on the computed value for 2019 with EBIT growth rate forecast, calculated based on Equation 4. Thus, an average of the ROC and RR for the last three years was calculated, resulting in an average ROC value of 10.81% per year and RR of 19.67% per year. Therefore, the EBIT growth rate was calculated at 2.13% per year. In order to forecast tax expenses, the average proportion of taxes paid in the last 5 years was considered. Finally, to forecast reinvestments in CAPEX and working capital, the proportion of 19.67% already calculated based on Equation 5 was established. It is worth noting that the free cash flow computed for 2026 will be used to calculate the net present value of the flow perpetuity cash flow.

Table 2: FFCF forecast (in thousands of reais)

	2020	2021	2022	2023	2024	2025	2026
EBIT	361.04	368.72	376.56	384.56	392.74	401.09	409.62
(-) Taxes	33.03	33.73	34.45	35.18	35.93	36.70	37.48
Profit after Tax	328.00	334.98	342.10	349.38	356.81	364.39	372.14
Reinvestment Rate	64.51	65.89	67.29	68.72	70.18	71.67	73.20
(=) Free Cash Flow	263.49	269.09	274.81	280.65	286.62	292.72	298.94

Fonte: Prepared by the authors

With regard to the estimate of the discount rate through the WACC, current values at the end of 2019 were considered, discounting the inflation for the parameters of the cost of equity calculated by the CAPM equation. The risk-free rate of NTN-B government bonds with a 15-year maturity was considered, whose value corresponds to 3.23% per year (TN, 2020).A beta parameter was additionally considered over 24 months for Grendene with a value of 0.65 extracted from the Economática® software.In turn, the market premium of 8.03% per year was considered for the month of December 2019 (CEQEF-FGV, 2020).

As for the debt cost, the value of 3.87% per year was found based on data published by the company in this period. After collecting and estimating all the data necessary to calculate the company's value through Equation 1, the result is R $ 9.954 billion. When the cash value is added and the debt value is subtracted, the amount of R $ 11.112 billion is earned. Given the number of shares on 12/31/2019 of 902,160,000, the share value found was R $ 12.32, a result very close to the market value quoted for Grendene's shares on 12/31/2019 of R $ 12.28.

4.2 Stochastic Variables

In this stage, probability distributions was assigned to the variables identified as having the greatest impact on the result of the estimated value for the company.

In the case of Grendene SA, the variables identified as the most sensitive to the company's present value result in decreasing order are: Perpetuity growth rate (denoted by Perpetuity Growth Rate in Figure 2), reinvestment rate (denoted by Reinvestment Rate in Figure 2), ROC, indebtedness (denoted by Debt Ratio in Figure 2) and tax rate (denoted by Taxes Ratio in Figure 2). Through the CrystalBall®, the sensitivity graph of these variables was obtained for the test intervals from 20% to 80%, as shown in Figure 2.

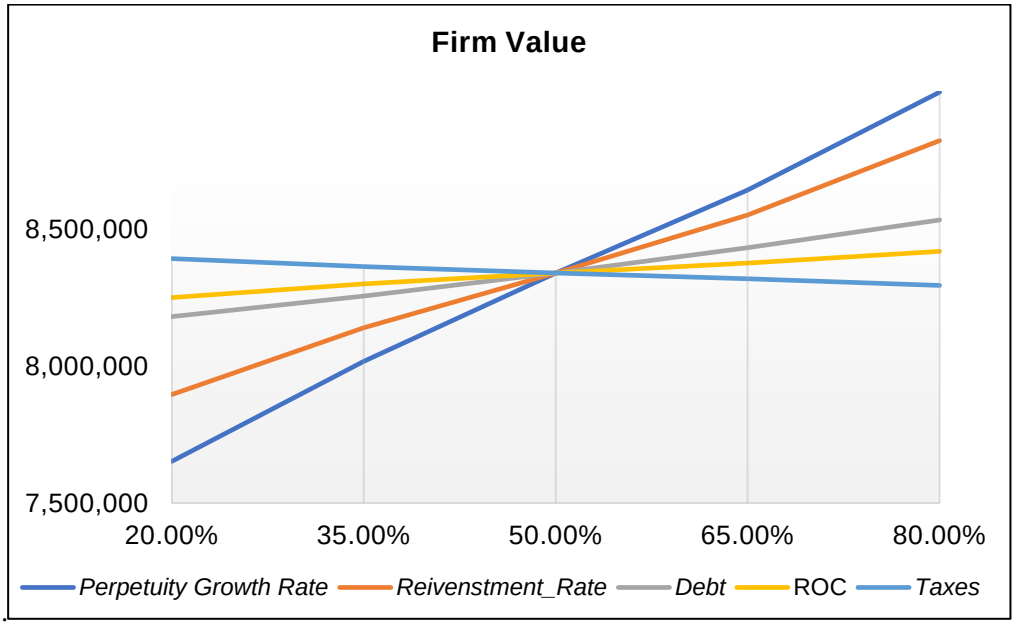

Fig.2: Sensitivity Graph.

4.3 *VaR*

After the previous step, the variables that had the most impact on the firm's value result were selected, and therefore only the tax rate variable was excluded from the simulation as it had little impact on the valuation results. Thus, the triangular distribution was attributed to the variables perpetuity growth rate, reinvestment rate and ROC since, according to Aouni, Martel and Hassaine (2009), such distributions can be used to insert the uncertainty in the input parameters and output of a model as they representhuman expertise well in correctly judging the behavior of common variables in different practical situations.

For the indebtedness variable, this studied opted for the use of uniform distribution. Table 3 presents the selected variables and their respective distributions and parameters inserted in the analysis.

Table 3: Stochastic variables

Variables	Distribution	Parameters
Reinvestment Rate	Tringular	(-2%, 19.67%,45%)
Perpetuity Growth Rate	Tringular	(0%, 1.37%, 2.13%)
ROC	Tringular	(8.32%, 10.81%, 12.65%)
Indebtedness	Uniform	(0%, 100%)

Source: Prepared by the authors

Thus, the aforementioned stochastic variables were inserted into the model and, using the CrystalBall® software, 10,000 iterations were simulated and the results can be seen in Figure 3. Based on the simulation shown in Figure 3, we can define that that given a confidence level of 5%, the value that the company can reach is R $ 5,793 billion.

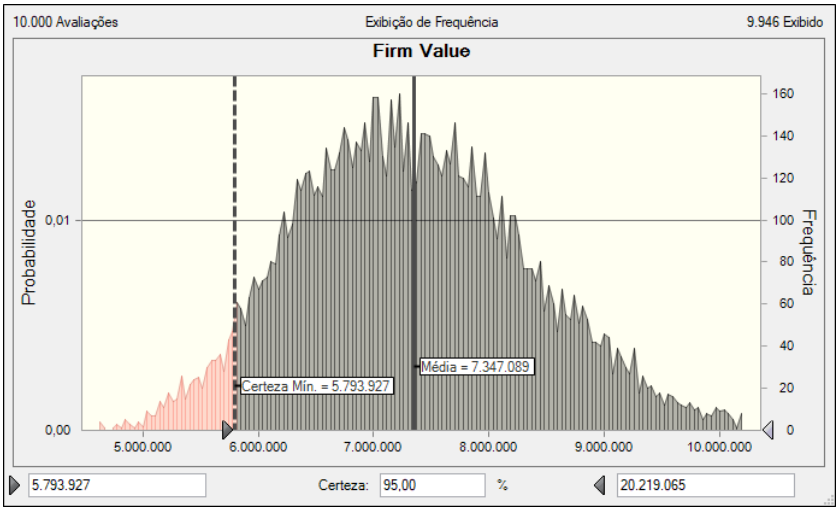

Fig.3 VaR (confidence level: 95%)

This result showed that in order to prevent a debt situation from affecting the company's equity solidity, the maximum that the company could borrow is approximately R $ 5,793 billion. With this level of market indebtedness and keeping all other variables fixed, the company would increase its value by approximately 26.13%. However, this debt value of 52.02%, is significantly higher than that presented by companies in the same segment. In this context, in order to analyze what would be the increase in value if the company were indebted to the most indebted company in the sector (Cambuci), a debt level of 27.50% was simulated for Grendene. The values found showed that such a change would result in an increase of 9.60% in the company's value. To identify the average loss that exceeds the VaR, the CVaR is calculated for the 95% confidence level, as shown in Figure 4.

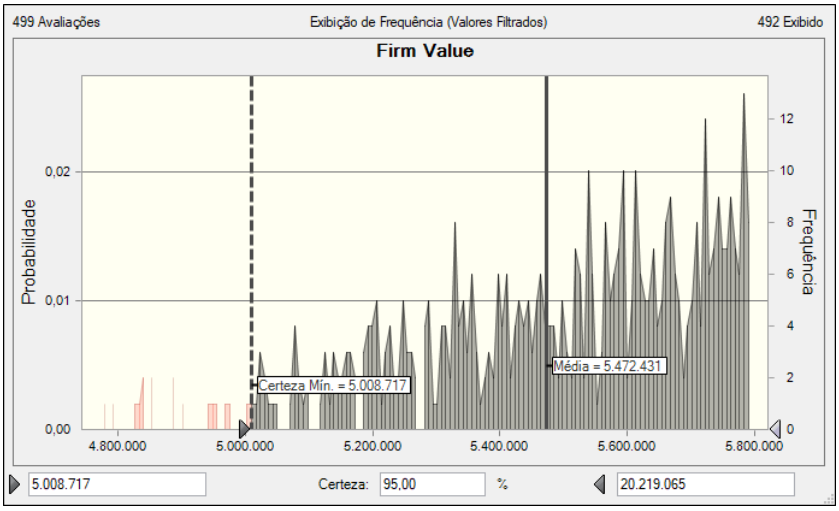

Fig.4 CVaR (confidence level: 95%)

Thus, it is possible to infer that the expected loss that exceeds the VaR is equal to R $ 5,008 billion. That is, it is the average expected value that the company's value is subject to given a 95% confidence level. In addition, other simulations were carried out in order to analyze the risk results for the different levels of indebtedness. In this context, the simulation results to find the VaR and CVaR for the 90% and 99% confidence levels are shown below in Figures 5 to 8.

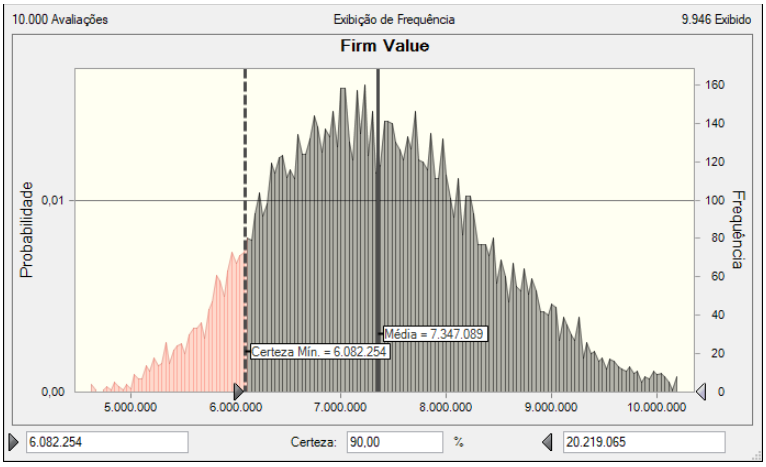

Fig.5 VaR (confidence level: 90%)

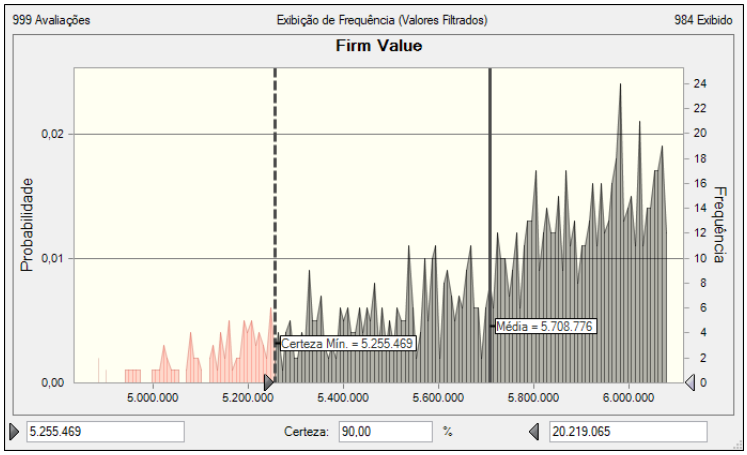

Fig.6 CVaR (confidence level: 90%)

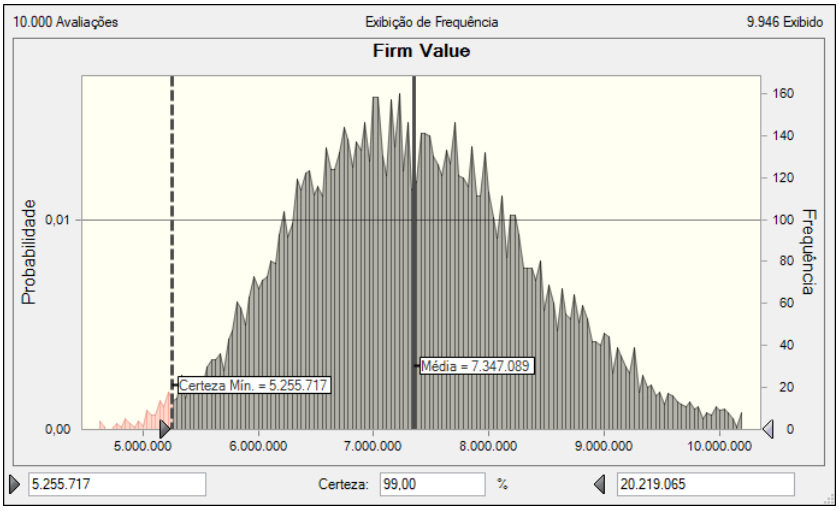

Fig.7 VaR (confidence level: 99%)

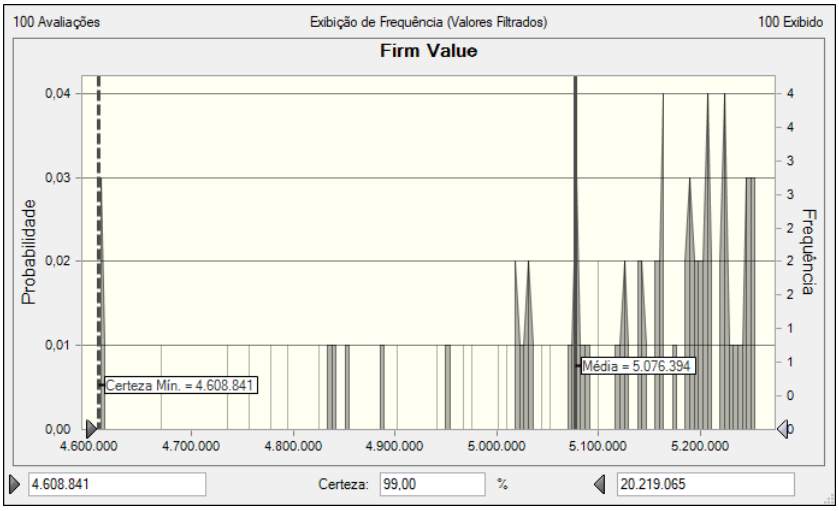

Fig.8 CVaR (confidence level: 99%)

It is observed that as the confidence level increases, the maximum level of indebtedness decreases and in this way, for the 90% confidence level, the maximum indebtedness level is R $ 6,082 billion and for 99% the maximum indebtedness is R $ 5,255 billion. That is, if it is the strategy of the company's managers to incur less risk of financial difficulties, despite the indebtedness creating value for the company, the results point to the adoption of a lower level of indebtedness.

4.4 Capital Structure Decision

From the results observed in the simulation, the financial manager will be able to make decisions about the company's capital structure policy, aiming to maximize the creation of value and the risk reduction of an eventual bankruptcy. Therefore, in order to report on the results observed from different levels of indebtedness, Table 4 shows the maximum indebtedness levels and their respective variations in the company's value for each confidence level.

Table 4: Indebtedness and change in company value

	99%	95%	90%
Indebtedness	47.33%	52.02%	54.60%
Δ Company value	+22.14%	+26.13%	+28.54%

Fonte: Prepared by the authors

As can be seen, the higher the level of confidence, the lower the maximum level that the company could be indebted to without compromising the company's equity situation. Thus, as in the simulated case, indebtedness offers the opportunity to maximize the company's value andthus the use of third-party capital can be a good strategy for the company's financial managers to adopt. However, it is important to point out that the greater the debt, the greater the risk of financial difficulties, and

therefore, if management has the premise of incurring lesser risks, as is the case of the company Grendene, adopting the 99% confidence level may associate value maximization with a low risk of insolvency.

4.5 Discussions of Results

The simulation of 10,000 scenarios showed some evidence of the benefits inherent in indebtedness for the company. The result of indebtedness is an increase in systematic risk, represented by the leveraged beta parameter (β) of the CAPM and with this, an increase in the cost of equity. However, the increase in indebtedness promotes tax benefits since interest is deducted for the purpose of calculating income tax in contrast to the payment of dividends. Mathematically, this effect can be seen in the calculation of third-party capital and consequently, in the results of WACC.

It is worth mentioning that the company's value is maximized with a level of indebtedness equal to the maximum loss amount, given a certain confidence level,since levels of indebtedness higher than this can affect the company's equity situation and lead them to difficulties with financial institutions. According to Opler, Saron and Titman (1997), these difficulties can affect the main stakeholders of the company (suppliers, workers and customers).Since suppliers tend to restrict credit to these companies, workers demand higher wages, and customers are not willing to pay a lot for the product. In addition, companies with high debt volumes tend to not fight for market position, reducing prices and investing in advertisingas they seek to preserve cash in the short term.

Thus, despite the indebtedness being linked to the increase in the company's value, it is the managers' responsibility to find the optimum level of indebtedness that maximizes the company's value without compromising the operational activity and incurring insolvency situations while always respecting the policy of capital structure established in the company.

V. CONCLUSION

The capital structure policy of companies has been a widely debated subject in the literature. However, no evidence has been found in relation to models to assist managers in decision making regarding the optimal level of indebtedness. That is, the level of indebtedness that would maximize the company's value. In this context, this article aimed to develop a model to support this decision making while respecting the risk limits and possible financial difficulties proved by excessive leverage.

Thus, the proposed model seeks first to calculate the company's value and the impact of variables on the valuation result and then to calculate the maximum loss value for a specific confidence level using VaR. The VaR value found is the maximum indebtedness suggested by the company and serves as a guideline for the decision making of the company's managers.

In the proposed simulation, the case of Grendene, whose policy is to operate with low financial leverage, was analyzed. The simulation results showed that this practice can be seen as debated from the point of view of creating value since higher levels of indebtedness increase the creation of value for the company. However, this low-leverage practice can be seen in other companies in this segment in Brazil with the exception of Cambuci, which operates at a level of indebtedness that, if practiced by the company Grendene, would increase the company's value by approximately 9.60%.

We do not prescribe, peremptorily, that the company in question changes its capital structure policy, but rather that it may feel motivated to reflect on the possible benefits and harms of adopting a more aggressive strategy.It is worth mentioning that proposals for adding value are beneficial not only for the company, but for all the chain and stakeholders involved, since more competitive companies can provide products and/or services with superior quality and lower prices, being therefore, an essential contribution of this proposal.

It is noteworthy that the effects of agency and transaction costs were not considered, but instead are recommended in the analyses of future publications. In addition, it is emphasized that other variables, distributions and parameters can be used to analyze the impact on the result of the company's value and increase the contributions of the method developed in the present study.

REFERENCES

[1] Aouni, B., Martel, J., Hassaine, A. (2009). A Fuzzy Goal Programming Model: An overview of the current state of the art. Journal of Multi-Criteria Decision Analysis, V.16 (5).

[2] Anastasia, N., Lorenza, D. (2019). Opportunistic Manager and Capital Structure Decision of property Companies in Indonesian Capital Market. Jurnal Manajemen Teknologi, v.18(1), p.1-16.

[3] Bastos, D. D., Nakamura, W. T. (2009). Determinanes da estrutura de capital das companhias abertas no Brasil, México e Chile no período 2001-2006. Revista Contabilidade e Finanças, V.20 (50), p.75-94.

[4] Bilan, Y., Mentel, G., Streimikiene, D., Szetela, B. (2020). Weather risk management in the weather-VaR approach. Assumptions of Value-At-Risk Modeling. Economic Computation and Economic Cybernetics Studies and Research, v.54(1), p.31-48.

[5] Brealey, RA., Myers, SC., Allen, F., Mohanty, P.(2018). Principles of Corporate Finance, 12 ed,.McGraw-Hill Education.
[6] CEQEF-FGV – Centro de Estudos Quantitativos em Economia e Finanças. Série de Equity Risk Premium, 2019. Disponível em:<https://ceqef.fgv.br/node/594>.
[7] Chang, Y-K. Chou, R. K., Huang, T-H. (2014).Corporatio governance and the dynamics of capital structure: new evidence. Journal of Banking & Finance, v.48, p.374-385.
[8] Charnes, J. (2007) Financial Modeling with Crystal Ball and Excel. Hoboken, NJ: John Wiley & Sons.
[9] Damodaran, A. (2012). Investment Valuation: Tools and Techniques for determining the value of any asset. Wiley, 3rd. 992p.
[10] Devos, E., Rahman, S., Tsang, D. (2017). Debt Conevants and the speed of capital structure adjustment. Journal of Corporatio Finance, v.45, p.1-18.
[11] Ehrhardt, M. C., Brigham, E. F. (2011). Financial management: theory and practice, 13°ed. South-Western: Cengage Learning.
[12] Fischer, E. O., Heinkel, R., Zechner, J. (1989). Dynamic Caital Structure Choice? Theory and Tests. The Journal of Finance, v.44(1), p.19-40.
[13] Graham, J. R., Leary, M., T. (2011). A Review of Empirical capital Structure Research and Directions for the Futue. Annual review of financial economics, V.3.
[14] Li, S., Cai, H. (2017). Risk-Aware Multi-Objective Optimization of Capital Structure for Private Financing Infrastructure Projects. ASCE International Workshop on Computing in Civil Engineering.
[15] Martinez, L. S., Scherger, V., Guercio, M.G. (2019). SMEs capital structure: trade-off or pecking order theory: a systematic review. Journal of Small Business and Enterprise Development, v.26(1), p.105-132.
[16] Myers S., Majluf N. (1984). Corporatio financing and investment decisions when firms have information that investors do not have. Journal of Financial Economics, v. 13: 187-221.
[17] MYERS, S. (1977). Debt and Taxes. The Journal of Finance, v. 32, n. 2, p. 261-275.
[18] MYERS, S. (1984). The capital structure puzzle. The Journal of Finance, v. 39, n. 3, p. 575-592.
[19] Modigliani, F., Miller, M. (1958). The cost of capital, corporation finance, and the theory of investment. The American Economic Review, v.48(3), p.261-297.
[20] Modigliani, F. and Miller, M.H. (1963), Corporatio income taxes and the cost of capital: a correction, The American Economic Review, v.53(3), p.433-443.
[21] Nakamura, W. T., Martin, D. M. L., Kayo, E. K. (2004). Proposta para a determinação da estrutura de capital ótima, na prática. Revista de Administração UNISAL, Ano 01 (01), p.25-37.
[22] Opler, T. C., Saron, M., Titman, S. (1997). Designing capital structure to create shareholder value. Journal of Applied Corporatio Finance, v.10(1), p.21-32.
[23] Perobelli, F. F. C., Famá, R. (2003). Fatores determinantes da estrutura de Captail para Empresas Latino-Americanas. Revista de Administração Contemporânea, v.7(1), p.09-35.
[24] Sardo, F., Serrasqueiro, Z. S. (2017). Does dynamic trade-off theory explain Portuguese SME capital Structure decisions?. Journal of Small Business and enterprise Development, v.24(3), p.485-502.
[25] Serrasqueiro, Z. S. Armada, M. R., Nunes, P. M. (2011). Pecking Order Theory versus Trade-Off Theory: are service SMEs' capital strucuture decisions diferent?. (2011). Service Business, v.5(4), p.381-409.
[26] Sharifi, M. Kwon, R. H., Jardine, A. K. J. (2016). Valuation of performance-based contracts for capital equipment: A stochastic programming approach. The Engineerging Economist, V.61 (1), p.1-2.
[27] TN – Tesouro Nacional. Histórico de Preços e Taxas, 2019. Disponível em:<https://www.tesourodireto.com.br/titulos/historico-de-precos-e-taxas.htm: