CATÓLICA LISBON
SCHOOL OF BUSINESS & ECONOMICS

Understanding Capital Structures for Companies in the Renewable Energy Market

Luís de Sousa Coutinho Ricciardi

Supervisor: Prof. Ricardo Reis

Dissertation submitted in partial fulfillment of requirements for the degree of MSc in Business Administration, at Universidade Católica Portuguesa, January 2016

(page left intentionally blank)

Understanding Capital Structures for Companies in the Renewable Energy Market
Luis Ricciardi

Abstract

In order to understand renewable energy companies' financing decisions, we analyzed 33 E.U. and 17 U.S. renewable energy producers from 2007 to 2014 and later analyzed EDP Renováveis and some of its peers in order to identify any patterns concerning their financing decisions. Our results were inconclusive but possibly suggest that pecking order theory partially explains capital structure decisions. Moreover, we believe business risk is an important determinant of financial structures. It seems that leverage is influenced by the way firms sell energy to the market and the way governments support their activity. The longer is the regulatory guidance provided by governments, the greater is the certainty concerning future expected cash flows which will consequently translate into higher levels of leverage.

Resumo

Com a intenção de perceber de que forma as empresas produtoras de energias renováveis se financiam, analisámos 33 empresas da União Europeia e 17 empresas dos Estados Unidos. De seguida, analisámos a EDP Renováveis individualmente assim como três concorrentes da empresa para identificar algum padrão nas suas decisões de financiamento. Embora inconclusivos, os nossos resultados indicam que a teoria de pecking order explica parcialmente as suas estruturas de capital. Adicionalmente, a nossa pesquisa leva-nos a acreditar que o risco de negócio é um determinante importante das estruturas financeiras destas empresas. Existem indícios de que a alavancagem financeira está relacionada com a forma como as empresas vendem a energia no mercado e com a forma como os governos apoiam a sua actividade. Parece que maior é a orientação prospectiva da política regulatória fornecida pelos governos ao mercado, maior é a certeza quanto a futuros fluxos de caixa e consequentemente, maiores serão os níveis de alavancagem das empresas do sector.

Acknowledgments

I would like to thank Prof. Ricardo Reis for being so optimistic about my work and guiding me during the last four months.

I would like to thank Gonçalo de Sousa Coutinho for introducing me to the industry and suggesting possible themes for me to study.

A special acknowledgement to Mr. João Manso Neto, EDP Renováveis' CEO, for making himself available to explain EDPR's financing decisions and the company's strategy.

I would also like to thank my friends who put up with my complaints during this last semester, encouraged me and reviewed my thesis, namely Maria, Vasco, Francisco and Carlos.

Last but not least, I would like to thank my family for providing me with a top education for the last 20 years which has prepared me to face the real world with ambition and optimism.

Table of Contents

List of Appendices

List of Tables

Abbreviations

EDP: Energias de Portugal
EDPR: EDP Renováveis
E.U.: European Union
IEA: International Energy Agency
IPP: Independent Power Producer
MW: Megawatt
NDTS: Non-debt tax shields
NEE: NextEra Energy
PPA: Purchase Power Agreement
U.S.: United States

1. Introduction

For decades, energy has been supplied primarily by the means of burning fossil fuels such as oil, coal and natural gas. This process is a major contributor to the emission of greenhouse gases to the atmosphere that have been warming our planet. Economies need a more sustainable source of energy that does not pollute as much as the ones currently used in order to prevent an irreversible damage to our planet. Additionally, energy is a big source of geopolitical power and it is important for countries to be independent from the supply of a small number of countries in order to increase their protection against market prices volatility and supply shortages. For this reason, the European Union and the United States are moving towards "low-carbon economies" as an effort to reduce CO2 emissions and increase their energy independence. A number of targets are being set by the United States and many European countries to boost renewable energy generation. Consequently, they have been supporting renewable energy projects to meet these targets in many different ways.

The purpose of this thesis is to understand financing decisions in the renewable energy market and to find whether producers follow any specific financing rule, namely any of the classical capital structure theories.

This thesis proceeds as follows. We first review the relevant literature and concepts which may relate to our research. Next, we describe the topics within the renewable energy market to introduce our statistical study. We focus on the different ways governments support the industry in the U.S. and the E.U., and the current market situation. Afterwards, we study renewable energy firms' capital structures in the U.S. and the E.U. in order to understand what are their main determinants. Finally, we analyze a specific company with investments in both regions in order to understand how it determines its financial structure, comparing to three more peers. Lastly, conclusions are drawn and we reflect on our thesis' limitations and suggest further research.

2. Literature Review

Myers (2001) provides different ways of looking at the way optimal capital structures are determined: static trade-off theory, free cash flow theory and pecking order theory.

In static trade-off theory, rooted on Modigliani and Miller's (1958) propositions, the primary variables considered are: the tax deductibility of interests and the probability of financial distress. Financial distress is a situation where firms have difficulty in servicing their debt and may incur in bankruptcy costs such as more expensive financing or legal and audit fees, e.g. when filing for Chapter 11 in the U.S. According to the theory, the optimal capital structure is reached by borrowing up to the point where the marginal value of tax shields on increasing debt is balanced by the present value of potential costs of financial distress. At this optimal point, the total cost of capital is minimized and the firm value's maximized. This means that firms will estimate their own optimal debt ratios and will constantly try to adjust towards it (cf. Marsh (1982) and Auerbach (1985)). This theory justifies moderate debt ratios and is consistent with some common sense observations saying that firms with safe and tangible assets tend to borrow more than companies with more risky and intangible assets. However, many studies discredit this theory as is the case of Fama and French (1998), who could not find any statistical evidence that interest tax shields contributed to the market value of firms, or Myers (1984) who pointed to a decrease in value following every equity issue or leverage-reducing operation.

Pecking order theory is first observed by Donaldson (1961), and then popularized by Myers and Majluf (1984). It gives emphasis to information asymmetry between firms' insiders and outsiders. It states that the cost of financing increases with asymmetric information, so firms will prefer internal to external financing and debt before equity. The reason is that there is barely any information asymmetry in internal financing. Secondly, issuing debt minimizes the information advantage of managers. Investors punish increases in equity because they think the only reason why firms issue new shares is because managers believe the shares are overvalued in the market, so they are taking advantage of that situation. Additionally, investors believe firms only issue new debt if managers are optimistic and believe their company is undervalued, meaning that they are confident enough to take on the risks that come along with contracting more debt. Therefore, equity issues will only happen when debt becomes too costly due to the risk of bankruptcy at very high debt ratios. Only in this case managers will turn to the equity market for financing.

In pecking order theory, there is not a targeted leverage ratio. Interest tax-shields and the probability of financial distress are secondary. Leverage changes when internal cash flows, net of dividends, cannot fulfill all the funding needs. Therefore, very profitable firms with reduced investment opportunities are expected to have lower debt ratios according to the theory. Overall, this means that debt ratios only change when there are needs for external funds and not for the sole purpose of reaching an optimal capital structure.

The free cash flow theory by Jensen (1986) defends that even at dangerously high debt ratios, firms will increase in value, despite the threat of financial distress, if their operating cash flow significantly exceeds their profitable investment opportunities. It says it solves the problem of "how to motivate managers to disgorge cash rather than investing it below the cost of capital or wasting it on organizational inefficiencies." Forcing companies to pay out cash by the means of interests acts as a shock therapy to make them cut back on wasteful investments, force the sale of underutilized assets, and to strengthen management's incentives to maximize value to shareholders. This theory was designed thinking of cash-cow firms that are prone to overinvesting, and the wave of leverage buyouts of the 80s was precisely trying to solve Jensen's problem.

Now focusing on the individual determinants of firms' capital structures, many aspects have to be taken into consideration. Many studies have tried to explain this choice and which institutional factors affect the decision. Harris and Raviv (1991) state that leverage increases with fixed assets, non-debt tax shields, investment opportunities and firm size. They also find that it decreases with volatility, advertising expenditure, the probability of bankruptcy, profitability and uniqueness of the product. Rajan and Zingales (1995), examining G7 countries, find that the tangibility of assets is always positively correlated with leverage in all countries, that market-to-book ratio is negatively correlated, size is positively correlated, and profitability is negatively correlated with leverage.

The relationship between the tangibility of assets and leverage can be explained as follows: creditors will lend money more easily to companies that can offer collateral assets to back the credit. In an uncertain world, with asymmetric information, creditors demand some security against their wealth, otherwise they will ask for higher interests in order to reduce any possibility of getting harmed by conflicts of interest with shareholders. This affiliation has also empirical evidence provided by Bradley, Jarrell and Kim (1984), who found positive correlation between the two factors. On the other hand, companies with many growth opportunities, or a high ratio of intangible assets, have a harder time borrowing long term (cf. Marsh (1982)). Growth opportunities give managers greater flexibility in the choice of future investments, thus making it more difficult for investors to monitor their activity. The relationship with short-term debt does not apply.

In terms of firm's size effect on leverage, studies present mixed results. Gupta (1969) shows a decrease in leverage as firm's size increases, whereas Harris and Raviv (1991) and Marsh (1982) show a positive relation. Smith and Warner (1979) suggest that larger firms usually hold more diversified portfolios comparing to relatively smaller firms, therefore they are able to support more debt. Fama and French (2002), using size as a proxy for volatility, assumed larger firms access debt at lower costs than smaller firms because they are likely to have less volatile earnings and net cash flows, which gives them the incentive to increase leverage.

Non-debt tax shields such as depreciations and amortizations ought to be considered as a determinant of capital structures since tax deductions from depreciations may act as a substitute for the tax shields of debt, argue DeAngelo and Masulis (1980). Results differ on their impact on leverage. The former authors state that non-debt tax shields should be negatively correlated with leverage because they reduce taxable income and reduce the relative advantage of interest tax shields. Bradley et al. (1984) disagreed with the argument suggesting that firms with many tangible assets that generate high depreciations and relative tax credits will have higher levels of debt, because the debt is "secured".

Profitability's impact on leverage divides trade-off and pecking order theorists. Fama and French (2002) say the most profitable firms should have capacity for higher debt ratios, taking advantage of tax shields. Higher profitability means that companies are able to better service their debt and are less likely to get into financial distress. On the other hand, pecking order theory says firms will always give priority to internal funds over external. Therefore, a profitable firm will use more retained earnings to fund its activity, to reduce information asymmetry and its need for external finance. The theory predicts that increases in profitability lead to firms' decrease of leverage.

Investment/growth opportunities are opportunities that could create a positive net contribution to a firm's market value, says Myers (1977), and impact firms' leverage ratios. However, there are several agency costs related with investment opportunities that could create unexpected effects. Titman and Wessels (1988) explain equity-controlled firms tend to invest sub-optimally to expropriate wealth from bondholders. It increases agency costs for bondholders which means that expected future growth should be negatively related to long-term leverage. However, this agency problem should be mitigated if firms issue more short-term debt instead according to Myers (1977). Pecking-order theory suggests the opposite, that firms with high growth opportunities must invest in major projects that generate a great demand for funds. When internal funds are exhausted, firms will then issue debt.

One other important determinant of capital structure is the industry classification. Firms belonging to the same industry in the same country face similar kinds of environments and economic conditions, therefore they tend to cycle together. Some industries, such as utilities, have naturally high leverage ratios contrary to high-tech firms who usually have low leverage ratios. While Toy et al. (1974) questioned the relationship between industry and financial structure, many others (cf. Scott and Martin (1975) and Talberg et al. (2008)) still find it a determinant.

Curiously, Bradley et al. (1984) found a systematic relation between regulation and financial leverage. Regulated industries such as telecoms, electric and gas utilities, and airlines were among the most levered companies in their sample. Renewable energy firms are likely to be included in this case as they've been continuously supported and regulated by government agencies around the world.

Few papers study the determinants of renewable energy firms' capital structures or that of capital-intensive industries overall. However, some papers could be found on energy financing or other specific capital-intensive projects' financing.
Saeed (2007) tested if energy companies in Pakistan followed any of the main capital structure theories and found that both static trade-off theory and pecking order theory were partially accepted in the sector, although pecking order provided more evidence. In his study, the only statistically significant determinants were firm size displaying a positive relation with financial leverage; profitability with a negative relation and firm growth with a positive relation. Ferreira et al. (2009) tried to establish a relationship between big investment decisions and changes in capital structures in the Brazilian energy and telecommunication sector. Concerning energy projects, they did not find any significant changes at the moment of the investment but found a decrease in leverage in the medium term pointing to a conservative stance by the companies waiting for the project to generate cash, who in the long-term increased leverage to improve shareholders' returns if the project had been successful. In

telecoms, results did not show any significant relationship between financing and big investments, but they noticed that telecoms have higher cash flow volatility which leads them to maintain a lower level of leverage than energy companies. Their study points to a negative relationship between uncertainty and leverage.

Pierru et al. (2013) provide empirical insight on the capital structures of liquefied natural gas (LNG) infrastructures and gas pipelines projects, both capital-intensive infrastructures like renewable energies are. Many of these projects are financed through Project Finance, where lending is directed at specific projects only and not to the company that is developing it. This debt is repaid from the cash flows generated by the project uniquely and may occasionally demand some more guarantees from the developer. Empirical studies find Project Finance to be highly leveraged for having lower asymmetric information and for optimally sharing and allocating risk among the project financiers and equity investors. The authors find a relationship between the country where the project is developed and its leverage ratio. After attributing a "risk score" to each country based on OECD ratings, they find that projects located in risky countries are financed with lower debt ratios. Again, we notice how uncertainty, which is intrinsic in riskier countries, affects leverage in a negative way. Their results go in hand with the basic view of risk-averse fund suppliers. Likewise, Rashid (2012) finds that both firm-specific and macroeconomic uncertainty have significant negative impact on U.K. energy firms' leverage ratios. As of firm-specific determinants, his study finds that leverage is negatively related to profitability and market-to-book ratios (i.e. investment opportunities), and positively with asset tangibility and firm size. He suggests that stable macroeconomic conditions and business activity are important to energy firms' capital structure stability.

Lino (2014), studying the risks of Project Finance in wind farms in Portugal, finds that several wind projects are funded through Project Finance structures as new companies are created from scratch owning uniquely those assets. These companies are called independent power producers ("IPP") and usually present very high debt ratios of roughly 70% of the initial investment or more. The reason why they are able to leverage their investments so much using a Project Finance structure is that they are guaranteed *feed-in-tariffs* by the government for periods of 15 years on average, but more on that later. The author presents the evolution of a wind farm's financing, clearly enhancing the considerable weight of long-term debt relatively to equity.

One last note on Project Finance for large infrastructure projects – Srivastava (2014) explains that these projects have higher marginal default rates in the construction period, particularly concerning land acquisition and environmental clearances. He argues that Project Finance must be reconsidered in uncertain regulatory, political and legal macro-environments. This will be relevant for our thesis further down.

3. Renewable Energy Market

In this chapter, we sought to describe the structure and current trends of the renewable energy market. In order to do so, we based our analysis primarily on interviews with experts in the sector and newspaper articles.

Renewable energies, namely wind, solar, hydric and biomass, are characterized by the fact that they are capital-intensive and have low-risk cash flows once they are operating. Being capital-intensive means that projects require a high level of investment up-front and relatively little operating and maintenance costs. The initial investment includes the research of potential locations for projects and the capital expenditure on wind turbines or solar panels. Once they are installed, those fixed assets require little maintenance and do not demand any additional costs for each unit of electricity produced (since wind and sun are costless), which means that the marginal unitary cost of the electricity produced from renewable energy sources is close to zero.

An important aspect of renewables is that they supply energy intermittently. That is, wind farms and solar panels only produce energy when the wind is blowing or the sun is shining, respectively. This creates an uncertainty regarding the supply because it is not always in line with the level of demand (except for biomass production). Whereas nonrenewable energy is only produced when there is demand for it. Thermoelectric plants will only burn oil or coal if there is a need for it. Moreover, fossil fuel power plants benefit from the fact that their capacity factors are very high and predictable. The capacity factor is the ratio between the annual average production and the total installed capacity. This means that if a project could produce 100% of electricity if the sun shone 24h a day using its maximum capacity, then it might only produce a fraction of that in reality. In the U.S., natural gas plants might produce about 70% of their total potential capacity, while wind farms produce roughly 35% and solar panels 17% (Bloomberg, 2015).

Although some of this variability is predictable (such as the lack of production from solar panels at night), there is still some risk associated to this intermittency due to the fact that electricity cannot be stored efficiently. However, governments have been fighting this problem by giving energy produced from renewable sources certain advantages relative to nonrenewable sources. One critical advantage was giving priority to renewable energies when entering the grid vs nonrenewable sources. Every Megawatt (MW) produced by a wind turbine or solar panel has the guarantee to enter the electric power network. Additionally, they may benefit from a number of support schemes meant to incentive long-term investments in renewable energy projects, such as:

- ***Feed-in-tariffs***: the market regulator sets a fixed guaranteed price for each unit of electricity produced sold to the electric network and oblige grid operators to buy it at that price. The tariffs can be set for 10 to 20 years on contracts for each project. They vary according to the maturity of the technology employed and the costs associated to it. In the end, the consumer is the one subsidizing the renewable energy because he pays a higher price for electricity.
- ***Feed-in Premium***: renewables are awarded with a price per unit of energy produced equal to the market price plus a fixed premium set over it. The point is to try to make up for the intermittency and lower capacity factor of renewable energy, avoiding big discrepancies with market prices.
- ***Quota obligations***: make electricity suppliers produce a certain share of energy using renewable sources.
- ***Fiscal support measures***: tax exemptions or reductions, or providing extra tax-shields.

Governments also have the choice to punish conventional energy producers by taxing more each unit of CO2 sent to the atmosphere, i.e. *carbon pricing*.

Comparing the renewable energy market in the U.S. and in the E.U. we notice some differences in the way governments encouraged investments in the sector. Whilst the European Union used mostly tariffs to subsidize the renewable energy sector, the United States employed other ways to do so. Three different incentives were given to U.S. firms investing in renewable energies[1]. First are Production and Investment Tax Credits that give producers the right to benefit from a tax credit equal to 30% of their investment in a renewable energy project. Secondly, firms are allowed to depreciate their investments faster using a 5 year span, even though the useful life of a wind farm or a solar project is roughly 25 years. Thirdly, 50% bonus depreciations of projects' investments were given in the first year for projects put in place until 2013. These can be seen as indirect subsidies since they allow investors to reduce the amount of taxes they would pay. However, most renewable energy producers do not have enough taxable income at the beginning of their activity to be able to benefit from those tax credits, so they must rely on external investors (financial institutions or

[1] "Tax Equity 101: Structures", Woodlawn Associates (2013). https://woodlawnassociates.com/tax-equity-101/

private companies) to fund these projects in return for the tax credits and some of its cash flows. It means that tax credits are somehow sold to companies with taxable income and with an interest in investing in green energy.

This specialized way of financing in the U.S. is called *Tax Equity* and requires complex financial structures, which creates some barriers for new non-specialized investors to get in the market. This is why there have been times of large gaps in the *tax equity* funding market, where demand was high and supply low as in 2008, and the U.S. government had to give cash grants[2] instead of tax credits to bridge this funding gap and continue to support the industry. In 2014, investments in *tax equity* hit a new record of US$9.1bn (Bloomberg New Energy Finance, 2014), led by wind projects that attracted roughly 57% of the total. It is a sign that the sector is getting increasingly attractive to investors as it starts to become competitive against other energy sources.

On what concerns the renewable energy market situation at the moment in the E.U. and the U.S., many improving aspects should be referred. Renewable energies are becoming increasingly competitive as their cost of production went down significantly during these last few years. A recent analysis by Bloomberg New Energy Finance (Bloomberg, 2015) has found that wind power is now the cheapest electricity to produce in Germany and the U.K., even without subsidies. The firm EDP Renováveis[3] estimates the levelized cost of wind and hydroelectricity is currently lower than coal and nuclear energy. Apart from the considerable improvement in technology, the growth of renewables changed the dynamics of the energy market. An increasing adoption of renewable energy has lowered the capacity factor of fossil fuel power plants. This is a consequence of renewable energy’s priority in the network. As more renewables are installed, coal and natural gas plants are used less, and over time, the cost of using them to produce energy goes up. The capacity factor for wind and solar is also increasing because the turbines are getting taller and more solar panels are being installed in the Southwest of the U.S. where sunny days are longer.

As long as the renewable energy market remains protected and keeps its priority when entering the grid, renewables will keep increasing their market share in the long run. Another actor that may boost the market is the development of batteries that could store renewable energy more efficiently, reducing the problem of its intermittency. A recent International

[2] American Recovery and Reinvestment Act 2009, Sec. 1603.
[3] EDP Renováveis 2014 Annual Report, p. 32

Energy Agency report estimates renewables will provide 26% of global electricity by 2020 (Financial Times, 2015), with wind farms and solar panels contributing to half of new global energy capacity installed.

Regulatory risks still remain unpredictable. The U.K. cut its support for renewable energy developers (Financial Times, 2015) all of a sudden to prevent the bankruptcy of coal-fired power plants and the U.S. might end its *tax equity* form of subsidy by the end of 2016. The tendency is a convergence to a freer market without subsidies. As technology improves and costs go down, renewable energy becomes a more attractive investment and tariffs will keep going down as a result. Lino (2014) illustrates this trend using the Portuguese case of wind energy which has seen its tariffs being progressively reduced by 30% during the last 10 years.

Governments are slowly dropping *feed-in-tariffs/premiums* and more renewable energy is now getting sold on public auctions in order to reduce the economic burden on consumers paying higher electricity prices. According to the EDP Renováveis 2014 Annual Report, the number of countries adopting public energy auctions went from 9 countries in 2009 to 55 in 2014. The Spanish government[4] altered the sector regulation in 2013, reducing tariffs to a level where renewable energy projects should benefit from a standard return before taxes of a 10-year government bond yield plus 300bp (basis points). A recent auction dedicated to solar energy producers only in the Iberian peninsula, resulted in the transaction of 333 GWh with a closing price of 52€/kWh (September 2015), a value in line with the market prices at the time. This could represent a problem for renewables if energy prices remain as low as today due to the current oil glut and cheap coal. But as they become more competitive we should see a higher mix of electricity production between fossil fuels and renewable sources.

How does this impact the financing of renewable energy projects? We notice how important is the impact of government policies in this sector and the extent to which it influences its financing decisions. The bigger is the regulatory and market uncertainty, the harder it is for companies to leverage their positions and get long-term financing.

Approximately 20 companies, mainly large financial institutions (namely Morgan Stanley, Bank of America Merrill Lynch, Goldman Sachs, etc.) lead the *tax equity* market and they like guarantees and predictable scenarios to invest. As we saw in 2008[5] in the U.S., financial

---

[4] *Boletín Oficial del Estado nº29, Sec. 1. Pág. 9072*

[5] "Bridging the Tax Equity Funding Gap", Project Finance International (2012). http://www.pfie.com/bridging-the-tax-equity-funding-gap/21013092.fullarticle

institutions reduced considerably their investments on *tax equity* (from US$6.1bn in 2007 to US$1.2bn in 2009), given the instability of the macroeconomic system and the lack of guarantees given by the government. To counter this uncertainty, U.S. firms have been looking for long-term purchase power agreements ("PPA") at fixed prices with private companies to guarantee the demand for their production. It contributes to stabilize their cash flows as both parties become protected from the volatility of spot energy prices and increases their ability to borrow at low costs. It also limits regulatory risks as it reduces the need for a centralized system that defines *feed-in-tariffs*.

4. Data

Moving on to our study, we searched for a set of companies that could provide any indication of how renewable energy firms behaved when determining their capital structures. Using financial data from these companies we performed a regression of relevant variables on different leverage measures.

We used accounting data from public renewable energy companies from the United States and the European Union from the last 8 years. We obtained 33 European companies and 17 U.S. companies (cf. Appendix 1) from the Thomson Reuters Eikon database using "Renewable Utilities" as a filter. Their business activities range from producing energy out of wind, to solar, to biomass and hydraulic. The companies' core business is effectively renewable energy production but there are some cases of companies with fossil fuel thermoelectric production in their portfolios as well.

Companies in the sample differ in the way they are integrated in the market. Some act as developers and build renewable projects from scratch, others just invest in already built projects.

We chose the U.S. and the E.U. for reasons of information availability and because the experts we met had a deep knowledge in these two regions. Even though China is currently the biggest renewable energy producer in the world, we believed it was better to focus on those markets, especially because they are the biggest markets for EDP Renováveis which we will approach further down this thesis as a case study and relate to our statistical results.

5. Methodology

Our main purpose with this thesis is to understand how capital structure decisions are taken within renewable energy firms. Whether the common variables referred in previous literature have an impact on leverage and whether leverage is determined according to any of the classical theories of capital structures, namely trade-off theory and pecking order theory. Although we mentioned free cash flow theory in our literature, we will ignore it in our study as it doesn't make predictions about individual variables' impact on leverage.

We use five explanatory variables in our model to test for their impact on leverage ratios. We chose these variables according to the data that was available and to what we believed would have the most impact on a capital-intensive industry with an important support of the government. The variables chosen for this study were Non-debt tax shields (NDTS), Profitability (Profit), Tangibility of assets (Fixed), Size and Growth opportunities (Growth). Depending on the way these variables impact leverage they will explain their own individual impact and whether trade-off or pecking order are explanatory theories for capital structure decisions in this sector.

The proxies used for each variable were chosen according to past literature. We used the ratio of depreciations expense over total assets for non-debt tax shields as suggested by Fama and French (2002) but we did not include research and development expenses as tax shields due to a lack of data. Profitability was measured by the ratio of earnings before interests and taxes over total revenue as suggested by Shyam-Sunder and Myers (1999). Rajan and Zingales (1995), measure firms' assets tangibility or the collateral value of assets using the ratio of fixed assets to total assets. These include mostly property, plant and equipment items. Growth opportunities use capital expenditures over total assets as a proxy as suggested by Titman and Wessels (1988). Finally, we use the logarithm of sales as a proxy for size, as most academics do.

As for the level of leverage we tested for different measures since each of them give different perspectives on firms' leverage. We used the debt-to-equity ratio, the ratio of total liabilities to total assets, long-term debt to total assets, total debt to total assets and total debt to capital (equal to total debt plus equity). The broadest definition of leverage is total liabilities to total assets as it represents whatever is left for shareholders if the company decides to sell all its assets. However, it includes trade credit items (e.g. accounts payable or other current liabilities) which should not be too relevant in a company's financing decision as it represents current operational activity and rather fits into working capital policies. Total debt or long-term debt to total assets has the advantage of only accounting for interest-bearing debt or financial leverage but still has the problem of total assets including trade credit items such as accounts receivable. Total debt to capital and the debt-to-equity ratio should give more adequate measures of leverage as they exclude trade credit items. All measures of equity and debt used in Table 1 are accounting values.

Table 1– Leverage Measures' Summary Statistics

	EU			US		
Leverage Measure	Mean	Median	Standard Deviation	Mean	Median	Standard Deviation
Debt/Equity	3,6228	0,8470	23,7242	4,3579	0,9607	20,8640
Long-Term Debt/Assets	0,2829	0,2867	0,2300	0,2756	0,2382	0,3153
Total Liabilities/Assets	0,6048	0,6035	0,5242	17,9860	0,7972	137,3519
Total Debt/Assets	0,3730	0,3506	0,3622	1,0842	0,3911	5,7981
Total Debt/Capital	0,4646	0,4695	0,5108	0,4644	0,4980	0,8535

Looking at the different leverage measures in renewable energy companies in the U.S. and the E.U. in Table 1 we notice some of the leverage ratios' means are overstated and have too much volatility due to a small number of companies with negative equity which unbalance their leverage ratios. For that reason we will focus on medians instead. Some leverage measures may be more appropriate for one region than the other. *Tax equity* structures, which represent a significant share of U.S. investment funding, are not considered to be financial debt but are still included in total liabilities. *Tax equity* investors lend the money upfront for a project to start and later receive tax credits as they are generated plus a share of projects' returns. On the other hand, when analyzing E.U. firms it may be more relevant to look at long-term and total debt ratios than total liabilities ratios. This explains why long-term debt to total assets is higher in the E.U. than in the U.S.

Overall, it looks like U.S. renewable energy firms are more levered than European companies using most measures of leverage. This difference could be due to more stable regulatory policies, a looser credit market, or specific characteristics of their activity, namely having PPAs or more collateral assets. It may also be influenced by the fact that some of these companies own thermoelectric power plants.

Table 2 – E.U. and U.S. Independent Variables' Summary Statistics

	EU			US		
Independent Variables	Mean	Median	Standard Deviation	Mean	Median	Standard Deviation
Fixed Assets	0,6028	0,6462	0,2547	0,5906	0,7536	0,3497
Size	910886672	40254430	2299149609	1579854828	5507740	4692929802
Profitability	-2,7516	0,0824	22,8523	-7,8271	-0,0123	26,5598
Non-Debt Tax Shields	0,0285	0,0260	0,0251	0,0331	0,0239	0,0311
Growth Opportunities	0,0840	0,0463	0,0998	0,0857	0,0466	0,1117

Table 2 reports the summary statistics (mean, median and standard deviation) of our independent variables discriminated between the two different regions. We notice how both U.S. and E.U. firms have a majority of fixed assets in their balance sheets due to the fact that their business activity is based around renewable energy projects' infrastructures. Regarding profitability, we notice U.S. and E.U. firms had on average negative operational profitabilities during the last 8 years as many companies, especially in the U.S., had negative operational profits consecutively. European companies still had a positive median and a higher profitability than U.S. firms on average which means that either U.S. renewables have been suffering from a tougher environment in the energy sector than E.U. companies or government policies have been benefiting E.U. companies more. Growth opportunities, measured by firms' capital expenditures over total assets, have been fairly equal in both regions. Non-debt tax shields are also little different in the E.U and the U.S.

Additionally, we tested for multicollinearity in our models. Table 3 describes the correlations between our chosen independent variables and we will look for any significant correlations between our regressors.

Table 3 – Correlation Matrix, Total Sample

	Fixed	Size	Profit	NDTS	Growth
Fixed Assets	1,0000				
Size	-0,1003	1,0000			
Profitability	-0,1640	0,0648	1,0000		
Non-Debt Tax Shields	0,0410	0,2840	0,1604	1,0000	
Growth Opportunities	-0,1250	-0,1813	0,0773	-0,1401	1,0000

The correlation matrix in Table 3 does not show any significant correlations between variables which means that collinearity should not be a problem in our study overall. When we analyze the two regions separately, correlations remain insignificant (cf. Appendices 6 and 7).

6. Regression

To determine the variables that explain capital structures in the renewable energy sector, we ran an ordinary least squares (OLS) regression using different measures of leverage as dependent variables and the set of regressors previously mentioned. We could test it two different ways. We either ran a simple panel data regression with all variables in the same year or we tested the independent variables with a lagged year. We tested it both ways to find out which model was more significant.

$$Lev_{t,i} = c + \beta_1 * Fixed_{t,i} + \beta_2 * NDTS_{t,i} + \beta_3 * Profit_{t,i} + \beta_4 * Growth_{t,i} + \beta_5 * Size_{t,i} + e_{t,i}$$

$$Lev_{t-1,i} = c + \Omega_1 * Fixed_{t-1,i} + \Omega_2 * NDTS_{t-1,i} + \Omega_3 * Profit_{t-1,i} + \Omega_4 * Growth_{t-1,i} + \Omega_5 * Size_{t-1,i} + e_{t-1,i}$$

Using the different measures of leverage referred previously, we regress our independent variables for each debt ratio and obtain the respective coefficients and corresponding p-values in Table 4. Only observations that included all the selected variables were considered for the regressions performed.

Table 4 – Estimated Coefficients[a] of the OLS regression, Total Sample

Debt Measure	Fixed	Profit	NDTS	Growth	Size	R^2	Nº obs
Debt/ Equity	18,6*	0,07	-137,63	-3,59	-0,74	0,0447	181
	(0,067)	(0,462)	(0,217)	(0,864)	(0,42)		
Long-Term Debt/ Assets	0,6***	0,00	-1,13**	-0,18	0,00	0,2258	190
	(0,00)	(0,111)	(0,049)	(0,135)	(0,972)		
Liabilities/ Assets	0,34***	0,00	7,87***	0,05	0,00	0,3001	190
	(0,001)	(0,47)	(0,00)	(0,808)	(0,809)		
Total Debt/ Assets	0,42***	0,00	7,20***	-0,03	-0,01	0,2932	190
	(0,000)	(0,322)	(0,00)	(0,899)	(0,496)		
Total Debt/ Capital	0,51***	0,00	10,28***	-0,01	-0,01	0,3026	190
	(0,000)	(0,34)	(0,00)	(0,98)	(0,582)		

[a] The coefficients are the predicted estimate change in the dependent variable for each regressor variation. Values below coefficients are p-values. *, **, ***, means significance at the 10, 5, and 1% level, respectively.

This regression includes the total sample of European and U.S. firms together. We assumed a random-effects model for our panel data, meaning that the firms' individual specific effects were assumed not to be correlated with the independent variables. The five regressions in

Table 4 do not provide much explanatory power overall when analyzing the R-square measure, but we notice some patterns of significance among some independent variables.

Fixed assets and non-debt tax shields consistently explain leverage variations using all measures of leverage except when trying to explain the debt-to-equity ratio by non-debt tax shields. Profitability, growth opportunities and size do not have any explanatory power in our sample.

To better understand the reasons behind differences in leverage in the U.S. and E.U. renewable energy firms, we decided to perform regressions separately in both regions. We have more observations in our E.U. sample compared to the U.S. which means that the coefficients obtained from the previous regression were considerably biased towards our European sample, which is one more reason why we decided to do the regressions separately.

Table 5 - Estimated Coefficients of the OLS regression, E.U. Sample

Debt Measure	Fixed	Profit	NDTS	Growth	Size	R^2	Nº obs
Debt/ Equity	23,67**	0,09	-172,12*	-27,32	-0,71	0,059	161
	(0,014)	(0,317)	(0,062)	(0,214)	(0,381)		
Long-Term Debt/ Assets	0,68***	0,00	-1,65***	-0,25	0,00	0,2627	161
	(0,00)	(0,169)	(0,009)	(0,043)	(0,753)		
Liabilities/ Assets	0,29	0,00	8,24***	-0,06	0,00	0,2988	161
	(0,017)	(0,48)	(0,00)	(0,797)	(0,957)		
Total Debt/ Assets	0,41***	0,00	7,88***	-0,16	-0,01	0,315	161
	(0,002)	(0,393)	(0,000)	(0,510)	(0,484)		
Total Debt/ Capital	0,48***	0,00	10,84***	-0,22	-0,01	0,308	161
	(0,004)	(0,377)	(0,000)	(0,522)	(0,482)		

The E.U. regression (cf. Table 5) does not present any especially significant model as all of our fitness indicators are low. Just like the total sample, it seems that our model does not have much explanatory power as a whole but some variables still do. Tangible assets and non-debt tax shields are significant for every measure of leverage tested. Tangible assets always impact leverage positively. However, non-debt tax shields provide mixed signs depending on the leverage measure being tested, which makes it hard to interpret. Possibly, the variable has a positive impact on short-term debt but a negative one on long-term debt.

We tested our U.S. sample and only obtained 29 observations due to a lack of data from many companies, as many of them only became public very recently. This made the regression somewhat irrelevant (cf. Appendix 2). We tried to counter this problem using a dummy variable in our total sample for U.S. firms, but the results still turned out to be insignificant.

Regarding the regressions using lagged independent variables we notice that every model presents a lower level of significance than the regular regressions therefore we opted to analyze the regular regressions' results (cf. Appendices 3, 4 and 5).

What do the results suggest? Firstly, as explanatory variable, tangible assets seem to be consistently the most significant regressor, with a positive impact on leverage. As confirmed by Bradley et al. (1984), creditors are more likely to lend money if companies can offer collateral assets to back the credit. Being capital-intensive firms, renewable energy producers usually possess important infrastructures and equipment such as wind turbines, solar panels, dams or thermoelectric plants for biomass energy that can be offered as collateral. This positive relationship is explained by both pecking order and trade-off theory (cf. Table 6). Table 6 compares the expected variables' signs for each capital structure theory and the coefficients' signs estimated by our regression. The expected variables' signs of pecking order and trade-off theory are summarized in Serrasqueiro and Caetano (2012) and Fama and French (2002).

Table 6 – Signs of Variables' Coefficients

	Fixed	Profit	NDTS	Growth	Size
Total	+	0	+	0	0
EU	+	0	+/-	0	0
US	+	0	+	+	0
Pecking Order	+	-	?	+	+/-
Static Trade-off	+	+	-	-	+

Overall, we find inconclusive results to support a single capital structure theory in the E.U. or the U.S. If we had a more robust sample of U.S. firms with the same results (cf. Appendix 2), we could infer that pecking order theory partly explains their capital structures due to growth opportunities' positive impact on leverage. Additionally, most U.S. firms are unprofitable and have relatively high debt ratios which lead us to believe that they have a preference for debt against equity when looking for external funds, thus following a pecking order. E.U. firms provide inconclusive results, although non-debt tax shields' negative impact on long-term debt and debt-to-equity, could be partly explained by static trade-off theory. The lack of consistent conclusions from our results in the E.U. can be possibly explained by the wide range of government supports between countries in the region.

7. EDP Renováveis

The purpose of this chapter is to compare our statistical results with a specific company acting in the European and U.S. markets and to understand what really drives its decisions concerning the financing of projects. We picked EDP Renováveis because it is a major producer of wind energy in Europe and the U.S. All the information presented in this chapter is based on EDP Renováveis annual statements, newspaper articles and a personal interview with the company's CEO, Mr. João Manso Neto.

EDP Renováveis ("EDPR") is a Portuguese renewable energy company headquartered in Madrid and owned in majority by the biggest utility company in Portugal, Energias de Portugal ("EDP"). The company has mainly developed wind farms since 1996 and it is publicly listed since 2008, owning at the end of 2014 a total capacity of 8.150 MW. It is mainly present in the E.U., and the U.S., but also owns projects in Canada, Brazil and Mexico.

The firm is involved in every stage necessary to run and develop a wind farm or a solar project. EDPR develops a project by finding the right location, negotiating its lease and obtaining licenses for operating it. Then, it evaluates the project and looks for financing. EDPR installs the wind turbines or solar panels, connects it to the grid and starts producing energy. The company operates the projects by constantly monitoring them and maintaining them to minimize any flaws in their activity.

The company's strategy is based in three pillars, namely increasing its profitability supported by selective growth through a self-funded business model. The company chooses its potential markets based on their growth prospects and the stability of their regulatory structure, which is an important aspect for the company's financing decisions.

A self-funded business model is, in line with pecking-order theory, to give preference to retained earnings when financing the company's activity. Therefore, new installed capacity is primarily funded through operational cash flows generated by its operational assets and by selling minority stakes in assets-in-place with low risk which are reinvested into projects with higher value (asset rotation strategy).

The company still seeks external funding, especially in the U.S. through *tax equity* structures taking advantage of the government's tax credits incentives to the sector. In the U.S., the company installed 73% of its capacity using *tax equity* structures and 24% using cash grants. It also uses Project Finance structures occasionally when developing projects in countries with considerable foreign exchange and refinancing risk e.g. Brazil, Poland, Romania, etc. The reason is that it gives the company the means to contract long-term debt in local currency at a lower cost. Indeed, Project Finance is particularly important in emerging markets as they require several guarantees, contractual relationships with government agencies or PPAs, and involve many lenders that help mitigate "political" risks to which projects could be exposed. However, Project Finance is a very bureaucratic and time-consuming process, which requires extra legal costs, higher interests demanded by lenders due to their limited available cash flow, and operating restrictions such as distributing earnings to the developer. Therefore, for a big utility company like EDPR, it isn't always efficient to use these structures to fund new projects in the E.U or the U.S.

EDP owns 77,5% of EDP Renováveis, which means that the companies' policies are dependent of one another. There are both advantages and disadvantages in this scenario. In terms of financing, EDPR benefits from the fact that EDP has a higher credit rating than itself. EDP issues bonds for itself at a lower cost of debt and subsequently lends the money to EDPR through a shareholder's loan. EDP's loans account for 76% of EDPR's total debt and the rest is financed by financial institutions. Disadvantages may arise from the potential inefficiencies of a concentrated ownership structure, such as the conflicts of interests among shareholders and the expropriation of minority shareholders by controlling ones.

Concerning the capital structure adopted by the company, it states that the main determinants of leverage are the market's regulatory framework and its activity's level of integration which is directly related to business risk. A company like EDPR, fully integrated in every stage of a renewable energy project, incurs in a higher business risk than a company that only acquires already built projects such as yieldcos. Lino (2014) and Srivastava (2014) enhance the risks involved in the pre-operational stage of a project, namely the risk of constructing it. Firstly, the company needs to find land with good atmospheric conditions and test the feasibility of installing a project there. This research is a sunk cost since the project will be approved or not depending on the evaluation of the land. This means that a vertically integrated company in this sector is subject to more risks since it needs to employ time and money in projects that may not even start, and is subject to the risk of having unexpected costs related to a project's construction.

This vertical integration is one driver for the company to adopt a lower risk profile in its financing and keep its leverage ratios below the rest of the industry. Going back to our literature review, this goes in line with the fact that uncertainty negatively impacts leverage (cf. Pierru et al. (2013), Rashid (2012), and Ferreira et al. (2009)). Table 7 presents EDPR's different leverage measures. The company has a low debt to total assets or capital ratio due to the self-funding strategy adopted and the fact that *tax equity* structures in the U.S. can replace corporate debt, being accounted as liabilities in the balance sheet but not interest-bearing debt (cf. Appendix 12).

Table 7 – EDPR Capital Structure (2007-2014)

Leverage Measures	Mean	Median	Standard Deviation
Debt/Equity	0,705	0,672	0,322
Long-Term Debt/Assets	0,259	0,271	0,055
Total Liabilities/Assets	0,580	0,591	0,071
Total Debt/Assets	0,277	0,278	0,070
Total Debt/Capital	0,397	0,402	0,100

EDPR's correlation matrix (cf. Table 8) displays some consistent correlations between our previous independent variables and different measures of leverage, although its relevance could questioned given the time series being so short. Fixed assets and non-debt tax shields are again strongly positively related to leverage. Size is positively related to leverage and profitability is negatively related, along with growth opportunities.

If we were to attribute any theory to the company's financing decisions using these results, we would find that both pecking order and trade-off theory partly explain EDPR's financing. Looking at Table 9, both theories explain fixed assets and size's relation with leverage. Pecking order explains the negative relationship of profitability with leverage, while static trade-off explains the negative relationship with growth opportunities. Overall, we could infer the company follows more of pecking order theory because of the management's pledge to finance the company's activity with internal equity. However, some aspects still support trade-off theory as well by looking at the company's leverage ratios from 2007 to 2014, as we do not notice any relevant variations in leverage ratios, which leads to the idea that the firm has a target leverage ratio. Again, we keep in mind the limitation of our time-series and consequently, the relevance of these correlations.

Table 8 – EDPR Correlation matrix (2007-2014)

Correlations	D/E	LTD/A	Liab/A	D/A	D/Cap	Fixed	Size	Profit	NDTS	Growth
Debt/Equity	1,000									
Long-Term Debt/Assets	0,990	1,000								
Total Liabilities/Assets	0,993	0,977	1,000							
Total Debt/Assets	0,994	0,999	0,984	1,000						
Total Debt/Capital	0,994	0,994	0,994	0,998	1,000					
Fixed Assets	**0,798**	**0,825**	**0,721**	**0,815**	**0,781**	1,000				
Size	**0,822**	**0,839**	**0,762**	**0,841**	**0,813**	0,948	1,000			
Profitability	**-0,358**	**-0,363**	**-0,454**	**-0,363**	**-0,401**	0,199	0,163	1,000		
Non-Debt Tax Shields	**0,953**	**0,936**	**0,936**	**0,949**	**0,948**	0,826	0,917	-0,159	1,000	
Growth Opportunities	**-0,933**	**-0,936**	**-0,886**	**-0,938**	**-0,921**	-0,939	-0,962	0,025	-0,960	1,000

Table 9 – EDPR Variables' Signs (2007-2014)

	Fixed	Profit	NDTS	Growth	Size
EDPR	+	**-**	+	-	+
EU	+	0	+/-	0	0
US	+	0	+	+	0
Pecking Order	+	-	?	+	+/-
Static Trade-off	+	+	-	-	+

7.1. Competition

Looking at some of the company's competitors in Portugal and the U.S. we notice major differences in their capital structures. In Portugal, we selected Generg and Iberwind as peers because they are the biggest renewable energy producers[6] after EDPR and publicly disclose their annual reports for the public. In the U.S., we chose NextEra Energy, the country's biggest renewable energy producer. The following information is based on the respective companies' annual reports.

7.1.1. Generg

Generg has a total installed capacity of 750 MW (including its stake in the ENEOP consortium) and produces wind, solar and hydric energy, with wind power representing the biggest share of production. Appendices 13 and 14 show that the company is highly levered compared to EDPR using every leverage measure. The excessive financial debt can be justified by the fact that the company always funds its projects using Project Finance structures which are more prone to use debt than equity, despite the fact that the company develops projects from scratch just like EDPR. The company was able to use these structures because it was always under the "shelter" of *feed-in tariffs* which guarantee a stable and predictable cash flow throughout a project's lifetime.

Generg believes its current high level of leverage is in line with the sector's expected parameters and it is protected against short-term financial difficulties. It is interesting that, just like EDPR, the firm plans to sustain its future growth through self-financing and loans agreed with banks at the project level. The company's increasing profitability has been used to pay out its debt, and growth opportunities decreased just like the level of leverage (cf. Appendices 15, 17 and 18). Through this information and looking at the correlation signs, such as profitability's negative correlation and growth opportunities' positive correlation with leverage, we suggest the company follows pecking order theory to partially determine its capital structure. We keep in mind the limitation of our time-series and consequently, the relevance of these correlations.

[6] e2p – Energias Endógenas de Portugal - http://e2p.inegi.up.pt/

7.1.2. Iberwind

Iberwind owns a portfolio of 31 wind farms with a total 684 MW capacity. The firm was created after a consortium, led by the private equity firm Magnum Capital, acquired Enersis' assets for €1.2 bn. in 2008. The new management team quickly refinanced the entire debt of Iberwind group with a total amount of €1.060 bn. and 16 years of maturity, set up as a Project Finance scheme, or *Project bond.* The managers justified the high degree of leverage with the company's important investment needs such as the full financing of 4 wind farms under construction in 2009 and to the full repayment of the acquisition debt. It included guarantees such as the pledge of shares and bank accounts, and assets related to the financed projects, as well as compliance with defined ratios.

This operation resulted in years of negative profitability due to the extremely high debt burden the company had to service and losses on interest rate swaps. Consequently, the firm's total equity became negative and it quickly increased all its leverage ratios. Still today, the company has negative equity and extremely high leverage. The company's financing decisions are comparable with Generg's as it opted for a Project Finance structure to fund its activity and a high degree of leverage. Likewise, the firm is much more levered than EDPR. (cf. Appendices 19 and 20).

Iberwind's variables' correlations with leverage (cf. Appendices 21, 23 and 24) suggest a pecking order theory as well due to profitability's negative relation with leverage, although its results are more inconclusive than Generg's or EDPR's, concerning the effect of non-debt tax shields or growth opportunities. We keep in mind the limitation of our time-series and consequently, the relevance of these correlations.

7.1.3. NextEra Energy

NextEra Energy ("NEE") is EDPR's biggest competitor in the United States with an installed capacity of 44.900 MW of wind, solar, natural gas, oil and nuclear power, although the majority of the installed capacity generates wind energy. Appendices 25 and 26 describe the firm's capital structure and shows that the company is more levered than its peer EDPR. The company is equally vertically integrated and does not use any Project Finance structures like Generg or Iberwind. However, it has an important number of purchase power agreements covering 13.045 MW of its assets (at 31th Dec. 2014) with average contract lives of approximately 15 years. NEE has almost 30% of its installed capacity covered by PPAs which is relatively more than EDPR, which has roughly 1.500 MW contracted or 18% of its installed capacity. PPAs are an effective way to reduce market risk and uncertainty which facilitates the use of leverage when funding new energy projects. PPAs are a consequence of the Production and Investment Tax Credits extended by the U.S. government until 2016 and they certainly provide an argument to justify the higher leverage bore by NEE.

Regarding the firm's capital structure determinants, we find that the company's variables provide mixed results on which theory is followed by leverage decisions. Profitability and size's negative relationship and growth opportunities' positive relationship with leverage imply a predominant pecking order theory in financial structure decisions (cf. Appendices 28, 29 and 30). On the other hand, non-debt tax shields' negative correlation with leverage supports trade-off theory. Overall, we suggest the company follows predominantly a pecking order theory and partly a trade-off theory in its financing decisions. We keep in mind the limitation of our time-series and consequently, the relevance of these correlations.

8. Limitations

We find several limitations in our thesis, especially concerning our statistical study. Starting with our sample, we find a small number of public companies in the industry and most of them are not pure renewable energy companies as they often own other energy assets such as thermoelectric power plants. As this is a relatively recent industry, we find a very limited time series for most companies studied. It is also limiting using public companies only because there are many private companies such as Iberwind and Generg in Portugal that are pure renewable producers and own considerable assets in the market. We studied many big utility companies and not so many independent power producers that may provide clearer results for our study.

Regarding the variables used in our regression, it could have been interesting to include business risk, through unlevered betas or the volatility of earnings, or a dummy variable for industry integration as suggested by Mr. João Manso Neto.

When analyzing companies individually and testing their variables' relationship with leverage, we obtain a very short time-series, which question the significance of those correlations. Again, being a relatively recent industry, we don't find such extensive data to provide empirical evidence.

In a further research, when testing if the companies follow pecking order or trade-off theory, a more complex approach could have been employed following Fama and French (2002) partial adjustment model.

9. Conclusion

In order to understand renewable energy companies' financing decisions, we analyzed 33 European and 17 U.S. renewable energy producers from 2007 to 2014 and tested which were their main leverage determinants. We then tried to relate the results to any capital structure theory and later analyzed four renewable energy firms in order to identify any similarities concerning their financing decisions.

Our results did not find an evident answer for this problem but we still found some patterns across firms in the industry, keeping in mind the limitations of our sample of firms. Firstly, the tangibility or the collateral value of a company's assets is a consistent contributor to a more levered financial structure. Size and profitability show little significance overall in our regression, but later, when analyzing some companies individually, we found profitability to be an important determinant of firms' capital structures, while size shows mixed signs across firms.

We suggest that U.S. firms' capital structures are closer to following a pecking order theory as they are unprofitable on average and have relatively higher leverage ratios than E.U. firms. There is also small evidence that E.U. companies follow pecking order and trade-off theory. It leads us to believe that since they do not have internal funds, they have a preference for debt against equity when looking for external funds. We find somehow comparable results when looking at individual companies in Portugal. Renewable energy firms seem to commit to using internal funding first before looking for external funds. Moreover, they seem to prefer debt to support their growth which leads us to think that pecking order theory is a possible explanation for capital structure decisions in this sector.

Although our statistical study presented limited results, we find clearer patterns when we combine our market research with individual cases. One aspect that seems to drive many financing decisions is business risk, and this risk is very influenced by the regulatory framework and market conditions. Leverage is influenced by the way that a firm sells energy to the market and how governments support its activity. We suggest that an environment where governments provide long-term guidance to the market regarding regulation, is more prone to having higher leverage. In the E.U., governments have been consistently altering tariffs each year, therefore increasing regulatory risk, which may justify European firms' lower leverage relatively to U.S. firms. Producers, such as Generg and Iberwind, who were able to lock on to long-term *feed-in-tariffs* in the past display very high leverage under Project Finance structures in order to maximize their internal rates of return. It means that leverage is related to a firm's stability and its future cash flow certainty.

It looks like capital structures are very much dependent on how many guarantees firms are able to provide lenders. We are referring to everything from PPAs, to collateral assets, and to subsidies that governments are willing to provide. This gives an immense market power to governments and lenders and barely any to developers who are completely dependent on the other parties' decisions. As we move to public auction mechanisms in the world, PPAs will gain a considerable influence on market dynamics and capital structures, and hopefully take away some power from the current centralized system.

Appendices

Appendix 1– Renewable Energy Companies Studied in OLS Regression

E.U.	U.S.
Enel Green Power SpA	NextEra Energy Inc
Edp Renovaveis SA	NRG Yield Inc
A2A SpA	TerraForm Power Inc
Infinis Energy PLC	Vivint Solar Inc
Capital Stage AG	8Point3 Energy Partners LP
Albioma SA	TerraForm Global Inc
Voltalia SA	World Health Energy Holdings Inc
Falck Renewables SpA	Principal Solar Inc
Polenergia SA	Juhl Energy Inc
Chorus Clean Energy AG	JA Energy Inc
Terna Energy SA	808 Renewable Energy Corp
Burgenland Holding AG	Nacel Energy Corp
SolarWorld AG	Far East Wind Power Corp
Futuren SA	Global Energy Resources Inc
Colexon Energy AG	Lightbeam Electric Co
Edison SpA	China National Appliance of North America Corp
Eolus Vind publ AB	Sol-Wind Renewable Power LP
Gruppo Waste Italia SpA	
Good Energy Group PLC	
Aggregated Micro Power Holdings PLC	
Alteo Energiaszolgaltato Nyrt	
4Energy Invest NV	
Elektrische Licht und Kraftanlagen AG	
Societe Electrique de l'Our SA	
Photon Energy NV	
Hydro Exploitations SA	
Te Wind SA	
Fon SA	
Atlantis SA	
Electrawinds SE	
Capman Green Energy Fund AD Sofia	
Energoni AD Sofia	
Bionersis SA	

Appendix 2 - Estimated Coefficients of the OLS regression, U.S. sample

Debt Measure	Fixed	Profit	NDTS	Growth	Size	R^2	Nº obs
Debt/ Equity	-15,8	0,14	-119,98	193,35***	-1,67	0,2884	29
	(0,743)	(0,907)	(0,727)	(0,007)	(0,743)		
Long-Term Debt/ Assets	0,26	0,01**	0,54	0,52	-0,02	0,44469	29
	(0,143)	(0,03)	(0,744)	(0,151)	(0,217)		
Liabilities/ Assets	0,51***	0,00	7,92***	0,93**	-0,01	0,5475	29
	(0,005)	(0,718)	(0,00)	(0,011)	(0,622)		
Total Debt/ Assets	0,22	0,01*	3,96**	0,83**	-0,01	0,4617	29
	(0,259)	(0,07)	(0,025)	(0,031)	(0,343)		
Total Debt/ Capital	0,42*	0,01	8,97***	1,37***	-0,01	0,5563	29
	(0,094)	(0,304)	(0,00)	(0,007)	(0,697)		

Appendix 3 – Regression Coefficients (w/ lagged independent variables), Total Sample

Debt Measure	Fixed	Profit	NDTS	Growth	Size	R^2	Nº obs
Debt/ Equity	28,25**	0,08	-111,75	-38,69	-1,28	0,0714	150
	(0,025)	(0,398)	(0,358)	(0,123)	(0,281)		
Long-Term Debt/ Assets	0,41***	0,00	-1,8***	-0,05	0,00	0,1524	158
	(0,00)	(0,62)	(0,00)	(0,608)	(0,968)		
Liabilities/ Assets	0,26**	0,00	4,86***	0,19	0,00	0,1554	158
	(0,018)	(0,235)	(0,00)	(0,502)	(0,994)		
Total Debt/ Assets	0,34***	0,00	3,67***	-0,01	-0,01	0,1453	158
	(0,008)	(0,28)	(0,002)	(0,981)	(0,598)		
Total Debt/ Capital	0,44***	0,00	6,51***	0,15	-0,01	0,1508	158
	(0,005)	(0,218)	(0,00)	(0,71)	(0,432)		

Appendix 4 – Regression Coefficients (w/ lagged independent variables), E.U. Sample

Debt Measure	Fixed	Profit	NDTS	Growth	Size	R^2	Nº obs
Debt/ Equity	32,68*	0,16	-424,67	-32,35	-1,55	0,0988	94
	(0,062)	(0,225)	(0,105)	(0,402)	(0,386)		
Long-Term Debt/ Assets	0,2**	0,00	0,83	-0,06	0,00	0,1369	94
	(0,026)	(0,17)	(0,422)	(0,642)	(0,516)		
Liabilities/ Assets	-0,03	0,00	4,44***	0,03	0,00	0,0638	94
	(0,722)	(0,871)	(0,00)	(0,806)	(0,791)		
Total Debt/ Assets	0,08	0,00	3,36***	-0,03	0,00	0,0947	94
	(0,483)	(0,391)	(0,005)	(0,838)	(0,798)		
Total Debt/ Capital	0,07	0,00	4,47***	0,00	0,00	0,0949	94
	(0,569)	(0,355)	(0,001)	(0,977)	(0,879)		

Appendix 5 – Regression Coefficients (w/ lagged independent variables), U.S. Sample

Debt Measure	Fixed	Profit	NDTS	Growth	Size	R^2	Nº obs
Debt/ Equity	124,05**	1,24	-361,65	-307,0***	-9,76	0,3251	22
	(0,026)	(0,281)	(0,243)	(0,00)	(0,14)		
Long-Term Debt/ Assets	0,17	0,01***	-1,76	-0,01	-0,02*	0,5054	22
	(0,327)	(0,005)	(0,322)	(0,986)	(0,061)		
Liabilities/ Assets	0,23	-0,01	5,61***	0,68	0,00	0,3737	22
	(0,338)	(0,317)	(0,005)	(0,119)	(0,924)		
Total Debt/ Assets	0,01	0,01**	0,84	0,18	-0,02	0,4479	22
	(0,943)	(0,012)	(0,682)	(0,705)	(0,168)		
Total Debt/ Capital	0,12	0,01	6,29**	1,00	-0,01	0,4781	22
	(0,685)	(0,425)	(0,031)	(0,143)	(0,652)		

Appendix 6 – Correlation Matrix, E.U. Sample

Correlations	Fixed	Size	Profit	NDTS	Growth
Fixed Assets	1,0000				
Size	-0,0967	1,0000			
Profitability	0,1611	0,0598	1,0000		
Non-Debt Tax Shields	0,0317	0,2816	0,1593	1,0000	
Growth Opportunities	-0,1168	-0,1894	0,0668	-0,1326	1,0000

Appendix 7 – Correlation Matrix, U.S. Sample

Correlations	Fixed	Size	Profit	NDTS	Growth
Fixed Assets	1,0000				
Size	0,4433	1,0000			
Profitability	-0,0061	0,1652	1,0000		
Non-Debt Tax Shields	-0,7896	-0,1111	0,1257	1,0000	
Growth Opportunities	0,2986	-0,1936	0,2438	-0,5214	1,0000

EDPR

Appendix 8 – EDPR Capital Structure (2007-2014)

Year	D/E	LT/A	Liab/A	D/A	D/Cap
2014	0,6749	0,2726	0,5961	0,2726	0,4029
2013	0,6454	0,2696	0,5657	0,2803	0,3922
2012	0,7134	0,2749	0,5923	0,2909	0,4164
2011	0,7171	0,2830	0,5916	0,2929	0,4176
2010	0,6698	0,2591	0,5896	0,2749	0,4011
2009	0,5121	0,2270	0,5378	0,2367	0,3387
2008	0,2863	0,1461	0,4578	0,1552	0,2226
2007	1,4182	0,3359	0,7113	0,4094	0,5865

Appendix 9 – EDPR Variables (2007-2014)

Year	Profit	Fixed	NDTS	Growth	Size
2014	0,3309	0,8969	0,0330	0,0375	1E+09
2013	0,3593	0,8202	0,0347	0,0620	1E+09
2012	0,3502	0,8086	0,0378	0,0460	1E+09
2011	0,3251	0,8120	0,0332	0,0684	1E+09
2010	0,3059	0,7875	0,0338	0,1108	9E+08
2009	0,2984	0,7739	0,0278	0,1532	8E+08
2008	0,3729	0,7686	0,0221	0,2038	6E+08
2007		0,7111	0,0010	0,0202	2E+07

Appendix 10 – EDPR Variables (2007-2014)

Variables	Mean	Median	Standard Deviation
Profitability	0,3347	0,3309	0,0276
Fixed Assets	0,7974	0,7981	0,0530
Non-Debt Tax Shields	0,0279	0,0331	0,0119
Growth Opportunities	0,0877	0,0652	0,0634
Size	913000000	1008237000	442077143

Appendix 11 – EDPR 2014 Consolidated Income Statement

Thousands of Euros	Notes	2014	2013*
Revenues from energy sales and services and other	6	16,293,883	16,280,161
Cost of energy sales and other	6	-10,926,754	-10,829,364
		5,367,129	5,450,797
Other income	7	402,278	359,385
Supplies and services	8	-896,959	-909,770
Personnel costs and employee benefits	9	-555,438	-631,775
Other expenses	10	-674,617	-670,628
		-1,724,736	-1,852,788
		3,642,393	3,598,009
Provisions	11	-52,095	-54,538
Amortisation and impairment	12	-1,397,238	-1,425,046
		2,193,060	2,118,425
Financial income	13	960,845	890,159
Financial expenses	13	-1,532,742	-1,588,485
Share of net profit in joint ventures and associates	20	15,094	-14,166
Profit before income tax and CESE		1,636,257	1,405,933
Income tax expense	14	-310,952	-212,289
Extraordinary contribution to the energy sector (CESE)	15	-61,495	-
		-372,447	-212,289
Net profit for the year		**1,263,810**	**1,193,644**
Attributable to:			
Equity holders of EDP		**1,040,448**	**1,005,091**
Non-controlling Interests	33	**223,362**	**188,553**
Net profit for the year		**1,263,810**	**1,193,644**
Earnings per share (Basic and Diluted) - Euros	30	0.29	0.28

* Restated for IFRS 10 and 11 purposes

LISBON, 3 MARCH 2015

Appendix 12– EDPR 2014 Consolidated Balance Sheet

Thousands of Euros	Notes	2014	2013*	1 Jan 2013*
Assets				
Property, plant and equipment	16	20,523,100	19,454,099	19,898,839
Intangible assets	17	5,813,026	6,017,802	6,530,075
Goodwill	18	3,321,286	3,253,144	3,275,727
Investments in joint ventures and associates	20	872,974	645,421	696,938
Available for sale investments	21	224,457	212,483	181,294
Investment property	22	37,399	29,180	1,540
Deferred tax assets	23	218,747	320,590	276,463
Trade receivables	25	174,591	98,994	97,099
Debtors and other assets from commercial activities	26	3,052,139	3,188,179	2,736,895
Other debtors and other assets	27	780,877	522,852	569,995
Collateral deposits associated to financial debt	35	388,808	420,081	411,217
Total Non-Current Assets		35,407,404	34,162,825	34,676,082
Inventories	24	266,456	264,788	355,993
Trade receivables	25	1,945,103	2,181,903	2,214,510
Debtors and other assets from commercial activities	26	1,734,129	1,820,900	2,037,730
Other debtors and other assets	27	318,848	306,579	311,943
Current tax assets	28	371,653	433,052	427,500
Financial assets at fair value through profit or loss		10,665	4,217	390
Collateral deposits associated to financial debt	35	40,362	18,729	13,451
Cash and cash equivalents	29	2,613,995	2,156,707	1,673,582
Assets held for sale	42	164,402	715,837	241,851
Total Current Assets		7,465,613	7,902,712	7,276,950
Total Assets		42,873,017	42,065,537	41,953,032
Equity				
Share capital	30	3,656,538	3,656,538	3,656,538
Treasury stock	31	-69,931	-85,573	-103,706
Share premium	30	503,923	503,923	503,923
Reserves and retained earnings	32	3,550,487	3,365,777	4,135,599
Consolidated net profit attributable to equity holders of EDP		1,040,448	1,005,091	-
Total Equity attributable to equity holders of EDP		8,681,465	8,445,756	8,192,354
Non-controlling Interests	33	3,287,679	3,082,146	3,238,559
Total Equity		11,969,144	11,527,902	11,430,913
Liabilities				
Financial debt	35	16,400,827	15,600,723	16,262,081
Employee benefits	36	1,682,988	1,751,066	1,750,838
Provisions	37	463,975	354,233	333,382
Hydrological correction account	34	-	-	33,644
Deferred tax liabilities	23	804,744	759,092	832,642
Institutional partnerships in USA wind farms	38	1,801,963	1,508,495	1,679,753
Trade and other payables from commercial activities	39	1,269,476	1,251,192	1,261,366
Other liabilities and other payables	40	517,486	326,570	341,439
Total Non-Current Liabilities		22,941,459	21,551,371	22,495,145
Financial debt	35	3,897,356	4,158,086	3,765,206
Employee benefits	36	197,285	183,469	182,587
Provisions	37	21,564	27,437	42,798
Hydrological correction account	34	1,010	35,641	22,832
Trade and other payables from commercial activities	39	3,182,255	3,219,936	3,172,735
Other liabilities and other payables	40	235,795	209,651	342,991
Current tax liabilities	41	415,821	574,080	458,439
Liabilities held for sale	42	11,328	577,964	39,386
Total Current Liabilities		7,962,414	8,986,264	8,026,974
Total Liabilities		30,903,873	30,537,635	30,522,119
Total Equity and Liabilities		42,873,017	42,065,537	41,953,032

Generg

Appendix 13 – Generg Capital Structure (2010-2013)

Year	D/E	LT/A	Liab/A	D/A	D/Cap
2013	6,9059	0,6986	0,8910	0,7526	0,8735
2012	26,4583	0,7478	0,9693	0,8110	0,9636
2011	72,5556	0,8003	0,9883	0,8514	0,9864
2010	19,9394	0,8101	0,9569	0,8590	0,9522

Appendix 14 - Generg Capital Structure (2010-2013)

Leverage Measures	Mean	Median	Standard Deviation
Debt/Equity	31,4648	23,1989	28,5744
Long-Term Debt/Assets	0,7642	0,7741	0,0516
Total Liabilities/Assets	0,9514	0,9631	0,0423
Total Debt/Assets	0,8185	0,8312	0,0487
Total Debt/Capital	0,9439	0,9579	0,0491

Appendix 15 – Generg Variables (2010-2013)

Year	Profit	Fixed	NDTS	Growth	Size
2013	0,5465	0,6718	0,0652	0,0288	1,7E+08
2012	0,5200	0,6973	0,0619	0,0501	1,5E+08
2011	0,4538	0,7340	0,0633	0,0933	1,3E+08
2010	0,4922	0,6971	0,0588	0,1226	1,3E+08

Appendix 16 – Generg Variables (2010-2013)

Variables	Mean	Median	Standard Deviation
Profitability	0,5031	0,5061	0,0396
Fixed Assets	0,7001	0,6972	0,0256
Non-Debt Tax Shields	0,0623	0,0626	0,0027
Growth Opportunities	0,0737	0,0717	0,0422
Size	145000000	140000000	20558859

Appendix 17 – Generg Correlation Matrix (2010-2013)

Correlations	D/E	LTD/A	Liab/A	D/A	D/Cap	Profit	Fixed	NDTS	Growth	Size
Debt/Equity	1,000									
Long-Term Debt/Assets	0,599	1,000								
Total Liabilities/Assets	0,785	0,803	1,000							
Total Debt/Assets	0,608	0,994	0,855	1,000						
Total Debt/Capital	0,780	0,818	1,000	0,869	1,000					
Profitability	**-0,897**	**-0,881**	**-0,834**	**-0,871**	**-0,841**	1,000				
Fixed Assets	**0,973**	**0,754**	**0,891**	**0,770**	**0,890**	-0,957	1,000			
Non-Debt Tax Shields	**0,052**	**-0,739**	**-0,482**	**-0,754**	**-0,501**	0,338	-0,177	1,000		
Growth Opportunities	**0,404**	**0,962**	**0,612**	**0,933**	**0,633**	-0,766	0,572	-0,798	1,000	
Size	**-0,629**	**-0,998**	**-0,839**	**-0,998**	**-0,853**	0,892	-0,783	0,727	-0,943	1,000

Appendix 18 – Generg Variables' Correlation Signs (2010-2013)

	Fixed	Profit	NDTS	Growth	Size
Generg	+	-	-	+	-
Pecking order	+	-	?	+	+/-
Static Trade-off	+	+	-	-	+

Iberwind

Appendix 19 – Iberwind Capital Structure (2010-2014)

Year	LT/A	Liab/A	D/A	D/Cap
2014	0,6595	1,1059	0,7193	1,1726
2013	0,6785	1,0938	0,7330	1,1467
2012	0,6841	1,1284	0,7405	1,2098
2011	0,7110	1,1005	0,7595	1,1525
2010	0,7215	1,0682	0,7706	1,0970

Appendix 20 – Iberwind Capital Structure (2010-2014)

Leverage Measures	Mean	Median	Standard Deviation
Debt/Equity	-	-	-
Long-Term Debt/Assets	0,6909	0,6841	0,0251
Total Liabilities/Assets	1,0994	1,1005	0,0218
Total Debt/Assets	0,7445	0,7405	0,0205
Total Debt/Capital	1,1557	1,1525	0,0411

Appendix 21– Iberwind Variables (2010-2014)

Year	Profit	Fixed	NDTS	Growth	Size
2014	0,4655	0,6903	0,0609	0,0056	174000000
2013	0,4561	0,7121	0,0578	0,0061	171000000
2012	0,4151	0,7183	0,0540	0,0009	159000000
2011	0,4474	0,7491	0,0524	0,0130	152000000
2010	0,4620	0,7631	0,0507	0,0125	158000000

Appendix 22 – Iberwind Variables (2010-2014)

Variables	Mean	Median	Standard Deviation
Profitability	0,4492	0,4561	0,0203
Fixed Assets	0,7266	0,7183	0,0293
Non-Debt Tax Shields	0,0552	0,0540	0,0041
Growth Opportunities	0,0076	0,0061	0,0051
Size	162800000	159000000	9311283

Appendix 23 – Iberwind Correlation Matrix (2010-2014)

Correlations	LTD/A	Liab/A	D/A	D/Cap	Profit	Fixed	NDTS	Growth	Size
Long-Term Debt/Assets	1,000								
Total Liabilities/Assets	-0,579	1,000							
Total Debt/Assets	0,998	-0,567	1,000						
Total Debt/Capital	-0,641	0,996	-0,627	1,000					
Profitability	**-0,005**	**-0,751**	**-0,029**	**-0,714**	1,000				
Fixed Assets	**1,000**	**-0,592**	**0,998**	**-0,653**	0,007	1,000			
Non-Debt Tax Shields	**-0,953**	**0,349**	**-0,963**	**0,415**	0,294	-0,951	1,000		
Growth Opportunities	**0,752**	**-0,779**	**0,724**	**-0,820**	0,575	0,753	-0,527	1,000	
Size	**-0,845**	**0,067**	**-0,847**	**0,147**	0,434	-0,836	0,916	-0,480	1,000

Appendix 24 – Iberwind Correlation Signs (2010-2014)

	Fixed	Profit	NDTS	Growth	Size
Iberwind	+	-	+/-	+/-	+/-
Pecking order	+	-	?	+	+/-
Static Trade-off	+	+	-	-	+

NextEra Energy

Appendix 25 – NextEra Energy Capital Structure (2007-2014)

Leverage Measures	Mean	Median	Standard Deviation
Debt/Equity	1,4885	1,4600	0,1231
Long-Term Debt/Assets	0,3326	0,3381	0,0273
Total Liabilities/Assets	0,7368	0,7365	0,0071
Total Debt/Assets	0,3911	0,3914	0,0244
Total Debt/Capital	0,5973	0,5935	0,0200

Appendix 26 – NextEra Energy Capital Structure (2007-2014)

Year	D/E	LT/A	Liab/A	D/A	D/Cap
2014	1,4573	0,3252	0,7342	0,3874	0,5931
2013	1,5757	0,3458	0,7397	0,4102	0,6118
2012	1,7027	0,3597	0,7506	0,4246	0,6300
2011	1,5370	0,3639	0,7387	0,4016	0,6058
2010	1,4399	0,3399	0,7271	0,3929	0,5901
2009	1,4567	0,3364	0,7324	0,3898	0,5929
2008	1,4627	0,3086	0,7394	0,3812	0,5939
2007	1,2760	0,2811	0,7324	0,3414	0,5606

Appendix 27 - NextEra Energy Variables (2007-2014)

Variables	Mean	Median	Standard Deviation
Profitability	0,1991	0,2099	0,0375
Fixed Assets	0,9044	0,9068	0,0124
Non-Debt Tax Shields	0,0315	0,0327	0,0041
Growth Opportunities	0,0582	0,0559	0,0104
Size	15548375000	15329000000	839918353

Appendix 28 - NextEra Energy Variables (2007-2014)

Year	Profit	Fixed	NDTS	Growth	Size
2014	0,2568	0,9054	0,0340	0,0468	1,7E+10
2013	0,2134	0,9136	0,0312	0,0466	1,5E+10
2012	0,2287	0,9164	0,0236	0,0756	1,4E+10
2011	0,2102	0,9122	0,0274	0,0704	1,5E+10
2010	0,2096	0,8986	0,0337	0,0556	1,5E+10
2009	0,1621	0,9082	0,0364	0,0606	1,6E+10
2008	0,1631	0,8772	0,0322	0,0562	1,6E+10
2007	0,1489	0,9036	0,0333	0,0540	1,5E+10

Appendix 29 - NextEra Energy Correlation Matrix (2007-2014)

Correlations	D/E	LTD/A	Liab/A	D/A	D/Cap	Profit	Fixed	NDTS	Growth	Size
Debt/Equity	1,000									
Long-Term Debt/Assets	0,840	1,000								
Total Liabilities/Assets	0,799	0,419	1,000							
Total Debt/Assets	0,961	0,923	0,602	1,000						
Total Debt/Capital	0,998	0,856	0,771	0,972	1,000					
Profitability	**0,576**	**0,599**	**0,274**	**0,637**	0,586	1,000				
Fixed Assets	**0,445**	**0,568**	**0,291**	**0,447**	0,423	0,444	1,000			
Non-Debt Tax Shields	**-0,749**	**-0,555**	**-0,855**	**-0,596**	-0,718	-0,378	-0,396	1,000		
Growth Opportunities	**0,521**	**0,623**	**0,561**	**0,424**	0,498	-0,005	0,297	-0,723	1,000	
Size	**-0,445**	**-0,405**	**-0,434**	**-0,374**	-0,404	0,072	-0,562	0,618	-0,603	1,000

Appendix 30 – NextEra Energy Correlation Signs (2007-2014)

	Fixed	Profit	NDTS	Growth	Size
NextEra Energy	+	-	-	+	-
Pecking Order	+	-	?	+	+/-
Static Trade-off	+	+	-	-	+

References

Auerbach, A. J., 1985, “Real Determinants of Corporate Leverage,” in Benjamin J. Friedman (ed.), *Corporate Capital Structures in the United States*, University of Chicago Press, Chicago.

Barton, S. L., and P. I. Gordon, 1987, “Corporate Strategy: Useful Perspective for the Study of Capital Structure?,” *Academy of Management Review*, 12, 67-75.

Bloomberg, 2015, “Solar and Wind just Passed Another Big Turning Point”, http://www.bloomberg.com/news/articles/2015-10-06/solar-wind-reach-a-big-renewables-turning-point-bnef

Bloomberg New Energy Finance, 2014, http://about.bnef.com/landing-pages/h2-2014-us-tax-equity-market-update-suppliers-market/

Bradley, M., G. A. Jarrell, and E. H. Kim, 1984, “On the Existence of an Optimal Capital Structure: Theory and Evidence,” *The Journal of Finance*, 39, 857-878.

Donaldson, G., 1961, “Corporate Debt Capacity: A Study of Corporate Debt Policy and the Determination of Corporate Debt Capacity”.

Fama, E. F., and K. R. French, 1998, “Taxes, Financing Decisions, and Firm Value,” *The Journal of Finance*, 53, 819-843.

Fama, E. F., and K. R. French, 2002, “Testing Trade-Off and Pecking-Order Predictions about Dividends and Debt,” *The Review of Financial Studies*, 15, 1-33.

Ferreira, R., L. Bertucci, and A. D. Pereira, 2010, “Relationship Between the Capital Structure and the Asset Structure in the Electrical Energy and Telecommunications Brazilian Branches,” *Revista Brasileira de Gestão de Negócios*, 12, 7-24.

Financial Times, 2015, “Renewables are changing the dynamics of the energy business,” http://blogs.ft.com/nick-butler/2015/10/12/the-growth-in-renewables-is-changing-the-dynamics-of-the-energy-business/

Financial Times, 2015, “Business rounds on UK government for green energy U-turns,” http://www.ft.com/intl/cms/s/0/92a68ca8-6388-11e5-9846-de406ccb37f2.html#axzz3nyFxIxg0

Gupta, M. C., 1969, “The Effect of Size, Growth, and Industry on the Financial Structure of Manufacturing Companies,” *The Journal of Finance*, 24, 517-529.

Harris, M., and A. Raviv, 1991, “The Theory of Capital Structure,” *The Journal of Finance*, 46.

Jensen, M. C., 1986, “Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers,” *American Economic Review*, 76, 323-329.

Lino, L., 2014, “VaR em Parques Eólicos – Modelização de Risco de Vento, Risco de Taxa de Juro e Risco Soberano,” Master Thesis, Universidade Católica Portuguesa.

Long, M. S., and I. B. Malitz, 1985, “Investment Patterns and Financial Leverage,” Benjamin J. Friedman (ed.), *Corporate Capital Structures in the United States*, University of Chicago Press, Chicago.

Marsh, P., 1982, “The Choice Between Equity and Debt: An Empirical Study,” *The Journal of Finance*, 37, 121-144.

Miller, M. H., 1977, “Debt and Taxes,” *The Journal of Finance*, 32.

Modigliani, F., and M. H. Miller, 1958, “The Cost of Capital, Corporation Finance and the Theory of Investment,” *The American Economic Review*, 48, 261-297.

Myers, S. C., 1977, “Determinants of Corporate Borrowing,” *Journal of Financial Economics* 5, 147-175.

Myers, S. C., 1984, “The Capital Structure Puzzle,” *The Journal of Finance*, 39, 575-592.

Myers, S. C., and N. S. Majluf, 1984, "Corporate financing and investment decisions when firms have information that investors do not have," *Journal of Financial Economics,* 13, 187-221.

Myers, S. C., 2001, “Capital Structure,” *Journal of Economic Perspectives*, 15, 81-102.

Pierru, A., S. Roussanaly, and J. Sabathier, 2013, “Capital structure in LNG infrastructures and gas pipelines projects: Empirical evidences and methodological issues,” *Energy Policy*, 61, 285-291.

Rajan, R. G., and L. Zingales, 1995, “What Do We Know about Capital Structure? Some Evidence from International Data,” *The Journal of Finance*, 50, 1421-1460.

Rashid, A., 2012, “Risks and financing decisions in the energy sector: An empirical investigation using firm-level data,” Energy Policy, 59, 792-799.

Saeed, A., 2007, “The Determinants of Capital Structure in Energy Sector,” Master thesis, Blekinge Institute of Technology.

Scott Jr., D. F., and J. D. Martin, 1975, “Industry Influence on Financial Structure,” *Financial Management*, 4, 67-73.

Serrasqueiro, Z., and A. Caetano, 2012, “Trade-off Theory Versus Pecking Order Theory: Capital Structure Decisions in a Peripheral Region of Portugal,” University of Évora, Évora.

Shyam-Sunder, L., and S. C. Myers, 1999, “Testing Static Tradeoff against Pecking Order Models of Capital Structure,” *Journal of Financial Economics*, 51, 219-244.

Smith, C. W., and J. B. Warner, 1979, “Bankruptcy, Secured Debt, and Optimal Capital Structure: Comment,” *The Journal of Finance*, 34.

Srivastava, V., 2014, “Project Finance Default in India: Implications for Bank Loans to the Infrastructure Sector,” *Journal of Structured Finance*, 20, 81-92.

Stiglitz, J. E., 1969, “A Re-Examination of the Modigliani-Miller Theorem,” *The American Economic Review*, 59, 784-793.

Talberg, M., C. Winge, S. Frydenberg, and S. Westgaard, 2008, “Capital Structure Across Industries,” *International Journal of the Economics of Business*, 15, 181-200.

Toy, N., A. Stonehill, L. Remmers, R. Wright, and T. Beekhuisen, 1974, “A Comparative International Study of Growth, Profitability, and Risk as Determinants of Corporate Debt Ratios in the Manufacturing Sector,” *Journal of Financial and Quantitative Analysis*, 9, 875-886.

Williamson, S. H., 1981, “The Moral Hazard Theory of Corporate Financial Structure: Empirical Tests,” Unpublished Ph.D. Dissertation, Massachusetts Institute of Technology.