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RESEARCH CASE STUDY: THE IMPACT OF HEDGING
ON REN

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ABSTRACT

This study conducts a field research on the Portuguese energy firm, Rede Eléctrica Nacional, S.A. (REN), with the purpose of analysing whether and how a risk management strategy impacts the group's business. Throughout the paper numerous crossings between previous empirical researches and REN's case study are conducted which lead us to conclude that hedging allows lower cash flow volatility and a more secure investment rating. However, the particularity of REN's hedging structure by incorporating the risk management of assets into its strategy is the main influential factor for creating a seamless stream of cash flow while eliminating risk.

RESUMO

O presente trabalho é elaborado com base num estudo de caso de um empresa energética portuguesa, Rede Eléctrica Nacional, S.A. (REN), com o objetivo de analisar quais os principais impactos que uma estratégia de gestão de risco tem no negócio da empresa. Para tal, foram efectuadas algumas comparações entre o caso de estudo na REN e estudos empíricos no qual foi possível concluir que o hedging permite diminuir a volatilidade do cash flow e assegurar uma notação financeira positiva. Há que destacar que o efeito de cash flow constante e eliminação de riscos que a empresa apresenta deve-se muito à sua estrutura de gestão de riscos particular, que incorpora o hedging tanto no lado do passivo do balanço como também no lado do activo.

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1. INTRODUCTION

"One is not exposed to danger who, even when in safety, is always on their guard"

(Publilius Syrus)

Risk management has become an increasing area of interest and study throughout the world in which corporations assess and manage the exposure to various sources of risk using derivatives. The importance of risk management grew tremendously during the late 80's and the 90's leading to a boom in publications related to mathematical equations and methods on how to forecast the future of the business and reduce risk. An article published in 1993 by *The Wall Street Journal* referred to the beginning of an important phenomenon in investing and business: *"although many companies use derivatives for capital raising … they are just beginning to use them for broader risk-management purposes."* (Grinblatt & Titman, 2001: 737). Today we can state that risk management has gained predominance as the majority of corporations rely on derivatives to hedge a range of financial risks to which they are exposed in the normal course of their business. In fact, the International Swaps and Derivatives Association (ISDA) survey has demonstrated that over 94% of the world's largest corporations use derivatives as a risk exposure protection mechanism. (Grinblatt & Titman, 2001; Speranda & Trsinski, 2015)

The trend towards greater attention to risk management can be explained by the increased fluctuation in variables such as interest rates, exchange rates and commodity prices which, in turn, reflect on the corporation's strategy and performance. The survey, mentioned above, found that foreign exchange derivatives are the most widely used instruments (88 percent of the sample), followed by interest rate derivatives (83 percent) and commodity derivatives. The deeper understanding of derivative instruments has made it possible for managers and CFO's to pursue with hedging strategies preventing any sudden downturn fluctuation from the markets to prejudice the results of the firm avoiding negative consequences. (Grinblatt & Titman, 2001; Speranda & Trsinski, 2015)

Literature theorists and then empirical studies of hedging activities are broad, either based on US companies (Allayannis and Ofek, 2001; Jin and Jorion, 2006), or focused on specific industries (Haushalter,2000; Carter, Rogers and Simkins, 2006; Tufano, 1996) or even based on wide scope of countries (Bartram, Brown and Conrad, 2011). Together, the different studies cloud the real impact of a risk management strategy as they all reach

results that differ or even contradict each other. Considering the stated, a fundamental question crops up: *Whether and how hedging affects the risks of the firm?*

To reach an answer to this question, a three month internship was performed in the financial department of REN, one of Portugal's big energy players. Which enabled us to conduct this dissertation based on a case study, focusing on the impact of a hedging strategy on one specific firm. In that matter this study differs from most empirical work conducted for this topic, which present conclusions that are mixed and lack a coherent explanation for the use of financial derivatives and its outcomes. One justification might lie on the fact that by conducting a study, with a wide sample, based solely on public financial reports details about the firm's specific risk management is lost hampering the powerfulness of the results.

On a second note, this study presents another differential aspect related to the fact that REN's risk management structure covers both sides of the balance sheet, asset and liability. This is important for the overall strategy of the group. On the liability side, we verify that hedging the interest rate risk exposure is creating losses on the group's earnings, mostly due to the current stage of the market. Moreover, even though subtle hedging is allowing less volatility in the group's cash flow. This scenario creates favourable conditions in maintaining stable credit metrics, in line with the current investment grade rating but in terms of creating an incentive to pursue with valuable investments projects hedging has little contribution. Nonetheless, adding the effects of applying risk management on the asset side not only it buffers the losses suffered on the liability side but also enables a more prominent financial health and stability in the group's results. In this setting, the groups asset liability management creates a structure that permits balanced results, therefore it is likely to consider that hedging in allowing the group to focus on spending higher capital towards profitable investment projects is an important trigger in higher firm value.

The remainder of the study is organized as follows: Section 2 details the theory and empirical studies related to risk management. Section 3 presents the methodology that was followed in section 4 which in turn includes the description of the company, the risk profile and the hedging strategy. Lastly, section 5 concludes.

2. LITERATURE REVIEW

"derivatives are financial weapons of mass destruction, carrying dangers that, while now latent, are potentially lethal."

(Warren Buffet, 2003)

2.1. RISK MANAGEMENT AND FIRM VALUE

"If a firm manages its financial price risk, it follows that the volatility of the value of the firm or the firm's real cash flows will decline" (Smithson, Smith and Wilford, 1995).

The relation between the firm's real cash flow and the financial policy was recognized by Franco Modigliani and Merton Miller (1958; 1963). The Nobel prize winning authors developed a theorem known as the Modigliani-Miller theorem which has served as base for the "modern finance". According to this theorem in a frictionless market, this is, in the absence of taxes, transaction costs and information asymmetries all of which constitute motivation for risk management, if these do not exist the financial policy on risk management becomes irrelevant. Mostly because, the shareholders can undertake the necessary hedging activities themselves at the same cost and therefore undoing any risk management activity. In other words, a firm's financial structure will not affect its market value in perfect capital markets. In light of the stated, the profitability of a company restrains only on the ability to perform well and to the appraisal of high profitable investments. The so called M&M proposition stresses that hedging has no implication in the corporation's value seeing as the liabilities increase due to the cost of derivatives and consequently decreases the overall value. (Froot *et al*, 1994; Speranda & Trsinski, 2015; Grinblatt & Titman, 2001)

Shapiro and Titman (1998) argue that according to the capital asset pricing model (CAPM) risk management is viewed to be irrelevant just as the M&M proposition defends. The CAPM model, developed by the modern finance theory, follows that diversified investors possess portfolios that already eliminate firms specific risk however they have no effect on the market risk. Therefore, risk management is considered irrelevant, unable to add value, because the investors required return (cost of capital) remains the same seeing as the markets risk is not affected even though hedging reduces total risk. (Shapiro and Titman, 1998; Fairchild, 2002)

Meanwhile, Shapiro and Titman (1998), reformulates why and how risk management is a value enhancing activity for the shareholders. The modern theory expresses that the value of the firm is equal to the expected cash flow discounted at the appropriate interest rate. Most financial economist focused on the market discounted rates segment of the equation, therefore concluding that hedging is irrelevant. However, the authors rational follows that, although risk management does not affect the discounted rate, unchanging the investors required returns, it increases the expected cash flow and thereby increasing the value of the firm. This is, by increasing the expected cash flow the corporation is less likely to fall into financial distress, therefore securing the operating side of business and investments as well as the interest and incentives of the stakeholders. The question that now arises is, *How hedging impacts the cash flow of the firm?* (Shapiro and Titman, 1998)

We have reached the conclusion that by relaxing the Modigliani-Miller assumptions we can encounter the real markets behaviour. Naturally many authors opposed the M&M proposition, proposing arguments that justify hedging strategies as value enhancing activities by turning the M&M proposition upside down. This is, if the financial policy on risk management is in fact relevant then hedging must have an impact on taxes, transaction costs and investment decisions. In this matter, Smith and Stulz (1985) provide an analysis in costs of financial distress, tax burdens and payments to corporate "stakeholders" as rationales for firm hedging. Froot, Scharfstein, and Stein (1992) stress that external capital is costly to raise as a justified reason to engage hedging strategies. Lastly, optimal hedging policies for agency costs regarding difference of interests between managers, shareholders and bondholders are presented by Jensen and Meckling (1976).

Smith and Stulz (1985) develop three strong arguments that support hedging strategies. First, that it diminishes the cost of financial distress by securing the cash flow, allowing the corporation to pursue stable operations and investments. The second argument follows that it reduces taxable incomes and therefore adds value to the corporation. Finally, on the third argument, the authors point out that by hedging the firm is able to reduce concerns with the probability of financial distress and therefore diminish the payments to "stakeholders".

According to Smith & Stulz (1985), a corporation experiencing a sharp downturn, in part due to unhedged exposure, will suffer from cash flow volatility, hence resulting in

insufficiency to repay its debts – financial distress. In the same line of though, if the company has insufficient cash flows to meet its obligations then it might fall into bankruptcy. In turn, several costs are attained by the corporation which interferes with the investment and operating decisions such as, the choosing to not engage on profitable investments, the diminishing of customer's trust seeing as the value of the service is lowered through financial distress and the losing of stable relationships with suppliers and employees. All of these factors reduce the sales and raise operating costs and consequently reduce the value of the corporation. Therefore, by pursuing a costless hedging strategy the probability of incurring the expected transactions costs of financial distress is reduced, increasing the current market value of the firm.

The second argument of Smith & Stulz (1985) follows that if the tax regime is a convex function, this is, effective tax rates rises with increases in pre-tax income, then high volatile earnings will entail a higher corporate tax liability. Therefore, by pursuing a costless hedging strategy the corporation can reduce the corporate tax burden by lowering the volatility of pre-tax income, hence the corporation's tax liability will fall and the expected post-tax value will increase. In short, hedging enables tax-reducing benefits allowing an increase in the expected corporate cash flow. (Shapiro & Titman, 1982; Smith & Stulz, 1985)

Remaining on the topic and before moving on, it is worthwhile to flash back to the theory pioneered by Modigliani and Miller (1958). The authors assumption is that the capital structure will have a zero effect on the total cash flow that is distributed to the debt and equity holders. However, this premise is not flawless, taxes have a strong influence on the cash flow and therefore constitute an important determinant in the optimal capital structure. Tax advantages stream from the fact that interest on debt is tax deductible, resulting in higher after-tax cash-flow when the firm includes more debt in its capital structure. (Grinblatt & Titman, 2001)

Ross (1996: 1) stresses that "*a firm that hedges its risks increases its optimal amount of debt and so realizes more tax benefits from leverage*". Accordingly, Leland (1994) also provides a model in which hedging increases tax benefits. The author rationale follows two explanations: first, in accordance with Ross (1996), hedging increases tax benefits from debt. This is, from the additional debt the company generates additional tax shields. The second explanation follows that hedging reduces the probability of default and of

incurring distress costs from a higher optimal debt ratio. This is, part of the debt will go unused, reflecting in lower distress costs which consequently increases firm value.

The bottom line is that although risk management enables greater tax-benefits it is also attached to risks, seeing as with increased leverage there is the possibility that high debt levels can trigger distress, defaults, and even bankruptcy. *"As leverage increases, the tax advantage of debt eventually will be offset by an increased cost of debt, reflecting the greater likelihood of financial distress"* (Leland, 1994: 1213). Therefore, the firm should align the tax advantages with the probability of incurring financial distress in order to achieve an optimal capital structure.

Furthermore, the third argument referenced in Smith and Stulz (1985) article hinges on the costs that are associated to the higher expected payments of corporate "stakeholders". Hedging reduces the manager's risk exposure as well as the risks exposures for all the other stakeholders, employee's, suppliers and customers, protecting the investments of each of these parties. The authors defend the importance of securing "firm-specific" investments of these parties from financial distress, seeing as added compensation for the greater risk would be demanded. "*Employees will demand higher wages at a company where the probability of layoff is greater. Managers with alternative opportunities will demand higher salaries to run firms where the risks of insolvency and financial embarrassment are significant. Suppliers will be more reluctant to enter into long-term contracts with companies whose prospects are more uncertain. Last, customers will be reluctant to buy products of a company whose service is variable and might cease in the future"* (Stulz, 1996:14). In light of the stated the authors concluded that by pursuing risk management the security of the stakeholder's investments can be established. Hence, it will improve the relationship on which it contracts with them and therefore increases the firm value. (Stulz, 1996)

Froot, Scharfstein and Stein (1993), demonstrate that in a capital-market imperfection, as the one we live in, "*the externally obtained funds are more expensive than those generated internally"* (Froot *et al,* 1993: 1630). The main message that the authors pass through is that corporations should raise internal funds to meet their investments in order to avoid the scrutiny of external financing costs. The deadweight costs of external financing referred by the authors arises from bankruptcy and financial distress, which consequently include direct costs, such as legal fee, and indirect costs, such as

underinvestment and lower competitiveness. The authors stress that risk management reduces the need to resort to external financing enabling the firms *"to better align their demand for funds with their internal supply for funds (Froot et al,* 1994: 96)*"*. In their paper Froot, Scharfstein and Stein (1993) reflect how the variability in internal cash flows affects two factors, the variability in the amount raised through external resources and the variability in the amount of investment. (Froot *et al,* 1993; 1994)

The M&M theorem is not entirely set aside by these authors, they acknowledge that the financial markets are not as smooth as envisioned by M&M but they also recognize that the external costs are more expensive and therefore it is preferable to generate internal funds. In the same line of thought, a company should hedge in order to ensure that is has sufficient funds to pursue potential investments. Otherwise, when faced with the decision of funding an investment the reluctance to burrow, due to the costs associated, can result in development deceleration or downturn placing the corporation in an unfavourable position on the market. In other words, a firm facing a cash flow feeble as a result of the variability in the market, would be more reluctant to pursue investments in R&D or resort to external financing to pursue value enhancing projects resulting in an underinvestment problem which in turn reduces significantly the company's competitiveness and market value. (Froot *et al, 1993;* Froot *et al, 1994)*

Many other authors follow the rational of Froot, Scharfstein, and Stein on the purpose of pursuing a hedging strategy. Lessard (1991) wrote *"…the most compelling arguments for hedging lie in ensuring the firm's ability to meet two critical sets of cash flow commitments. First the exercise prices of their operating options reflected in their growth opportunities (for example, the R&D or promotion budgets) and second their dividends… the growth options argument hinges on the observation that, in the case of a funding shortfall relative to investment opportunities, raising external capital will be costly."* In the same line of though, Lewent and Kearney also share the opinion that investment plays an important role in the explanation of hedging. They state that the key reason in the decision to hedge is *"the potential effect of cash flow volatility on our ability to execute our strategic plan – particularly, to make the investment in R&D that furnish the basis for future growth"* (Froot *et al*, 1993: 1635-1652).

Up to this point, the theories presented assumed that managers act in the shareholder's best interest, eliminating the variable conflict of interest between the two parties. This

way, it enables the maximization of shareholder value in which the firm hedges to avoid deadweight costs in order to secure internal cash-flow. As already seen, the literature contributes with theories presented by Smith and Stulz (1985), Stulz (1996), Froot, Scharfstein and Stein (1993, 1994) and others in which hedging provides benefits for the firm, including reduction of financial distress, minimization of tax burdens and protection of optimal investment opportunities.

The following theories claim that hedging *"is based on diversification motives for owners or personal utility maximization for managers"* (Jin and Jorion, 2006: 896). Managers, in contrary to shareholders, are highly undiversified seeing as their employment and income as well as reputation is tied to the firm. Therefore, managers perform in ways that reflect their personal circumstances and degree of risk aversion choosing only to hedge those risks that reflect their highest expected income. Hence, the relationship between managers, seeking to maximize their personal wealth, and shareholders, failing to align their interests with those of the managers originates the so called "agency costs". Stulz (2003: 71) defines agency costs as "*the costs associated with managements opportunity to undertake projects that have a negative net present value when it is advantageous for them*". Put in other words, managers whose interest is not aligned with those of the shareholders might pursue risk reducing activities that penalize the firm while increasing their own personal perquisites. Hedging can mitigate agency costs through the reduction of financial risk which minimizes the manager's exposure. Also, compensation schemes help create a bridge between the shareholders and the managers aligning their corporate policies and avoiding value-destroying strategies. (Bartram, 2002; Fatemi and Luft, 2002)

Jensen and Meckling (1976) presented a fundamental paper regarding agency costs, focusing on the relationships between the different groups of ownership that a firm can possess. The first is related to manager's that own 100 percent of the firm. This theory is aligned with the one presented later on by Stulz (1996). As already conjectured, the manager's behaviour translates into actions that increase their best welfare. In situations in which managers have significant portions of their own wealth tied up in their own company, it is expected to see behaviours in which managers hedge more and make operating decisions that maximize the value of the company. Stulz (1996) argumentation follows that, managers are likely to consider all sources of risk seeing as the volatility of the company's exposure translates fairly into the volatility of the manager's wealth.

Moreover, Jensen and Meckling (1976: 12) add that *"…as the manager's ownership claims fall, his incentive to devote significant effort to creative activities…"* also falls which reflects into a lower value enhancement for the firm. This result, can be explained by the fact that managers apply more effort in using corporate resources to obtain better perquisites instead of pursuing value enhancing opportunities. Thus, it forces the firm to introduce compensation contracts in order to induce managers to take greater actions towards increasing the firms returns. Accordingly, if the purpose of the firm is to reduce cash-flow variance then it should apply a compensation that is a concave function of the firm value. This is, managers with greater ownership of shares will have incentive to reduce firm cash-flow variability through reduced engagement in positive NPV investments. While if the purpose is to discourage managers from devoting excess resources to hedging, the compensation package should be a more convex function of firm value. "*Hence, the more option-like features in a firms compensations plan, the less the firm is expected to hedge*" (Smith and Stulz, 1985:403). The main achievement in this strategy is to align the incentives of the managers with those of the shareholders in a way that benefits both parties. (Smith and Stulz, 1985)

DeMarzo and Duffie (1995) presented a model with risk aversion and information asymmetries in which hedging is optimal. The authors stress that the informational effect of hedging allows the appraisal of manager's performance by stripping extraneous "noise" from the process and consequently developing more efficient compensation contracts. DeMarzo and Duffie (1995) demonstrate that managers are better apt to hedge risks associated to the corporation needless of the interference of shareholders. With nondisclosure hedging actions, managers are motivated to engage full hedging strategies allowing to lower the variability of firm's profits, which in turn reduces the variability of wages benefiting risk averse managers. If hedging positions are disclosed the *"shareholder's perception of managerial ability are more sensitive to the firms performance"* (DeMarzo & Duffie, 1995: 746) which implies a higher variability of the managers wages, thus it destroys the incentive for full hedging. Therefore, the authors argue that keeping the shareholders oblivious of the risk management policies, without this being harmful to them, could turn to be beneficial for the firm.

In line with the previous authors namely, Jensen and Meckling (1976), Smith and Stulz (1985) and DeMarzo and Duffie (1995), some of the actions undertaken by managers due to factors such as, risk aversion and information asymmetries, decrease the value of

shareholders. Stulz (1990) and Tufano (1998), both argue with different perspectives that external capital markets can diminish existing agency conflicts between shareholders and managers. The reasoning goes that although going out to the external markets definitely possesses major disadvantages, as presented by Froot, Scharfstein and Stein (1993, 1994), in the presence of agency conflicts, cases in which managers do not act in the best interest of shareholders, it also presents benefits. Briefly, agency costs theory reflects that at times managers with free excess cash-flow available will have a tendency to overinvest, often resulting in money losing projects. In this situation, Stulz (1990) reflects that debt can reduce the overinvestment problem, this because the excess cash-flow is directed towards paying the debt, therefore reducing the amount available to invest. Hence, Stulz (1990) reaches the conclusion that by reducing the volatility of the cash flow, through risk management activities, and increasing the debt, the company can control the managements tendency to overinvest and increase the value of the firm. On the other hand, Tufano (1996) reflects that in the presence of agency conflicts turning to the external market can result in a positive outcome as they impose an extra restraint on managers, this is, external capital providers have the role to reject poor investment projects, in doing so they act in the shareholder's welfare. In this view, the author argues that risk management also possesses costs as it removes this extra restraint of the markets, by delivering excess cash-flow to managers, whom in turn are allowed to avoid the scrutiny of the markets and consequently apply resources that fit their best welfare while destroying the shareholders' value.

So far, we have covered two of the major groups in Jensen and Meckling (1976) theory, managers and shareholders, the next section proceeds with the authors rationale introducing the bondholder's relationship with shareholders. Fama and Miller (1972) argue that under certain circumstances the conflict of interests between bondholders and shareholders can be anticipated seeing as a *"...production plan that maximizes shareholder's wealth does not maximize bondholder wealth, or vice versa"* (Fama and Miller, 1972:179). Thus, managers acting in the interest of shareholders often perform in ways that restricts the benefits that accrue to bondholders enabling conflict of interest between the two parties. This relationship results from the differences in the kind of claims each holds, shareholders are residual claimants of the firm's assets while bondholders have priority claims. In consequence, two classic problems are developed,

these are the underinvestment problem and the asset substitution problem. (Jensen and Meckling, 1976; Mcminn, 1987)

The conflict of underinvestment occurs when the firm is highly levered which enhances the manager's incentive to reject investments in positive NPV projects, decreasing the value of the firm, due to the outcome of accepting the project accruing to bondholders. Therefore, the existence of debt reduces the value of the firm weakening the corporation's incentive to undertake good future investments. By pursuing risk management, the firms cash flow volatility reduces enabling the managers to undertake positive NPV investments which would be otherwise deferred. In other words, debt reduces the market value of the firm weakening the corporation's incentive to undertake value enhancing investments, hedging reduces the firm volatility and therefore permits to undertake good future investments.

Further, the asset substitution problem can be seen as shareholders engaging in riskier projects once the firm has obtained the debt finance. This effect increases the value of the shareholders at the expense of bondholders seeing as debt is issued with the promise of investing in low-risk projects however it is applied in high-risk projects. Therefore, it allows to transfer wealth from the bondholders to shareholders as equity rises with increased volatility of the firm's cash flow. Bondholders are aware of these opportunistic behaviors and consequently try to protect themselves by lowering the price they are willing to pay for the firm's bonds or by imposing contracts that restrict corporate investment and financing policies. These result in agency costs and ultimately decreases firm value. *"Risk management can add value by avoiding the errors in the investment decision that are induced by conflicts between bondholders and shareholders"* (Smithson, Smith and Wilford, 1995: 506). In that manner, as risk management reduces the probability of default it engages potential bondholders to pay more for the bond. Shareholders put into practice hedging activities knowing that the benefits accrue mostly to bondholders. However, hedging also increases the debt capacity of the firm and therefore allowing tax advantages of greater leverage which can offset the advantages transferred to the bondholders. (Bartram, 2002; Smithson, Smith and Wilford, 1995, Leland, 1998)

The authors referenced above, defend that hedging strategies *"protects a company from excessive business risk, thus reducing business costs and making the company more*

economical and more competitive" (Speranda & Trsinski, 2015: 560). Throughout this section it was illustrated that risk management avoids the probability of costly lower-tail outcomes – eliminating financial distress, reducing corporate tax burden, lowering the demand for costly external finance and investment and last reduces the agency costs of diverging manager's, shareholders and bondholder's interests.

2.2. EVIDENCE OF RISK MANAGEMENTS IMPACT ON FIRMS

William Millar (1989) surveyed large multinational corporations and reached a conclusion that risk management was ranked second after firm's credit standing. Another survey published in 1993 by Treasury Magazine indicated that from a total of 95 firms, 74 percent used derivatives. These results are consistent with the increased volatility of the interest rate during the 1970s making it imperative for firms to hedge those risks. As financial markets have become and maintained volatile, besides the risk of the volatility of the interest rates firms are also confronted with the volatility of foreign exchange rates and commodity prices. In fact, a more recent study[1] conducted by the International Swaps and Derivatives Association (ISDA) has demonstrated that the derivative use continues to grow. From the world's 500 largest firms over 94 percent use derivatives as protection mechanism. Consistent with the demonstrated facts, the literature argues that firms concern has risen with the unpredictable movements in financial price risks, seeing as they can quickly wipe away any profit and determine the firm's survival. (Nance, Smith and Smithson, 1993; Stulz, 2003)

As stated, firms in the ordinary course of their business are subject to different financial price risks that could lead to financial distress and bankruptcy. Such risks, like the exposures from foreign exchange rates can mellow down the business and create new competitors. In the same way, volatility of commodity prices can force the firm to inflate prices leading consumers to pursue substitute products that are more affordable. Also, changes in interest rate can put pressure on the firm's expenses and receipts, this because, besides the costs of borrowing increasing substantially and therefore businesses reducing investments in R&D, with high interest rates customers also cut back on spending. Consequently, this cycle affects the sales which in turn plummet, leading to financial distress.

Now enlightened about how financial price risks can affect the firm's business, the answer to *Why firms use derivatives?* can be given. The answer is that *by using derivatives the firm can cut away unwanted portions of risk exposure* by reducing the total risk in the system or by shifting them to economic agents who are willing to bear the risks. In doing so the firm is said to be hedging. (Ross, Westerfield and Jaffe, 2005)

The question that now rises is whether *hedging adds value to the firm, and if so, is there evidence consistent with hedging theory?* (Stulz, 2003; Smithson and Simkins, 2005; Froot *et al*., 1994)

"Finance theory indicates that hedging increases firm value by reducing expected taxes, expected costs of financial distress, or other agency costs" (Nance, Smith and Smithson, 1993: 267). Risk management theories, presented in the previous section, focused on the reasons firms use derivatives. This section is dedicated to examine if the use of derivatives is consistent in the context of risk management theory. Accordingly, this section will follow the model provided in Smithson and Simkins (2005) paper in order to reach an interpretation of the impact risk management has on firm value. The authors presented three investigation questions:

    i.   Is the use of risk management tools (derivatives) associated with reduced risk?
    ii.   Is cash flow volatility related to firm value?
    iii.   Is there a relationship between the use of risk management and the value of the firm?

i.   Is the use of risk management tools (derivatives) associated with reduced risk?

To test the relation between derivatives and firm risk, Smithson and Simkins (2005) argued that if firms are exposed to financial price risks, this is, their equity returns are sensitive to changes in interest rates, foreign exchange rates and commodity prices, and use derivative mechanisms to manage those risks, a change in the sensitivity of their stock returns would serve as evidence that the market reacts to hedging activities. Stock market returns or total risk is the combination of specific risk and market risk. Hence, in order to recognize the markets value of hedging it is necessary to analyse the market risk, which is generally measured by "beta". Beta is the sensitivity of a firm's stock price to market wide movements, this is, measures the amount that investors expect the stock price to change for each additional 1% change in the market. (Smithson and Simkins, 2005)

Accordingly, many authors such as Guay (1999), Allayannis and Ofek (2001), Jin and Jorion (2006) among others provided empirical evidence that firm risk is reduced with the use of derivatives. Nonetheless, there was one study conducted by Hentschel and Kothari (2001) in which the evidence proves the contrary. However, although not unanimous the weight of the evidence encourages that derivatives use by nonfinancial firms, mainly to hedge foreign exchange risk, reduces the sensitivity of firm's equity returns in regard to financial price risks. (Smithson and Simkins, 2005)

Guay (1999) constructed a study with 254 non-financial firms that began the use of derivative tools as a protection mechanism. Guay (1999) reached a conclusion that in the following period after initiation the firm risk declined. Hence, in accordance with the purpose of hedging the author found that derivatives are associated to lower risks. According to the test the average risk reduction ranges to 22% for firms using interest rate derivatives and 11% for firms using exchange rate derivatives. Guay (1999: 334) findings report that "*new derivative users experience significant reductions in stock-return sensitivity and the risk exposures (interest rates or exchange-rates) underlying their derivatives positions.*"

Allayannis and Ofek (2001) examined the use of foreign exchange derivatives among 378 U.S. nonfinancial firms during the period between 1992-1994. The aim of the study was to evaluate the sensitivity of equity returns to foreign exchange rate exposures. The tests result concluded that the use of foreign exchange derivatives had a negative relation with the foreign exchange sensitivity of equity returns, meaning that the use of derivatives significantly reduced the exposure of the firms to exchange rate risk.

Hentschel and Kothari (2001) provided different results concerning the use of derivatives to reduce risk. The authors investigation on 425 U.S. firms found that the exposures and sensitivity of interest rates and exchange rates with the use of derivatives display small measurable differences in risk for the majority of the firms. The authors reflect that the effect of derivatives on firms is positive but economically insignificant. Specifically, compared to the firm's annual volatility of 29% the expected increases in the annual return volatility is only one percentage point. Thus, these results complement Koski and Pontiff's (1999) findings in which they also contradict *"the popular association of derivatives use with increased risk exposure"* (Koski and Pontilf, 1999: 183). Therefore, Hentschel and Kothari (2001) shed light on the possibility that firms use financial

derivatives to speculate. The studies show a fast growth pace of derivatives usage, 48.4% over two years, however the effects of derivatives usage on firms are very small with insignificant increases or decreases in firms return volatility, for speculative purposes it would be expected higher volatility of return and more exposure. Therefore, regarding the paper's title *Are Corporations Reducing or Taking Risks with Derivatives?* the authors answer *"typically not very much of either"* (Hentschel and Kothari, 2001: 117).

Moreover, Jin and Jorin (2006) investigated the hedging activities of 119 U.S. oil and gas producers from 1998 to 2001 in order to reach a conclusion about the difference in firm value between firms that hedge and those that do not hedge their oil and gas risk exposure. The authors conducted a study in which they examine the relation between stock return sensitivity to commodity prices and the use of derivative tools. Analysing the firm beta, the authors conclude that the oil and gas exposure are positive and significant *"We find that about 92% of the oil betas and 95% of the gas betas are positive"* therefore, for an average firm, an increase of 1% in oil and gas prices represent an increase in the stock price of 0.28% and 0.41% respectively. The author's main hypothesis is that the use of derivatives reduces the stock price sensitivity to oil and gas prices. In that manner, the findings prove that the relation between derivatives and sensitivity of commodity prices is negative, therefore concluding that *"the market recognizes the effect of hedging activities on a stock's exposure to commodity prices."* (Jin and Jorion, 2006: 908)

ii.   Is cash flow volatility related to firm value?

Finance theory indicates that hedging increases firm value to the extent that it ensures the firm has cash-flow available to undertake promising investments, by doing so it reduces the underinvestment problem as well as the expected costs of financial distress. This theory is supported respectfully by Froot, Scharfstein and Stein (1993) and Smith and Stulz (1985) theoretical papers. The former authors defended that when cash flow is volatile and access to external financing is costly, firms cut down on investment spending and growth opportunities in a way that is costly to the firm while the latter authors argued that cash flow volatility originates deadweight costs and thereby resulting in financial distress.

Minton and Schrand (1999) examined this question and reached the conclusion that firms with higher cash flow volatility will present lower levels of investment in R&D expenditures. This association follows the rationale provided by Froot, Scharfstein and

Stein (1993) that firms prefer to forgo investments opportunities than using external capital markets. Thereby establishing the tie between lower levels of investment with cash flow volatility.

Besides the negative impact that cash-flow volatility has on investment, the literature theory on risk management policies demonstrates that greater cash-flow volatility weakens shareholder's value since, it increases the costs of financial distress and reduces the tax benefits of debt. Providing empirical evidence towards this theory, Haushalter (2000) and Shin and Stulz (2000) focus on different perspectives, however their evidence complement each other.

Haushalter (2000), focusing on oil and gas industry between 1992 and 1994 showed that there is *"a positive relation between the extent to which a firm hedges and its financial leverage"* (Haushalter, 2000: 146). In that manner, the author found that firms with greater leverage tend to hedge financial price risks more often as they are more sensitive in financing investment opportunities than less levered firms. Therefore, the author establishes the link between hedging against price risk and financial leverage supporting the theory that hedging reduces financing costs, allowing greater debt capacity which in turn decreases tax liability and ultimately strengthens the shareholder's wealth. Consistently, Shin and Stulz (2000) reach the same conclusions with different prespective. They argue that the relation between changes in equity volatility and shareholder wealth is negative, this is, increases in cash-flow volatility which increases equity volatility affects shareholders by weakening their expected returns. Hence, the evidence shows that the effects are larger, this is, shareholder wealth decreases more for financially weaker firms with higher leverage and lower cash-flow and investment than for larger firms with high growth opportunities. This result is consistent with the literature, in which larger firms generally with better access to capital market will experience lower costs of financial distress. The bottom line, in accordance with the theoretical arguments, is that an increase in cash-flow volatility affects shareholders adversely. (Smith and Stulz, 1985; Haushalter, 2000; Graham and Rogers, 2002, Shin and Stulz, 2000)

iii.   Is there a relationship between the use of risk management and the value of the firm?

The last question in Smithson and Simkins (2005) paper relates back to the starting question: Does the use of risk management add value? The empirical evidence on the effect of derivatives usage on firm value is still mixed. However, although not uniformly supportive, regarding the use of interest rate and foreign exchange rate derivatives, Smithson and Simkins (2005: 8) concluded that "th*e evidence reinforces the idea that corporate risk management is a value-adding activity".* As for the commodity price derivatives the impact on firm value appears to depend on the activities in which the firm operates, this is, if it is a producer of the commodity then according to Jin and Jorion (2006) the effect of derivatives usage does not increase firm value however if the firm is a user of commodities then there is a significant association to greater firm value in Carter, Rogers, and Simkins (2006a) view. Hence, the majority of the studies measured the relationship between derivatives and firm value using Tobin's Q method, defined by the authors as *the ratio of a company's market value to the replacement value of its assets."* (Smithson and Simkins, 2005: 14) Meaning, "*if a firm has a higher Tobin's Q, it creates more value out of the assets it purchases*" (Stulz, 2003: 637).

Allayannis and Weston (2001) examined the use of foreign exchange derivatives among 720 U.S. nonfinancial firms over the period of 1990-1995, with the aim of evaluating its impact on firm value. The authors compared the users of foreign exchange derivatives with the non-users and found that there is a positive and notable relation between firm value and the use of foreign exchange derivatives. Specifically, the authors reached a figure of 4.87% higher value for those firms that hedge exchange rate risks.

Differently from other studies, Graham and Rogers (2002) shed direct light on how risk management adds firm value by examining whether the use of derivatives is consistent with existing theories of hedging. In their paper, the authors address the incentives of corporate hedging related to debt capacity and tax shields. Recalling the tax burden theory presented by Smith and Stulz (1985), if a firm's expected tax function is convex, then hedging can reduce the firm's expected tax liability and income volatility. For this theory, the authors found no direct relation between convexity and hedging. Nevertheless, regarding the debt capacity theory presented by Ross (1996) and Leland (1998), in which the authors defended that hedging allows increases in the optimal amount of debt

therefore generating greater tax shields from leverage, consequently leading to higher firm value, Graham and Rogers (2002) provided evidence of the use of derivatives in response to tax incentive. Accordingly, the investigation found there is a positive relationship between debt and hedging allowing greater debt capacity. Specifically, the tests concluded that hedging increases the firm's debt ratio by 3%, hence the tax benefits of increased debt capacity amounted to 1.1% of firm value.

However, raising doubts about the conclusions provided by Allayannis and Weston (2001) and Graham and Rogers (2002), Guay and Kothari (2003) proceeded with an analysis to estimate the cash flow implications from hedging programs for 234 large U.S. nonfinancial firms and consequently the inferred changes in firm value. Guay and Kothari's (2003) findings contradict many empirical derivative researches that argued the benefits of derivatives usage on risk management and its significant effect on firm value. Specifically, *"for the median firm in their sample of 234 firms, a simultaneous three-standard-deviation change in interest rates, FX rates, and commodity prices would result in a cash inflow of only $15 million and would increase the value of the firm's derivatives portfolio by only $31 million"* (Smithson and Simkins, 2005: 14). Therefore, the author's concluded that corporate derivatives positions in general are far too small relative to entity-level risks and cannot possibly have an effect of the magnitude claimed by Allayannis and Weston (2001). The interpretation of the observed increases in firm value, in Guay and Kothari (2003) view, lies on the correlation problem. This is, the positive results in firm value are driven by other risk management activities which happen to be positively correlated with derivatives, overlapping the derivatives effect in the sample.

Jin and Jorion (2006) in question 1 reached the conclusion that hedging reduces the firm's stock price sensitivity to oil and gas prices, allowing the authors to further analyse if hedging increases firm value. Using Tobin's Q, the authors found that the effect of hedging on firm value is not statistically significant, in fact there was no difference between hedging and non-hedging firms. Specifically, the values of Q for oil and gas exposures, demonstrates that the Q values for hedging firms are slightly lower than for non-hedging firms, in which the differences are on the order of 4%. These results diverge from the findings reported in Allayannis and Weston (2001), whom covered a large sample of U.S. multinationals in different industries and with different growth rates. In that manner, Jin and Jorion (2006) shed light on the importance of sample selection and reflected that their sample was more homogeneous focusing only on one industry being

less exposed to the endogeneity problem and therefore lessening the possibility of spurious results. The endogeneity problem is a result of different variables used by firms towards risk management practices therefore, affecting the interpretation of the results which consequently may generate differences across studies. (Jin and Jorion, 2006; Bartram, Brown and Conrad, 2011)

This outcome, in the Jin and Jorion's (2006) view, suggests that in the oil and gas industry hedging does not add value due to the possibility of the investors undertaking the necessary hedging activities themselves, bringing it closer to the M&M theorem. Contrary to what occurs with oil and gas, in the case of foreign exchange derivatives the risks are more complex involving complex derivatives and therefore much harder to hedge away by investors. Therefore, the authors argue that for the multinational firms hedging foreign exchange risks can be beneficial due to information asymmetries. Yet, Jin and Jorion (2006), just as Guay and Kothari (2003), do not set aside the possibility of the positive results between hedging and firm value reached by other studies being a result of the correlation problem. Nevertheless, opposing to the foreign exchange risk the oil prices can be easily identified through the financial statements and "*one might even argue that investors take positions in oil producers precisely to gain exposure to oil prices. If so, an oil firm should not necessarily benefit from hedging oil price risk.*" (Jin and Jorion, 2006: 895). Jin and Jorion (2006: 915), also add that if hedging has no impact on firm value, "*the explanation probably lies in management acting for personal utility maximization purposes*".

Differently from Jin and Jorion (2006), Carter, Rogers, and Simkins (2006a) examined the case of jet fuel hedging in the U.S. airline industry and reached the conclusion that hedging allows significant higher firm value. Airlines are potentially exposed to risks resulting from adverse movements in jet fuel prices, "*the standard deviation of average monthly fuel prices during 1992-2003 is about 15.7 cents per gallon*" (Carter, Rogers, and Simkins, 2006: 56) resulting in economically significant higher financial risks. Consistent with the assertion that jet fuel prices are highly volatile, there is greater incentive to hedge fuel price risk. Thus, the author's results show that the impact on firm value could be greater than 5%, supporting the evidence of Allayannis and Weston (2001), in likelihood of being larger than 10%. Considering all the previous testimonies, the value showed is quite substantial, however the authors argue that it is reasonable

taking into account that annualized jet fuel price volatility is around 30% compared to the major currencies volatility of only 11%. (Carter *et al*, 2006)

The ground of empirical evidence in this section reflects on shareholder maximization hypothesis in which managers act in the best welfare of shareholders. However, the literature also includes theory on personal utility maximization for managers, in which there is also empirical evidence.

Consistent with the theory, Tufano (1996) explored the determinants of hedging in the gold mining industry. Due to the transparent nature of the industry, in which investors can undertake the necessary risks themselves, it would be expected that the firms in the gold mining industry would choose not to hedge. However, the findings prove the contrary. Studying the behaviour of 48 gold mining firms, the author found a significant variation in the risk management behaviour. While all firms hedged something, none of them hedged everything. From this outcome, Tufano's (1996) study was inclined to analyse *why hedging differs so much across firms?* The bottom line to this question lied on managerial risk aversion. In that manner, Tufano (1996) reached strong results that firms management hedged less gold price risk when their compensation contracts included more options holdings. In this case, managers had more incentives to undertake greater risks, as lower risks would reduce the volatility and hence the expected returns. By contrast, firms with greater management ownership in the firm's shares hedged more gold price risk. Therefore, with greater wealth tied up to the company the managers would consider all sources of risk. This evidence goes in accordance with the theoretical authors who suggest that risk management policies should align manager's incentive with those of the shareholders by linking the manager's compensation with stock price performance. This way, corporate resources are applied in the firm's best interest instead of in manager's personal maximization utility.

Linking all three questions, a recent study conducted by Bartram, Brown and Conrad (2011) examined the impact of using exchange rate, interest rate and commodity prices derivatives using a sample of 6.888 non-financial firms from 47 different countries. The sample is quite large allowing a greater statistical power however we might question, like with Allayannis and Weston (2001), that the endogeneity of variables will interfere with the interpretation of the results. Nevertheless, the authors apply methods to control variables such as, firm size, profitability, access to financial markets and leverage to

mitigate concerns of endogeneity. Therefore, in agreement with the empirical evidence reached in question one, the authors also concluded that the use of derivatives reduces the sensitivity of the firm's stock return to financial price risks. Specifically, Bartram, Brown and Conrad (2011) show that for derivatives users the stock return volatility is on average 18% lower compared to those that do not hedge with a lower average market beta of 6%. Consistent with the evidence presented in question two, the authors argue that the reduction in cash-flow volatility enables to alleviate the underinvestment problem permitting internal cash-flow to meet potential investments opportunities, which in turn reduces the likelihood of financial distress. However, as for the impact on company value, question three, the authors demonstrated that there is positive but weak evidence towards that direction. "*Overall, while there is substantial evidence of sustained and growing use of derivatives by firms, the effect of this use on risk and value, and the mechanisms by which value may be affected, are still unclear.*" (Bartram *et al.*, 2011: 974)

Although the results from the different studies vary preventing the possibility to reach one strong conclusion, the outcome from this section support several explanations of corporate risk management theories. Among the main reasons we discussed for why risk management increases firm value are:

- **Taxes.** The evidence seems fairly consistent that firms hedge to increase debt capacity, in which the central motive lies on increases of tax deductions. Thus, consistent with the theories presented by Stulz (1996), Ross (1996) and Leland (1998).

- **Costs of financial distress.** The consensus evidence is that firms hedge to reduce cash-flow volatility. Thus, there is a strong relation between hedging and investment allowing firms to undertake attractive investment opportunities as well as devote higher expenditures in R&D, consistent with Froot, Scharfstein and Stein (1993) framework also with Smith and Stulz (1985) argument that hedging reduces the probability of the firm encountering financial distress and consequent costs.

- **Agency cost.** The main evidence demonstrates that hedging activities can be linked to the holdings risk averse managers possess in the company. Therefore, in agreement with the literature theory of Smith and Stulz (1985).

3. METHODOLOGY

3.1. STUDY DESIGN

The goal of this dissertation is to study the impact and gains that the application of a hedging strategy can bring to a firm. While, many authors referenced in the literature review draw their conclusions upon a sample of nonfinancial firms, e.g. 119 US oil and gas firms in the case of Jin and Jorion (2006) and in Allayannis and Westons (2001) investigation all firms with 500 million in total assets each year in the US, this study differs by reflecting only on one nonfinancial firm and therefore allowing a different approach to the study in hand. The emphasis this study is determined to reach is that a hedging strategy is tailored to manage specific and individual risks with unique features, which previously mentioned authors could have easily miss out on when studying the risk management of a bundle of firms, therefore leading to spurious results.

The fact is the present literature presents evidence that is mixed, while some studies such as Allayannis and Weston (2001), Carter et al. (2006) defend the positive impacts of hedging activities, Jin and Jorion (2006) and Bartram et. al (2011), on the other hand, demonstrate that hedging does not increase firm value. Additionally, Ahmed's et al. (2013:1) findings show that "the effectiveness of the risk management practices varies significantly across the financial risks and the derivatives used for hedging", highlighting the possibility of endless outcomes of whether hedging increases firm value considering each firm's specific risks and hedging strategies. Thus, the importance of more research on the subject, which therefore creates a drive to develop and study new cases with a different perspective to further contribute to the existing literature. In fact, Brown (2001) also adopted this methodology, one case study, to reach a more in depth conclusion about risk management activities claiming that the empirical theories so far have left us with stylized facts which are not consistent and lack power in their results.

With this said, aiming to build a comprehensive investigation and draw a conclusion about the impacts a hedging strategy has on a firm, the study drives to answer the question *Whether and how hedging affects the risks of the firm?* To reach powerful outcomes, when possible the results are crossed with those presented by the previous authors.

3.2. RESEARCH SAMPLE

Considering the goal of testing the theory in terms of why hedging is considered by the firm, how they are applied and with what result, the case study research showed to be the most appropriate for this investigation allowing to obtain the holistic and important aspects of real-life events. Hence, to draw a conclusion this investigation requires an historical analysis, rather than mere frequencies, ruling out other forms of research such as, surveys and experimental strategies. Therefore, Rede Eléctrica Nacional, S.A. (REN) constituted our single case study for this investigation in which a three-month internship was performed to capture the essence of the groups hedging strategy. REN conducts activities to ensure an uninterrupted supply of electricity and natural gas having maintained a steady course along the years and successfully achieving new goals. The latest was the mark of its international strategy with the acquisition of stakes in Chile growing the groups asset base. Furthermore, REN presents a stable and positive financial balance, an EBITDA of € 476.0 million in 2016 and continues to be rewarded with an investment grade rating from the three largest international agencies

According to Yin (2009) single case studies are relevant to further support the theory and increase knowledge. Yin (2009) defends that a single case can represent the critical test of a well-formulated theory used to ascertain if the theory's propositions are correct or challenge with an alternative set of explanations. However, there are some limitations pointed out by the author, namely, the lack of systematic procedures, which are present in other forms of inquiries namely, experiments and surveys. Consequently, this lack of rigor, as expressed by Yin (2009), makes it easier to manipulate the results and conclusions. A second limitation refers to the difficulty of generalizing the single experiment. While the investigators can solve this problem by applying multi-case studies to broaden their spectrum, this work consists on the analysis of a single firm. To circumvent this pitfall, we will, when possible, compare the results reached in our study with the ones presented by Brown (2001), who also presents a case study investigation. This way, if both studies match it creates powerful results.

3.3. INSTRUMENTS

Yin (2009), while citing Creswell (2007) states that the case study method is not just a form of "qualitative research", even though it may be recognized among the array of qualitative research choices, it can also be extended to being used as a mix of quantitative and qualitative evidence. In fact, during the field research at REN the data collected had not only qualitative but also a quantitative nature, allowing a complete and thorough analysis of the hedging strategy applied in the group. Among the data collection was the annual, the quarter and the half-year reports, presentations, internal documents and historical data on the derivatives transactions, all of which were carefully analysed and reviewed in order to incorporate relevant information to the study at hand. Furthermore, the opportunity to perform field research enabled conducting specific and structured questions to the financial department at REN and observe some of the procedures necessary in this field in terms of control and supervision. With this, we were able to conduct our study and draw conclusions that are further developed in following chapters.

Furthermore, the collected data allowed us to perform tests to analyse the impacts of the group's hedging strategy. In section 4 we conduct a multiple linear regression model with the support of the eview's econometric software. We found multiple regression an appropriate method, as it allows an adequate analysis when the research problem seeks to predict the changes in the dependent variable in response to changes in the independent variables. The remaining tests all took shape based on the yearly financial statements and internal documentation of the group allowing to build tables that compare a hedged group, as REN currently is, with an unhedged group, case in which REN did nothing to limit the exposure to financial price risks. Therefore, reaching a better understanding of how hedging impacts the risks of the group.

4. FIRM DESCRIPTION

This section, describes REN's activity, risk profile and hedging strategy towards the investigation of *Whether and how hedging affects the risks of the firm?* The analysis will focus on REN's operations, exposures to financial price risks as well as the group's derivative instruments, using quantitative and qualitative description.

4.1. ABOUT REN

REN - Redes Energéticas Nacionais is present in the electricity and natural gas markets. Its core business is the management of energy transmission systems, this is, ensuring an uninterrupted supply of electricity and natural gas at a low cost with high quality and safety, mirroring the company's mission. Thus, in a market in which there are many players (e.g. generators, distributors, suppliers and consumers) REN operates as the intermediator guaranteeing a balance between those who require and those who supply energy.

REN's two main operating activities, with characteristics that few possess in Europe, are the following, transportation of electricity at very high voltage and overall technical management of the Nacional Electricity System, and transportation of natural gas and overall technical management from the reception, storage and regasification of liquefied natural gas (LNG). Apart from this main line of business, REN's other businesses include telecommunications, production of electricity from sea waves, management of the remaining Power Purchase Agreements (PPA's) and REN services which aims at assisting third parties with consultancy and commercial services.

Furthermore, the group's core market is located in Portugal, where the continuous superior transmission of expertise in the integration of gas and electricity assets, both as a system and a network, and the integration of intermittent energy sources, as well as the expertise in operational and technical performance positioned the company among the best Transmission System Operators (TSO's) worldwide. Thus, besides the focus on Portugal, REN is seeking to pursue an international strategy for new and growing opportunities and has prospects to expand the activity to the Latin American and African

markets. Following the re-privatization process and the entry of two new strategic partners with a strong influence in the global energy sector, State Grid and Oman Oil, this vision has become more prominent. The outcome will translate into a company that not only provides a high service in its home land but also possess an international nature enabling diversified revenue streams, lower geographical, regulatory and financial risk while continuing to create and enhance shareholder value.

Figure 1
REN's Internationalization Agenda

The main goal that REN seeks to achieve from the strategic partnership with the Chinese multinational State Grid is to reinforce the leading position in Portugal, continue with the contribution in the Iberian market and potentiate REN's international expansion in Angola and Mozambique in the energy sector. Hence, pursue business opportunities in the role of a service provider in Brazil and China. The partnership with the multinational Oman Oil company also supports REN's international expansion in which it will enable REN to access the market in the countries of the Cooperation Council for the Arab States of the Gulf. Besides these new partnerships that emerged from REN's reprivatisation, it already has important strategic partnerships with Red Elétrica Corporación and Enagás designed to develop the energy market in the Iberian Peninsula.
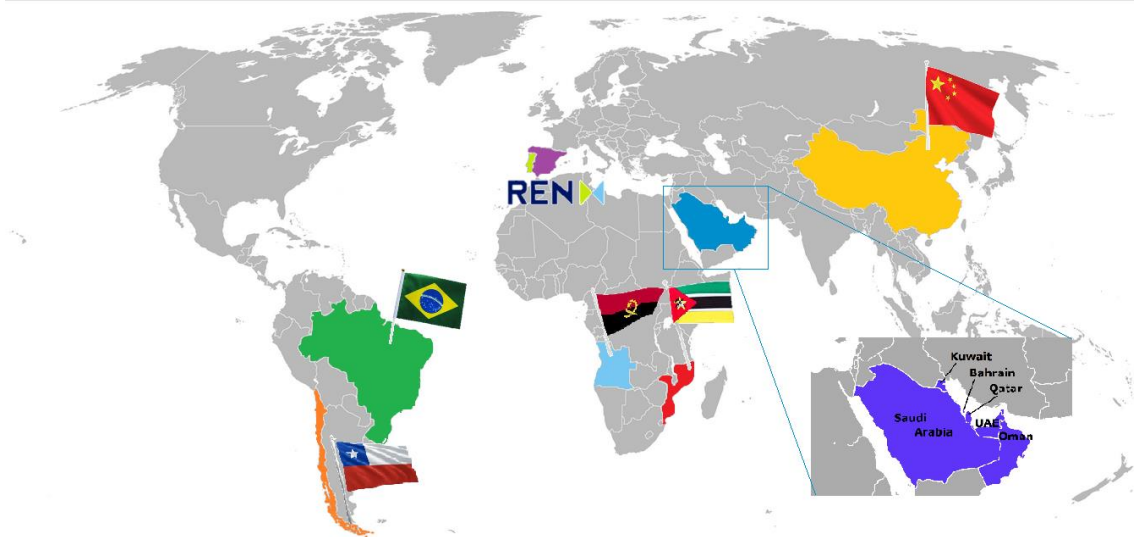
Steady that international expansion is a key growth pillar REN has already shaped its first international success story with the investment on a key natural gas asset in Chile. Having said that, REN is now part of major Chilean energy players, with 42.5% of Electrogas shares. Electrogas owns a natural gas transportation system and possesses the only gas

pipeline in Chile's central region, stretching 165.5 Km it links Quintero's regasification terminal to the country's largest population center in Santiago. This opportunity matched REN's medium long-term goals, acquiring a stake in a sector in which the group has extensive knowledge and in a country with a stable and competitive economy highlighting the development and sustainability of the group in diversifying geographies and leveraging the recognized expertise of its professionals.

In line with the description above, REN is a group of big dimensions with over 100 million euros in net profit and with a distinguished mark in the energy world. Hence, the interest in aiming this study at REN as it not only possesses the requirements necessary to conduct this analysis but also has a particular hedging strategy. During the ordinary course of its business, REN not only hedges its exposure to the financial risks, exchange rate and interest rate, but also incorporates a hedging strategy for the assets side of the balance sheet. A strategy that aims to minimize the risks that threatens to disrupt the group's stability in cash flows by actively managing the "*changes in interest rates, the mix of balance sheet assets and liabilities, the holdings of foreign currencies and the use of derivatives.*" (Kallur, 2016: 315)

Bearing in mind the mentioned in the literature review, the expectation, in accordance with most empirical researchers is to find that hedging allows REN's cash flow volatility to decrease enabling the corporation to pursue some important investments opportunities in a period where it begins to follow an international strategy. For the challenges that lie ahead, expansion of REN's operations internationally and to continue to provide stable services in the homeland, some investments will be fundamental for the sustainability and growth of the company namely on, the acquisition of assets, in electricity and natural gas infrastructures, as well as in the recruitment and retention of local expertise. Therefore, if hedging can reduce cash flow risk, through financial risk management with derivatives, it will increase REN's ability to pursue its investments therefore executing its strategic plans and consequently strengthening its competitiveness and market value.

4.2. RISK PROFILE

"Being aware of best practices and striving to implement them are keys not just to success, but to having good prospects of long term survival." (Fusaro, 2008: 67). Having mentioned this, the first step towards applying the best risk management practices is to understand the risks that influence the business, the operations and the financing of the group. With that in mind, this section presents the main risks exposures of REN.

4.2.1. FINANCIAL RISKS EXPOSURES

Changes in the economic environment have led to an experience of turbulence and unpredictability in the market making it imperative for firms to be aware of their exposures to financial price risks. Foreign exchange fluctuations are a major source of risk for corporations, adding to that, interest rate and commodity price have demonstrated to be as volatile. Individually these risks affect the expected future cash flow of the firms and consequently firm value in diverse and complicated ways, together they increasingly challenge firms for survival. (Smithson *et. al,* 1995; Prasad and Rajan, 1995)

REN's business activities relies on the stability of its future cash flows to ensure an uninterrupted supply of electricity and natural gas with the best quality and safety as well as the accomplishment of the challenges that the group sets for itself. Therefore, any instability from the financial price risks can unsettle the normal course of the group. Two examples can be provided to exemplify the impacts the financial price risks can have on the groups business. REN's activities in the transmission and transportation of electricity and natural gas have positioned the group as one of the best TSO's worldwide, enhancing its engagement to participate in R&D fields in delivering innovative solutions, approaches and methods into energy systems. Therefore, the R&D of the group's budget can be quite substantial leading to a major concern for management. This because, any unpredictability in interest rate and foreign exchange rate could force the group to decrease its R&D expenditures, thereby becoming less competitive. Moreover, REN's strategy for international growth through partnerships with State Grid and Oman Oil requires significant capital expenditures, which puts pressure on the group's cash flow. Hence, once more any unpredictability from the financial price risks could significantly affect REN's ability to properly execute its international strategy and achieve its growth goals.

i. INTEREST RATE EXPOSURE

Interest rate risk theorists have reflected on the importance of managing this financial price risk, as it not only affects the cash flow but also influences the firm's financial assets and liabilities. Thus, changes in interest rates due to economic instability can influence through the direct effect on the cost of capital, the investment decision of the firm. (Bartram, 2002)

REN's exposure to interest rate impacts the financial performance in two distinct layers, the group's assets on the revenues REN receives for electricity transmission and natural gas activities as well as the group's liabilities on the borrowings.

On the asset side of the balance sheet, considering the position of REN's operations in the electricity and natural gas value chain, the group is subject to industry regulation and consequently exposed to interest sensitivity. 95% of REN's activities are within the regulated rules defined by the ERSE[1], an entity that aims to protect the rights and interests of the consumers as well as assure the correct balance within the regulated activities. In that manner, much of REN's assets have a guaranteed return, however they are also linked to the ten-year Portuguese Republic Treasury bond yield (OT's) and therefore sensitive to any oscillations in the market interest rates. Figure 2 illustrates the evolution of the Portuguese Bond Yield, which clearly demonstrates the interest rate exposure and the impacts on the groups return. More precisely, figure 2 demonstrates the plummet of the rates that occurred from 2012 onwards, automatically prejudicing REN's rate of return on electricity and natural gas businesses, consequently resulting in higher cash-flow volatility. Currently the bonds yield marks 3.76% leading the group to be slightly affected however they seem to be moving into an ascending direction. Case in which the group's rate of return also increases and consequently generates higher cash-flow.

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[1] ERSE – Entidade Reguladora de Serviços Energéticos

Figure 2
10 year Portuguese Republic Bond Yield

The evolution of the 10 year Portuguese Republic Bond Yield during the last 8 years has suffered strong oscillations reflecting the instability of Portuguese economy. Analysing the figure, up to 2009 the bond yields were characterized by slight swings. However, between 2009 and 2012 the Portuguese bond yield rose rapidly reaching a pick of 17% followed by a sudden plummet to historical lows in 2014 continuing thereafter a recovering flow having reached in 2016 a mark of 3.76%.
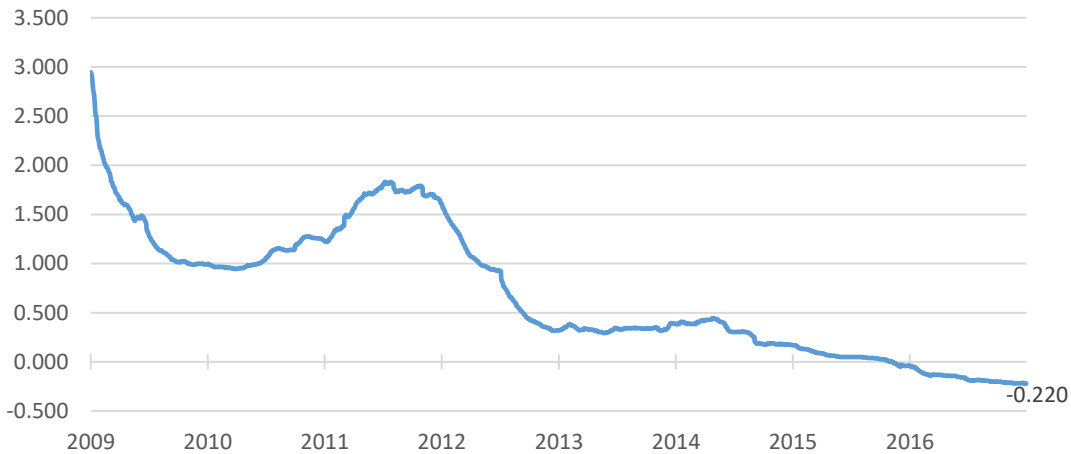

SOURCE: Bloomberg

As for the liability side, REN's exposure to interest rate risk is mainly through the robust debt profile. Having mentioned this, REN being highly levered will experience higher costs of debt if interest rates follow an increasing movement. The evolution of the Euribor 6 months, a proxy for the interest rate exposure of the group, illustrated in figure 3 demonstrates that rates have reached negative values, -0.221 at the end of 2016, which constitutes a favourable scenario for the group. However, when the interest rate increases again it will expose the group to cash-flow risk, leading the group to be adversely affected. Furthermore, the markets current stage with rates reaching historical lows and the unpredictability of when they will rise again or whether it will continue with the falling rates creates instability in the group's financial performance. Thus, the need to hedge the interest rate exposure to secure that whichever the direction of the interest rate in the future, the effects on the group will be minimized.

Figure 3
Euribor 6 Months

The evolution of the Euribor 6 Months index over the sample period has shown to reveal a falling tendency. The figure illustrates bounces between 2009 and 2011 however since 2012 the rates have followed a decreasing course, falling into negative rates in 2015 and reaching historical lows in 2016 with -0.220.

SOURCE: Bloomberg

ii. FOREIGN EXCHANGE RATE EXPOSURE

"A firm is exposed to currency risks to the extent that the future real wealth on some target date depends on future real currency values" (Adler and Dumas, 1980: 973). In light of this view, foreign exchange rate exposure is common for firms with foreign sales and foreign trade, whose activities are embedded with different currencies inheriting the uncertainty factor from the volatility of exchange rates. Inevitably, the future cash flows will be characterized by sensitivity affecting the value of the firms. (Adler and Dumas, 1980; Allayannis and Ofek, 2001)

REN's activities have, until the current stage, been mainly conducted in Portugal or within the European Union, therefore regarding the foreign exchange rate risk, this exposure resulted exclusively from foreign debt, namely a bond issued in the Japanese currency on the total amount of 10,000 million Yen (JPY). Higgins (1980) in the discussion of Adler and Dumas (1980) paper describes, *"the unique characteristic of a foreign asset is that the real purchasing power of the cash flows from the asset depends on the exchange rate*

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prevailing on the conversion date". This said, the uncertainty about the future currency fluctuations can lead to large swings in value. In that matter, the foreign currency debt transformed to the functional currency can suffer either an appreciation in the value of the exchange rate Euro/JPY that would lead to a decrease on equity or a depreciation, which would result in an increase on equity.

In light of its recent growth strategy, REN is now also exposed to the exchange rate volatility in the USD currency. The dividends set to receive from Electrogas are nominated in dollars, thus similarly to the EUR/JPY any appreciation or depreciation of the currency will affect the group's cash inflow.

iii. COMMODITY PRICE EXPOSURE

REN's commodity price exposure refers particularly to the acquisition of CO_2 emissions allowances. This is, in 1997 the Quioto Protocol established a three-phase model to guarantee that the CO_2 emissions would decrease significantly by 2020. To see this goal through, the European Union Emissions Trading Sytem (EUETS) elaborated a cap system which sets the maximum target of greenhouse gases that can be emitted by companies each year. Adequate also to mention, that the cap target is reduced over time to assure the graduate reduction of greenhouse gas emissions. This way, to cover for their emissions that exceed the target and avoid heavy fines, REN acquires extra CO_2 emissions allowances on secondary markets, through future contracts. Thereby continuing with the normal operations and satisfying the EUETS regulations, nonetheless creating an exposure for the group.

Overall, the financial price risk that significantly influences the group's performance is the interest rate risk as opposed to commodity price risk that influences only a relatively small set of the group's operations. As for the foreign exchange risk, it has become more relevant with the added risks from the acquisition of assets in Chile. Therefore, in REN's activities commodity price risk is of a lower magnitude than the remaining financial price risks, as such, we focus our attention on the analysis of interest rate risk and foreign exchange rate risk.

Throughout this section, we have described the financial price risks that the group is exposed to. Hence, acknowledging that the main risk factors relate to the interest rate, Euribor 6 months, and to the foreign exchange rate, EUR/JPY, we conduct a regression analysis to better understand the impact of the variation of these risks on firm performance. Before discussing the results, we first describe the variables used to conduct the regression model. Table 1 demonstrates the summary statistics for the variables presented in the following paragraphs.

i. EMPIRICAL MODELS

The regression model applied has the purpose of testing the impact the volatility of the risks have on firm performance and will therefore incorporate as an explanatory variable, the Net Income. This variable is an indicator of the group's total earnings commonly used as a measure of a company's profitability. To capture exactly the impact of these risks, the independent variables will include the Euribor 6 months index as a proxy of the interest rate risk and the exposure of the Euro towards the Japanese Yen for the foreign

Table 1
Summary Statistic of Variables used in the Regression Model

This table presents summary statistics for the variables used in the regression model. The data is gathered from quarterly reports, in respect to the group's financial details for the period in analysis, as well as from Bloomberg, in search for the historical rates of both risks.

	NI	CAPEX	Equity	EBIT	EURJPY	EUR6M	ROE
Mean	-0.147214	0.633869	0.006728	-0.194504	-0.002707	0.00311	-0.137289
Median	-0.086693	0.337345	0.022609	-0.017714	-0.009991	0.000179	-0.089878
Maximum	4.661736	9.75	0.041695	0.463032	0.131912	0.002681	4.934514
Minimum	-3.583029	-0.910638	-0.061723	-3.682317	-0.128285	-0.001583	-3.480845
Std. Dev.	1.264835	1.928665	0.033309	0.777331	0.067552	0.000893	1.291248
Skewness	0.988594	3.624743	-0.871098	-3.567121	-0.035531	0.788186	1.298134
Kurtosis	9.762166	17.91363	2.272263	15.55471	2.320821	4.421363	10.42335

exchange rate risk. Furthermore, other variables are also included, namely the Capex, the group's equity, the EBIT and lastly the return on equity (ROE). Missing to mention is that these variables are all considered for a period of eight years, ranging from the first quarter of 2009 to the third quarter of 2016.

Accordingly, we obtain the following equation using the variables above mentioned, where t refers to time:

$$NI_t = \beta_0 + \beta_1 Eur6M + \beta_2 \frac{EUR}{JPY} + \beta_3 capex_t + \beta_4 equity_t + \beta_5 Ebit_t + \beta_6 ROE_t + \varepsilon_t$$

(1)

We also check, before running the linear regressions, if all the variables included in the model are stationary. Hence, time series properties of the data were examined in order to test for the existence of unit roots using the Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) unit root tests to account for time-series dependence in the data. The results are reported in Table 2. The unit root null hypothesis can be rejected for all the variables. Therefore, the stationarity for all the variables included in the regression equation (1) is verified.

Table 2
Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) unit roots tests

This table displays de test values and the critical values of the ADF and PP unit root tests when applied to the first differences of different variables. The AR order is chosen for the ADF tests the Akaike Info Criterion (AIC) and the spectral estimation method used in PP tests was the Bartlett Kernel. Data are quarterly from 2009:1 to 2016:3.

Variable	ADF		PP	
	Test Statistic	Critical Value (5%)	Test Statistic	Critical Value (5%)
NI	-3.597	-2.976	-4.115	-2.968
EUR6M	-3.608	-2.981	-3.248	-2.968
EURJPY	-5.537	-2.968	-5.535	-2.968
CAPEX	-7.231	-2.968	-7.230	-2.968
Equity	-6.064	-2.972	-13.82	-2.968
EBIT	-3.263	-2.968	-3.077	-2.968
ROE	-3.517	-2.976	-4.231	-2.968

ii. REGRESSION MODEL RESULTS

With the preliminary analysis performed the focus follows on to the regression model whose goal is to test whether the two risks factors under consideration are important in determining REN's results, particularly the net income. The overall results obtained from the OLS method (Ordinary Least Squares), presented in table 3, is that the variables, Euribor 6 months and EUR/JPY, are not statistically significant in explaining the variability of REN financial results, which means that the volatility of these two risks have little or no impact on the firm's net income. Contrary to all the other variables used in model which have a statistical significant impact at a 1% and 5% level, the two risks factors present no relation at all with the explanatory variable, more precisely their p-values are 0.48060 and 0.35040 respectfully for the Euribor 6 months and EUR /JPY, well above any confidence level.

Considering the mentioned one explanation comes to mind as a justification for the results shown in table 3. This is, for the period under analysis table 3 shows that the evolution of the interest rate, if REN had not covered its risks, would have contributed with an increase in the net income of 4.105 while the exchange rate evolution, even though without great magnitude, would have led to the decline of the group's financial results in -0.092. Since the group hedges its exposures to the two risks factors in consideration there was little or no influence, in the statistical point of view, on the evolution of the net income, meaning that the group's risk management strategy is probably playing its role. On the opposite, if the regression results had shown that the Euribor 6months and EUR/JPY had significant impact on the financial results then it would mean that the groups risks management was being inefficient. Furthermore, we can also assert that the model under consideration is strong, as the R Square reveals that 99% of the explanatory variables justify the variation of the net income and the F-test reinforces that at least some of the explanatory variables used, all except the two financial price risks, are important in explaining the dependent variable.

Table 3
The Impact of Financial Price risks on Firm Performance

This table shows the results of the regression performed to evaluate the impact the price risks volatility, EUR6M and EUR/JPY, have on REN's performance, measured using the Net Income. The explanatory variables used in equation (1) are the following, CAPEX, Equity, EBIT, EUR/JPY, EUR6M and ROE. Statistical significance at the 1%, 5%, and 10% levels is indicated by *, **, ***, respectively.

Variables	Coefficient	Std. Error	t-Statistic	Prob.	Signif
C	-0.012502	0.00481	-2.599269	0.01640	**
CAPEX	0.005897	0.00197	2.994146	0.00670	***
Equity	1.05059	0.146566	7.168052	0.00000	***
EBIT	0.075422	0.005063	14.89613	0.00000	***
EURJPY	-0.092046	0.096476	-0.954076	0.35040	
EUR6M	4.105409	5.72179	0.717504	0.48060	
ROE	0.958905	0.003868	247.8865	0.00000	***
R-squared					0.99975
F-statistic					12984.9
Prob(F-statistic)					0

Moreover, to prevent the potential presence of heteroscedasticity and first-order autocorrelation of the estimation errors, we used the test proposed by White (1980) and the Lagrange multiplier of Breusch (1978)-Godfrey (1978), respectively. Although we do not report the results of the tests in our work, they showed evidence that residuals are mostly heteroscedastic and autocorrelated, a problem that originates an efficiency loss on the OLS estimators, which could undermine the value of the statistical inferences that were reached. Therefore, we used the procedures proposed by Newey and West (1987) to correct any autocorrelation and/or heteroscedasticity problems which could rise in the residual terms of the regressions.

4.3. HEDGING STRATEGY

This section examines the impact of using financial derivatives and whether they affect REN's exposures to risks. Hence, this section discusses the use of swaps, the impact they

have on firm performance, REN's distinguished hedging structure and finally a brief description of the group's incentive to pursue with a risk management strategy.

4.3.1. The Structure of Interest Rate Risk Management

As mentioned previously REN is exposed to financial price risks, interest rate risk and foreign exchange rate risk, thus falling to the use of swaps, namely interest rate swaps and cross currency swaps, as a mechanism tool to hedge the above stated risks.

Swaps are described as the most recent risk management tool, the financial derivative appeared in 1981 and has since registered a dramatic increase in its use. As presented in table 4, the annual surveys conducted by ISDA demonstrate the huge growth of both interest rate swaps and currency swaps since their appearance. Looking at the interest rate swaps, this increase went from $682 billion in 1987 to $381 trillion in 2014, a considerable amount in a very short period, which reflects the general use in corporate hedging activities. (Smithson, Smith Jr & Wilford, 1995)

Table 4
Interest and Currency Swaps (US$ Billions)

The notional amount of interest rate swaps and currency swaps has grown tremendously since the beginning of their use. Analysing the evolution from 1987 to 2014 both interest rate swaps and currency swaps rose constantly during the period between 1987 and 2013. The following year, 2014, resulted in a decrease in the notional amounts for both derivatives, for interest rate swaps this fall was sharp due to the contraction in euro denominated interest rates contracts. Nonetheless, it can be stated that within the markets of the OTC derivatives, there is no doubt that interest rate derivatives dominate. Joint all together the OTC derivatives market totalled up to $ 505 trillion in 2014, of which interest rate swaps accounted for $381 trillion representing 80% of the use of financial instruments in hedging activities. In light of the stated, when comparing the two financial instruments, although currency swaps are forerunner to interest rate swaps, the use of the later has not only been remarkable but far exceeds the use of currency swaps.

	1987	1992	2001	2013	2014
Notional amount in billions of interest rate swaps	$ 682	$ 3,850	$ 57,220	$ 456,725	$ 381,028
Notional amount in billions of currency swaps	$ 183	$ 860	$ 4,302	$ 25,448	$ 24,204

SOURCE: International Swaps and Derivatives Association, Inc; Bank for International Settlements

Hence, we can state that the great use of swaps confines to its versatility that enables firms to manage financial price risks on both the liability and the assets side of the balance sheet, making the derivative instrument a uniquely suited financial innovation. In this sense, aiming to obtain powerful outcomes, swaps play a central part of REN's financing strategy in allowing the group to play down interest rate exposure and create cheaper liabilities or higher yield assets.

The first's steps taken towards the development and implementation of REN's risk management program began in 2009 with the contract of four interest rate swaps and one cross currency swap, the latter from the bond issued in the Japanese market that year. Further on, new instruments (e.g. swaption) were introduced to the strategy as a creative possibility to deal with the group's exposure, however they proved to be unfit with REN's strategy. Nonetheless, the use of interest rate swaps and cross currency swaps not only grew but also intensified along the years and today they represent a notional amount of 1 604 217 million compared to the 757 000 million in 2009. This demonstrates the positive standpoint from the financial department on the use of financial instruments to hedge against the risk exposures of the group. In fact, the graph bellow illustrates the graduate increase in the groups hedging intensity of 0.08 between 2009 and 2016 measured using the proportion between the notional value of financial derivatives and total assets.

Although in the generic view the graph shows that there was an increase in the use of derivatives along the years, analysing specifically we notice that the growth was graduate with ascending and descending fluctuations. The year of 2009 marked the initial use of derivatives and has since registered a considerable amount of 10% of derivatives to total assets. Followed by a positive trend with bounces along the years, in 2015 the group reached the highest peak with the financial derivatives totalling up to 23% of the total assets, twice as much than 2009, then followed by a slight decrease in 2016.

Figure 4
Hedging Intensity

The graph illustrates the hedging intensity since the initial use of swaps in 2009 until 2016. The construction of the graph was accomplished by measuring the ratio between notional value of both interest rate swaps and cross currency swaps with the total assets of each year.
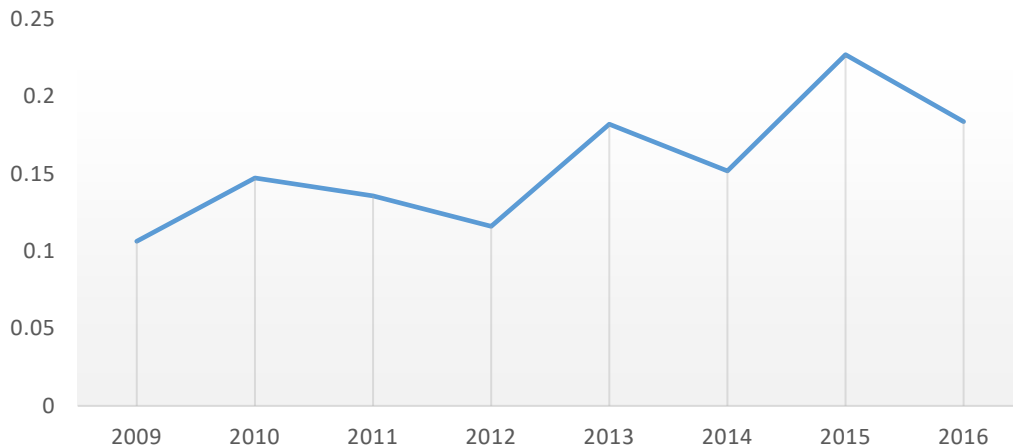

Bearing in mind the mentioned, REN contracts swaps to exchange a series of cash flows at specified intervals with another party. Smithson et al. (1995) describe the process as nothing more complicated than a portfolio of forward contracts in which the cash flows are determined by two different interest rates. Precisely, figure 5 illustrates the interest rate swap diagram in which the group exchanges different interest rates with the bank, which occurs at specific periods, then forwarded to the counterparty of the deal. In this setting, the active liability management of the group applies swaps to transform floating interest rates of borrowings into fixed rates as well as to transform fixed rates into floating rates. In the first case, the group locks in a fixed rate on the trade date which serves as base for the interest payments in the future until the contract matures (Figure 5, panel A), this way it protects REN from any fluctuations that may rise from the market space. In the second case, it is the reverse mindset as the group is subject to higher uncertainty due to the payments being attached in accordance with the floating rates of the markets (Figure 5, panel B). This strategy exposes the firm to interest rate risk, nonetheless as illustrated previously the rates have been decreasing for the past few years which reflects the strategy of the group in taking advantage of the markets current stage.

Figure 5 illustrates an interest rate swap contract between REN and a counterparty with an intermediary of a bank. Through this arrangement, panel a) shows the swap contract flow in which REN makes periodic fixed rate payments to the bank and receives a variable rate on the agreed index, thereafter forwarded to the counterparty, note that there is no exchange of principal. Panel b) exhibits the same flow with the variance of REN paying periodic floating rates and receiving fixed. This way, the group converts its obligations to pay a floating rate (fixed rate) into a fixed rate (floating rate) by using a swap.

Panel A:
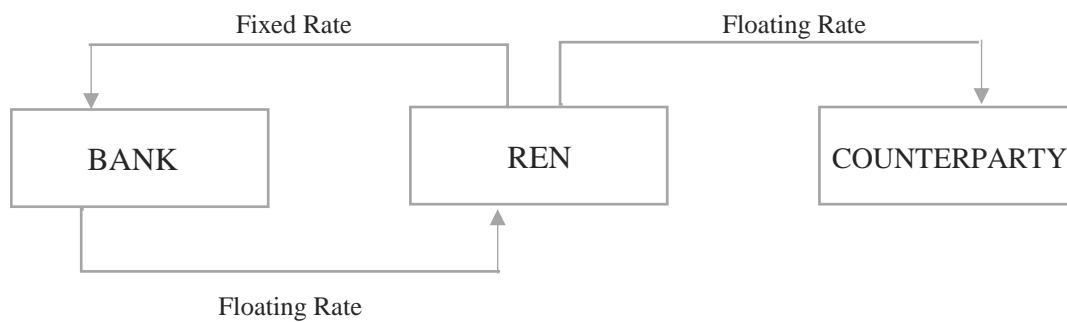
Panel B:
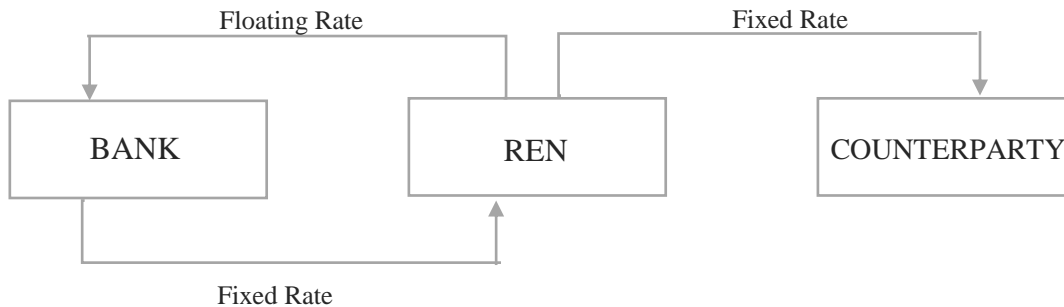
4.3.2. THE PRACTICE OF INTEREST RATE RISK MANAGEMENT

Interest rate risk constitutes a big concern for the group as it lies at the heart of the group's cash flows stability in which high fluctuations in rates will lead the group to experience some instability in the steady business that characterizes the firm, hence prejudicing REN's investment growth goals. The mixed literature theory provided a hand full of frameworks that either proves or disapproves the application of a hedging strategy to manage the risks exposures of a firm. Smith and Stulz (1985) and then Froot et al. (1993), stressed that one of hedging's greater advantages relates to the ability to pursue with valuable investment projects by creating favourable conditions on a firm's cash flow.

Therefore, circumventing the underinvestment problem rising from difficulties in obtaining funds from external financing. Furthermore, recalling what was stated in the literature review, Jin and Jorion (2006) disagree with any empirical evidence that confirms hedging assists in creating value for a firm, defending that for the oil and gas firms the tests claim otherwise. In that matter and with these claimants in mind we proceed with the analysis to test whether in fact hedging adds value to REN and contributes for the investments projects ahead or whether it falls within the category defended by the theorists Jin and Jorion (2006) and Bartram et al. (2011).

The study is constructed based on a range of eight years from 2009 to 2016. The data used includes the details of all the derivatives transactions for the period in consideration. In light of the mentioned, table 5 shows the impact using financial derivatives can have on REN's performance by comparing the relationship between using the interest rate swaps as a risk management tool and not using anything at all to hedge the risks exposures of the group. The table is segmented in three groups, EIB, Bonds and total which is the sum of the previous two categories. REN contracts funds from the European Investment Bank (EIB), whose aim is to support the development of projects that are within REN's scope of interest, namely infrastructures. Furthermore, besides both party's interests being aligned, EIB also borrows at good rates revealing to be a fine source to borrow from. For other general requirements besides investments, REN seeks to external investors for funds also through bond issues. This distinction is important since for the EIB contracts the group uses interest rate swaps to convert fixed rates into floating rates while the bond issues is constituted by both forms of interest rate swaps, those that convert a fixed rate into a floating rate as well as those that convert a floating rate into a fixed rate.

With this distinction made, the main results from table 5 show that the hedging strategy of the group is causing more losses than if no risk management were practiced. Precisely, the table allows us to conclude that if the group had not performed a hedging strategy then the interest costs would total up to 276 462 398,79 € while with hedging, the interest costs totals up to 303 795 107,36€, an additional 27 332 708,57€. Why might this be? An acceptable judgement would lie on the fact that the market rates have plummeted, precisely hitting the period in which the group started its hedging activity. Figure 3 illustrates the markets drastic decline that initiated in 2009 having reached negative marks in 2015 followed by a continued falling flow until 2016. These consistent falling rates

Table 5
Comparison Between a Hedged and Unhedged Strategy

The following table was constructed with the aim of illustrating the impact the use of interest rate swaps possessed on the group's financial results. The table is divided in three sections, the total row, the EIB row and the Bonds row for the period ranging between 2009 and 2016. For each section it is calculated the difference between a hedged and an unhedged strategy.

		2009	2010	2011	2012	2013	2014	2015	2016	TOTAL
TOTAL										
Unhedged		29,221,929	32,693,227	42,496,587	49,201,726	38,317,924	29,027,457	30,362,007	25,141,543	276,462,399
Hedged		28,565,194	35,469,975	44,673,130	54,100,229	47,853,700	32,760,112	31,512,562	28,860,205	303,795,107
	DIFFERENCE	656,735	-2,776,748	-2,176,543	-4,898,503	-9,535,776	-3,732,655	-1,150,555	-3,718,663	-27,332,709
BEI										
Unhedged		13,255,246	12,204,941	16,693,269	16,900,913	6,964,730	6,501,620	4,735,972	2,301,724	79,558,414
Hedged		14,204,543	14,270,305	17,992,098	20,043,322	13,976,826	13,118,384	12,094,425	9,683,994	115,383,897
	DIFFERENCE	-949,297	-2,065,364	-1,298,829	-3,142,409	-7,012,096	-6,616,764	-7,358,453	-7,382,270	-35,825,483
BONDS										
Unhedged		15,966,683	20,488,286	25,803,318	32,300,813	31,353,194	22,525,837	25,626,035	22,839,819	196,903,985
Hedged		14,360,651	21,199,670	26,681,032	34,056,907	33,876,874	19,641,728	19,418,137	19,176,212	188,411,211
	DIFFERENCE	1,606,032	-711,384	-877,714	-1,756,094	-2,523,680	2,884,109	6,207,898	3,663,607	8,492,774

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[2] All information and data concerning the construction of table 5 is public and available upon request

that resulted from the market downturn significantly influences the results of REN's hedging strategy.

Considering the mentioned and performing a deeper analysis, looking at the results shown in the second and third category of table 5 we can observe that the EIB category, which has the form of fixed interest rates, is creating a loss of – 35 825 482.66 € when compared with an unhedged group. Consistent with the hedging strategy it makes perfect sense seeing as the market rates keep decreasing and the group has fixed a rate that is now higher than their current stage, originating an opportunity cost. On the opposite side, the bond category, which combines both variable and fixed interest rate forms, is creating a gain for the group. Here the reverse mind-set is applied in which with the current setting of negative rates the group is, in fact, receiving interest for the borrowings that have been swapped for floating rates. Therefore, comparing the results between a hedged and an unhedged group the difference sums up to a positive 8 492 774.09€, meaning that the group's interest costs are less than if it had adopted for an unhedged strategy. Nonetheless, although the bond category is creating a gain for the group is does not compensate for the losses suffered in the EIB category. Overall, hedging is resulting in a loss for the group.

This analysis of the two forms of interest rate allows us to assert that the markets position heavily influences the outcome of the group's risk management strategy, adding the fact that they are unstable leads only two possible outcomes for a company that hedges, either it makes the right move, e.g. fixes the rates when they are rising, and therefore increase its gains or it suffers losses, e.g. fixed a rate before it started falling or even taking a position of avoiding any risks and fixing a rate even though it is falling. With the current stage of the market it is not the ideal time to have fixed rates, acknowledging this the financial department of REN strategically transformed some of the fixed interest rates into floating rates to take advantage of market but also not to lose competitive advantage towards the main players in the energy industry. Therefore, it is a strategy that requires constant supervision as well as a good perception of the interest rate fluctuation to make the right decision of how much fixed rates to hold and specially the right timing to hold them, thus, aiming always for the stability of the results.

Although the hedging strategy put in motion by REN is creating a loss, it becomes important to verify its impact on the group's financial performance, on a first instance will test its impact on the net income and later, on the groups cash flow. These tests are

represented on table 6 and are a mirror of those presented by Brown (2001). Considering that we performed a study based on a case study, with the same purpose and with the same outlines as the one conducted by Brown (2001) it seemed reasonable to follow the same tests and compare results. Hence, the more studies conducted based on a case study the more robust the combined results will be and ultimately the more powerful the conclusions. In that manner, table 6 panel A illustrates the impact of using derivatives on the group's financial reports, namely the profit and loss statement.

Table 6
The Impact of Hedging on Net Income and Cash-Flow

The table presents the group's Net Income (Panel A) and Cash Flow (Panel B) in two perspectives, with and without using financial derivatives between the years of 2009 and 2016. The second column represent the mean of each panel while the last column of each panel reports the standard deviation as a measure of REN's financial performance volatility.

Panel A: Net Income Perspective

	Obs.	Mean	Std Deviation
Net Income - Hedged	8	117,355	10,076
Net Income - Unhedged	8	119,720	9,896

Panel B: CF Perspective

Cash Flow - Hedged	8	76,248	50,220
Cash Flow - Unhedged	8	102,201	52,429

The first row represents the values reported in the annual statements (Hedged) while the second row reflects what would have been in case the group did not use financial derivatives (Unhedged). The results from table 6 illustrate that the use of derivatives has a negative impact of €2.366 Thousand (T, hereafter) less on the average annual income. Furthermore, the values for the standard deviation point out a 2% increase in the group's net income volatility for a hedged strategy when compared to an unhedged strategy, particularly this increase flows from €9.869T to €10.076T. This means that, the net income is less volatile if REN adopts an unhedged strategy. Similarly, we perform the same calculations for the cash flow, presented in panel B.

The empirical analysis presented by Bartram et al (2011) and Guay and Kothari (2003) about the impact of using financial derivatives on a firm's cash flow share the same conclusions that a risk management strategy allows to decrease the volatility of a firms results. Having performed an analysis on REN's cash flow we draw the same outcome. Through panel B results, the conclusion reached is that having a risk management strategy reduces the volatility of the group's results helping to achieve stability in an environment dominant by uncertainty. The table demonstrates that hedging decreases the standard deviation from €52,429 T to €50,220 T, that is a €2,209 T or 4% decrease. This outcome differs from the one presented by Bartram et al (2011) in which they affirm that derivative users can obtain lower fluctuations, between 7%-18%, in their results. Instead our results are more aligned with Guay and Kothari's (2003) study, who reflect that on the overall, derivatives are unlikely to have an economically large effect on the volatility of the firm's cash flow. We agree with the author's viewpoint, as a €2,209 T reduction in the cash flow when compared to the total volatility of €52,429 T, is modest or when compared to the average net income of 117,355 T seems much less substantial. Hence, more interesting is that these results are in conformity with those presented by Brown (2001), whom describes the effects of hedging on the cash flow as "*not overwhelming*".

Overall, the two panels present results that flow in different directions leading to mixed evidence. While for the net income panel we experience more volatility with a hedging strategy, although only 2%, for the cash flow the existence of derivatives allows a more stable stream. The downside of hedging on REN's income reflects the markets current rates characterized by instability (figure 3), together with the combination of fixed and floating interest rate the group possesses explains the higher volatility in REN's income. On the cash flow the outcome reached aligns with the theories presented by Smith and Stulz (1985) and then Froot et al. (1993) in which using financial derivatives to hedge against interest rate risk allows less volatility in the groups cash flow.

4.3.3. A DISTINGUISHED STRUCTURE

The aim of this study was focused on how hedging the liabilities affects the group's performance and value, however and as referred previously REN's hedging structure is quite distinguished by incorporating the risk management of assets into its strategy.

Bearing in mind that REN's sensitivity to interest rate risk affects both sides of the balance sheet, on the assets side, the exposure is due to the nature of the group's activities, which are regulated and therefore indexed to the Portuguese Treasury Bonds. That said, and considering that the group also hedges its liabilities, the foundation of REN's risk management strategy is based on the concept of Asset Liability Management (ALM).

The ALM framework is an interrelationship between assets and liabilities with the aim of managing the fluctuations in the interest rate while limiting risks from the financial viability of the organization. How exactly does REN reach this outcome? Theoretically it goes as follows, the group matches the debt maturity to the regulatory cycle using the Macaulay duration, key concept and tool to measure the interest volatility, offsetting any difference between the assets and liabilities and maximizing the creation of value. Specifically, REN's costs and profits have a symmetrical exposure to interest rates, in which an increase in the rates will lead to an increase in costs (e.g. pay more interest) and in the profits (e.g. receive more interest), the contrary is also valid. Therefore, whichever the variation of the interest rates, the outcome on the group's results will be neutral as together both sides hedge against the interest rate risk exposure. This is the pure hedging impact that the group seeks for, claimed as the immunization effect, in which, whichever the direction of the interest rate the net income is protected.

Nonetheless, there are some nuances that "block" the perfect immunization that REN seeks to achieve, one is related to the fact that the assets are indexed to the treasury bonds while the liabilities are indexed to the euribor. Which means that, although the interest rate will have symmetrical effect on both asset and liability sides, there will be a mismatch between the two as the variation will not be quite the same.

Furthermore, the figure below demonstrates the interest rates impact on the asset side of the balance sheet. It is visible that the variation of the 10 year Portuguese treasury bond yield is cornered between a cap and floor system which means that however the interest drops the return of the group is secured at the floor level, same goes for an increase in the rates which consequently will result in a limit of revenues, cap.

Figure 6
Interest rate Impact on the Asset side

This figure illustrates how the interest rate affects the asset side of the balance sheet. Having a regulated activity allows the group to protect its revenues though a cap and floor system, in which the floor represents the minimum rate that affects the groups revenues and the cap represents the maximum rate.
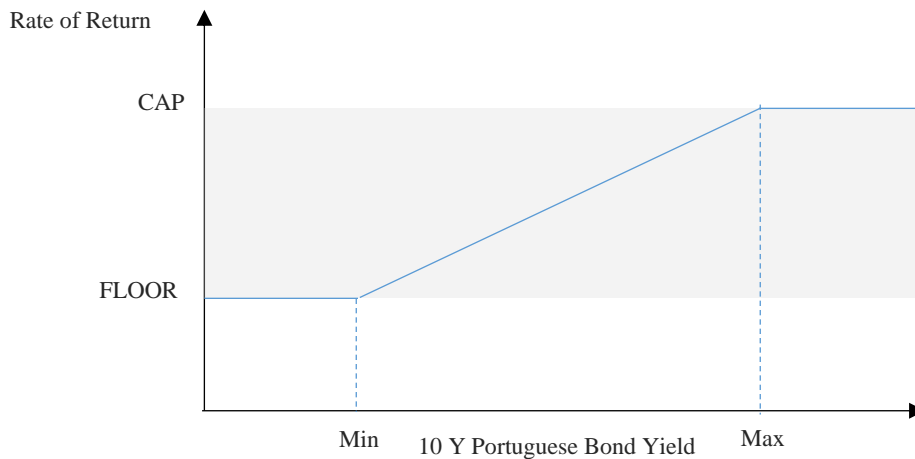
SOURCE: REN – Investors Outlook

Combined with the financial derivatives, the ALM enables the group to reach one of two outcomes, either the group's financial results remain stable or create profit. The first outcome is the current situation, in which the markets reveal falling rates. In this setting, the revenues remain stable as the group will not receive less than the floor and the costs are fixed which together leads to less volatility in the financial results. This is, the group receives and pays fixed amounts maintaining the difference between the two and thereby securing the results of the group. Again, here we could argue that the company could benefit from the markets rates, opting for floating costs and ultimately reaching profits instead of stable results. However, the unpredictability of when the rates will rise again is a factor that the financial department prefer not to gamble, claiming that they cannot fall much further. Hence, REN's aim to pursue with a risk management activity is to secure the results of the group against financial price risks and this structure accomplishes that. For example, in 2016 we concluded that using financial derivatives was causing a cost of € 3 718 662.86 due the choice of the group to use financial derivatives for protection against interest rate risk. However, hedging the asset side represents a cushion against the losses suffered in the liability side, which put together creates an optimal

structure to hedge against interest rate risk. Bearing in mind the mentioned, falling back to section 4.2.2 there is an alignment between the regression analysis conducted and the ALM strategy. The regression results showed that the groups risk management is being effective in allowing lower interest volatility on the group's performance (net income). Hence it can be explained by REN's business structure influenced by fluctuations of interest rate on the asset side of the balance sheet which permits the group to calibrate the debt management strategy, currently resulting in higher costs from the practice of hedging, and ultimately create a seamless stream of cash flow while eliminating risk.

Contrary to the current scenario, in which we would observe increasing rates, the return on the asset side would increase, until it reaches the cap, following the same trend the costs would also rise however here the group has fixed rates which means that even though the rates have increased, REN's payments remain the same. Therefore, in this setting, the revenues would more than compensate the costs resulting in higher profits.

4.3.4. INCENTIVES FOR RISK MANAGEMENT

Many reasons were given throughout this paper of why firms manage their risk exposure. The goal of REN's financial department for hedging is to minimize the effects of the interest rate and foreign exchange rate movements to achieve financial health and stability in the group's performance. In that matter, we found that the theories presented by Smith and Stulz (1985), Froot et al. (1993) and Shappiro and Titman (1998) were most fit with groups structure and objectives.

According to Smith and Stulz (1985) and Froot et al. (1993) applying a risk management strategy to reduce cash-flow volatility will secure the group's risk of passing attractive investments opportunities as well as provide lower external financing costs. Moreover, Shappiro and Titman (1998) reflected that stable cash flow diminishes the costs of financial distress and therefore constitute an influential factor in obtaining positive credit ratings. Other empirical work support these theories, in particular, Minton and Scharand (1997) view follows that the use of financial derivatives to reduce cash flow volatility is associated with firms embracing high growth opportunities. Campello, Lin, Ma and Zou (2011) find that hedging allows lower restrictions on the firm's investment decisions due to the better borrowing agreements. Additionally, Minton and Schrand (1999) mentioned

that cash flow volatility is associated to worse S&P bond rating and therefore it should constitute a factor for firms to pursue with risk management strategies.

The relevant question that rises is whether the hedging strategy followed by REN is aligned with the justifications above. Interestingly, the two justifications addressed, equation of cash flow with investment, and external financing support each other and can be linked with the group's objectives. REN recently initiated its gradual international expansion with the acquisition of assets in Chile and earned an investment grade rating from the three largest rating agencies. The accomplishment of these two primary goals enhance the importance of maintaining a solid financial position and positive rating to obtain financing at a reasonable cost and accomplish its international agenda.

Keeping in mind the mentioned, hedging even though in a small scale is allowing to minimize the volatility of the group's results. This outcome becomes fundamental as Fitch Ratings positive grade came attached with a caution, mentioning that a slight "increase in debt or weaker cash flows, may lead to negative rating action". In Shappiro and Titman's (1982) words companies are normally very protective of their credit reputations, which reflects the perks that come attached. We noticed that while the group's rating improved, over this time frame, the average cost of debt shrunk. This reveals the importance of maintaining the current rating because any downgrades would prove to be more expensive resulting in more obstacles in the groups expansion strategy. Therefore, the incentive to engage in hedging actions to maintain the current credit ratings and create more favourable conditions for further growth in international grounds.

Furthermore, looking back at the year of 2016, marked by the major acquisition of Electrogas assets in Chile, the investment of the group totalled up to 171,500 thousand euros. Thus, in line with our earlier conclusions, REN's hedging strategies accounts for only fairly small differences in the volatility of the group's cash flow when compared to an unhedged group. That is, the use of financial derivatives is only allowing a decrease of €2,209 thousand euros in the groups cash flow volatility that when compared to the total investments represents a meaningless 3%. This allows us to assert that the hedging of the liability side, on its own, seems unlikely to justify as an incentive to pursue with valuable investments projects over this sample period. Which once more puts us in agreement with Brown's (2001) conclusions, who claims that investment isn't a primary motivation for hedging financial price risk.

Nonetheless, although in agreement with the author having reached similar results, we cannot set aside the fact that REN has a distinguished structure which consequently changes the hole outcome. The group hedges the asset side which independent from the liability side represents a cushion for the losses suffered in keeping the group safe from financial price risks. Hence, increasing the benefits of the group's hedging strategy while enabling to better stabilize performance and diminish volatility from the costs and revenue streams. Therefore, by hedging both sides of the balance sheet REN reaches a financial balance which consequently results in better ratings and ultimately creates more favourable conditions to pursue with investment strategies that strengthens the groups position internally and geographically. In this setting, even though investment is not a primary motivation, hedging by allowing to secure the group's results creating an incentive to pursue with valuable investment projects is an important trigger in higher firm value.

5. CONCLUSION

This study has focused on studying REN's risk management strategy. The structure followed is quite distinguished when compared to most literature theorist's models, based on one firm's specific characteristics and structure. That said, this structure further enhances the literature with a different perspective on the topic, first brought by Brown (2001). Both this study and Brown's (2001) share the opinion that aggregating the risk management from a broad sample of firms misses on important details about a firm's hedging strategy influencing the end result which might lie as a justification for the mixed evidence in the literature. Furthermore, through this case study we are able to heighten some results reached by Brown (2001) and therefore as a hole obtain powerful outcomes.

With that in mind, the analysis of this study centered on the question of *Whether and how hedging affects the risks of the firm?*

The outcome reached for weather hedging affects the risks of the firm, first part of the question, is aligned with the literature theory in which having a risk management strategy diminished cash flow volatility, in this case a €2,209 T decrease or 4% reduction. In accordance with Brown (2001), we find this reduction modest and not substantial when compared to the group's total volatility of €52,429 T. Furthermore, we find that the current falling rates of the market heavily influences the results of a hedging strategy. This is, REN is suffering losses from hedging the liability side as it possesses fixed interest rates when they are following a descending movement, ultimately resulting in an opportunity cost.

The second part of the question is tricky. Taking into account the characteristics and objectives of the group we found that the theoretical explanations for risk management that are most fit with the group are, maintaining its investment grade rating and lowering cash flow volatility in the form of embracing value enhancing investments, defended by Smith and Stulz (1985) and later by Froot, et al (1993). The former explanation does in fact create an incentive to pursue with hedging activities as it allows the group lower average debt costs and lower cash flow volatility therefore securing the group's credit metrics. However, for the later explanation we agree with Brown (2001) results, which similar to our own indicate that the reduction in cash flow volatility is modest to pursue with valuable investment projects. This puts us in agreement with the theorists that affirm

that hedging liabilities allows lower cash flow volatility however in terms of creating value for the group there is little evidence. Nonetheless, the group has a distinguished strategy by hedging the asset side of the balance sheet. Therefore, the results differ, hedging the asset side increases the groups benefits in allowing to better stabilize performance and by diminishing volatility from its costs and revenue stream. And only in this setting is hedging increasing REN's ability to embrace valuable investment projects therefore executing its strategic plans and consequently strengthening its competitiveness and market value.

Unfortunately, the insufficiency of data to assess the potential gains that hedging the asset side brings to the group's performance is a limitation in this study, which prevents a deeper a thorough analysis of REN's hedging strategy.

Lastly, this study contributes to the literature in three forms. First, it performs a single case study research on the topic, similar to the one conducted by Brown (2001). Interestingly, both studies reach similar outcomes on the grounds of hedging the liability side. Secondly, this study includes an asset liability risk management structure which added an interesting factor to the study and allowed the assessment that together they form an optimal hedging strategy. Finally, it sheds light on the heavy influence of the markets fluctuation on the groups hedging activity and therefore calls for further research on historical market rates and respective firms hedging results. It would also be interesting to follow more case study researches to further enhance or even contradict the outcomes reached in this study and in Brown's (2001).

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