



UNIVERSIDADE CATÓLICA PORTUGUESA

# The use of Derivatives in Risk Management

A study of the Portuguese listed companies

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## Resumo

As empresas tentam até ao limite ter sucesso em ambientes e mercados que não controlam e onde não possuem informação perfeita. Para suceder é necessária a exposição a riscos e em grande parte das indústrias a competição transforma-se na lei do mais forte.

Uma das mais populares ferramentas de cobertura de risco são os instrumentos financeiros, em particular derivados. O seu uso está imerso em controvérsia uma vez que quando utilizados de forma incorrecta ou sem profundo conhecimento as consequências podem ser catastróficas como foi visto durante a crise financeira de 2008 e 2009 onde as Credit Default Swaps e Collateralized Debt Obligations foram vítimas de escrutínio da opinião pública.

A literatura neste tópico é vasta e diversa, salientando os benefícios que estes instrumentos podem trazer a um negócio mas também tendo em conta as implicações negativas que o seu uso pode ter numa empresa.

Este estudo analisa as 15 empresas não financeiras do índice português, PSI 20, do período de 2013 a 2015 e explora os riscos que estas encontram na sua actividade, como é o caso do risco de taxa de juro e de mercado, em empresas dependentes de um bem específico, e como é que os derivados podem ter um impacto na sua política de gestão de risco e ajudar a empresa a reduzir os seus encargos financeiros no presente e a assegurar a sua sustentabilidade face a situações desfavoráveis. Através de uma análise qualitativa e quantitativa tentaremos isolar as variáveis que têm uma correlação com o uso de derivados numa empresa e se são criadores de valor como ferramenta de hedging.

**Palavras-chave:** Derivados, Risco Financeiro, Cobertura de Risco, Mercados Financeiros , Gestão do Risco



## Abstract

Companies try their hardest to perform in environments and markets that they cannot control and where they do not have perfect information. In order to thrive it is necessary to be exposed to risks and in most industries it has been proven to be a survival of the fittest.

One of the most used tools to hedge risk are financial instruments, more particularly derivatives. The use of derivatives is immersed in controversy as its incorrect and unknown use can cause catastrophic consequences as it was seen during the financial crisis of 2008 and 2009 where Credit Default Swaps and Collateralized Debt Obligations were scrutinized by the public opinion.

Literature on this subject is very diverse, highlighting the benefits that can come from derivatives usage but also taking the full implications of this instrument with a grain of salt.

This study analyses the 15 non-financial companies from the Portuguese index, PSI 20 from the period of 2013 to 2015 and assesses what are the main risks these enterprises face in their daily activity, such as interest rate or market risk, in firms dependent on the price of a specific commodity and how derivatives have an impact in the Risk Management of these firms and can help the business reduce its financing costs and assure its sustainability against unpleasant surprises. Using qualitative and quantitative analysis we will try to isolate the variables that have a correlation with the use of derivatives in a firm and understand if they could be of added value as a hedging tool.

**Keywords:** Derivatives, Financial Risk, Hedging, Risk Management, Financial Markets



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# Introduction

In today's world, financial markets play a vital role in the production activity in nearly every industry. If the financial system fails, it endangers a country as a whole as banks are the primary source of financing for firms to innovate and enhance their capability to provide products for the economy. This is the cause for many alarm bells, as Bernanke (2009) described that it is impossible to have economic recovery within a financial system's crisis

That being said it is also a responsibility of both financial and non-financial firms to promote long term growth without exposing themselves to risks that could harm not only their business but the system as whole.

When looking at risk, the concept is misunderstood in many enterprises. It can arise from every single activity performed in a business and all of them, with different levels of importance, affect its long term prospects. Bernstein (1998) states that it is the correct managing of these risks that distinguish the firms that stand the test of time of the ones that have major fall downs.

In recent times new tools were developed to hedge risks and financial instruments have been one of the most popular ones. Bartram (2009) studied 7292 non-financial firms and reached to the conclusion that 59,8% of the firms use derivatives in their hedging<sup>1</sup> strategy. One of the main advantages of this instrument is that a derivative has no boundaries and restrictions. If two counterparties reach to an agreement, a derivative contract has limitless possibilities. This means that companies can almost perfectly tailor a contract to address a specific risk they face, as for example locking an interest rate to fix their

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<sup>1</sup> Hedging is a Risk Management strategy used to limit the probability of losses from fluctuations in variables the firm has exposure. It can involve either reducing the exposure on those variations or manage it at a firm acceptable level Pettinger(2008)

future debt amount and reduce the probability of not being able to meet their responsibilities.

Derivatives also fill other roles, such as the ones of arbitrage and speculation. These are not relevant for this study as arbitrage, described by Mc Craken(2005) represents profiting from market inefficiencies and speculation, according to Carret(1930) involves undertaking unacceptable risks for firms whose main benefit of derivatives is actually to eliminate them.

The main question and for which we will try to find evidence is if the use of derivatives is truly a value adding activity. As analysed by previous studies it is a very debatable question especially since hedging strategies are not a one size fit all and underperformers tend to severely skew the sample data.

This study will begin with an analysis of the main concepts of risk and risk management practices and how the different types of derives cater business's needs depending on the area they operate in and the risks trying to be hedged.

After this literature review we will conduct an analysis of the Portuguese listed companies for the time frame of 2013 until 2015. This analysis will have a qualitative focus, focusing on aspects such as the derivatives usage of the PSI 20 firms as well as the quality of information provided regarding their role in their risk management policies. A quantitative analysis will also be done to try to confirm the preliminary findings of this study.

The final results aim to reveal whether derivatives help firms in managing their risks and what are the factors behind a company's decision in using this instrument and how acting in different markets can influence a Risk Management strategy.

# Chapter 1

## Literature Review

### 1. Risk in today's environment

In recent times, risk has been a major concern for every organization due to the constant change brought by globalization and the increasing level of technology being used even in the most mundane tasks. It has been used as a support for decision making and a risk/return approach has been adopted almost worldwide for bigger corporations.

The most popular definition of risk is the one set by Frank Knight (1921) that characterizes risk as “immeasurable and impossible to calculate” in what is known as Knightian Uncertainty. This is due to the fact that, according to Knight, an ever-changing world brings opportunities for businesses but also uncertainty about future events. The author also separates risk from uncertainty, acknowledging that risk refers to an unknown outcome, but one which we can accurately measure the odds while uncertainty applies to situations where we do not have all the information to make a proper estimate about the probability of that same situation. This can be explained in real life, taking the case of the investment banks, which before the financial crisis regarded their own apparently precise risk assessments as trustworthy while it was not the case. They were operating in an unknown environment and had no real clue of the risks they were actually undertaking and the probability of those events happening. However Knight has been criticized due to the fact that his definition is not really a definition of risk, not measuring the actual exposure an organization can have to a specific event.

According to Glyn A. Holton (2004) exposure to an event is defined as having a personal interest in the outcome of it. Risk entails two essentials components: exposure and uncertainty and implies self-awareness of the situation, hence why it is not a condition of an organization but of its individuals, who are the ones managing it.

The Federation of European Risk Management Associations defines risk as “the combination of a probability of an event and its consequences” (ISO /IEC Guide 73), also referring to the concept of up and downside, which means that risk does not only imply losses, but could also represent an unexpected positive outcome. Norm ISO 31000 defines risk as the impact that uncertainty can have in the strategic objectives of an enterprise.

Menezes (2012) indicates that uncertainty is the key problem in decision making by the organizations, as it stops managers from having a full overview of the situation of their company. With an actual probability of occurrence and a known exposure it is much easier to decide on the future and to establish goals.

Campbell (2005) has a perspective that “risk equals expected damage”, referring only to downside of an event.

Menezes (2012) also focus on the conception that a probability of occurrence can be determined by statistics and the analysis of the past. Aven (2009) advises that historical data may exclude extreme observations, which have a possibility of happening in the future and that the behaviour of an individual is more significant when assessing their level of risk than past data. So Aven (2009) defends that data represents just a trend and not the actual chance of an episode actually existing, which is why this type of analysis can become too narrow.

## 1.1 Different types of risk

One of the major risks within a company's activity is market risk. According to Morik (2003), market risk relates to the volatility of the market price of the assets that an organization possesses. It also includes exposure to other unanticipated movements in financial variables and the market conditions, which as we can see, change on a daily basis. Changes in equity and commodity prices, foreign exchange and interest rates and credit spreads have an impact in the financial position of an enterprise. The number one measure for market risk in financial firms is, according to McKinsey & Company (2012) the Value-at-Risk (VaR), which determines the extent and occurrence ratio of potential losses in an institutional portfolio. A VaR of 1.6 million with a 95% level of confidence for one month, means that a company is 95% confident that they will not lose over the said amount in the next 30 days. The problem about this measure, as Jorion (2006) describes is that it takes out the extreme events which in case of happening will lead to much bigger losses.

Johnson and Scholes (2002) define strategy as "the direction and scope of an organization over the long-term." Strategic risk can be defined as "those threats and opportunities that materially affect the ability of an organization to survive." and have the possibility of disrupting a business (Allan and Beer, 2006). Whenever firms have ineffective or inappropriate business plans they are exposed to strategy risk and the failure of responding to changes in a competitive environment. A good corporate strategy also has to be able to assess its potential risks as to why it's is commonly said that strategic management cannot exist without risk management as a firm cannot persevere if their strategy does not

take into account the risk exposure of the application of that strategy in their daily activity.

Compliance risk has been a matter of an increasing importance in recent years, especially with the post crisis regulation and can be defined as the “risk of loss arising from non-compliance of pre-established norms” (Smith, 2008) having more a prescriptive feel being that firms must enforce compliance with the rules within its employees in order to prevent legal implications or damages to their reputation. It can be said that compliance tends towards the principles of best practice hence why it has been assuming a major role in industries where best practice was not properly the case and where losses can be severe if regulatory requirements aren't met, as in the financial services industry.

One of the major topics when analysing risk is operational risk that is “the risk of direct or indirect loss resulting from inadequate or failed internal processes, people or systems or from external events” (British Bankers Association, 2001). It is a broad definition and based on the fact that operational risk covers a great part of a business in the way that people and processes are present in every activity of a company and subject to possible failure. One of the differences between operational risk and the already referred market risk is that in the first one the concept of exposure is not clear and it is difficult for a business to correctly calculate or even guess its current level of operational risk, hence why this topic has been addressed by most businesses by establishing a control department.

Edgar R. Fiedler (1971) described credit risk as “the probability that a loan will not be repaid according to the terms of the contract” and the fact that it is virtually impossible to have a zero exposure to this. It is dependent of a range of factors as the borrower characteristics, which will ideally be pre-set by the business and the economic environment. It is unequivocally true that in periods of recession credit

defaults rise and credit risk exposure tends to increase as well as the requirements for a company to concede credit to a customer tend to tighten up.

## 1.2 Risk Management in the business

Risk as a profession has been growing exponentially and nowadays has a significant role in a large range of businesses, being frequently present at the board of directors of the biggest firms worldwide. This has happened largely due to the financial crisis in 2008 where a great number of wrong practices were exposed and control was an underdeveloped function within the business (Voinea and Anton, 2010). The successful management of the risks they are exposed to represents a crucial competitive advantage and risk management is widely considered to be a value added activity. At the moment risk management stopped being an independent and underused tool and is integrated, as a culture, in the company's overall activity communicating their analysis and advising other departments about potential threats. Every individual must understand the risk implication of their actions and be accountable for those.

Risk Management can be defined as "all measures and activities carried out to manage risk" (Aven, 2008) and it is the correct management of uncertainty that has a positive impact on a project's success.

### 1.2.1 Managerial Motives for Hedging

Merton (1974) controversially affirms that equity value is an increasing function of asset volatility, which could imply that managers acting according to shareholders interests would have incentives not to hedge. However managers are more risk averse than shareholders as they have an undiversified financial position on the firm, in contrary of shareholders. This means that managers usually spend resources in order to hedge diversifiable risk.

Stulz (1984) characterizes that “corporate hedging is an outgrowth of the risk aversion of managers” meaning that according to managers decisions and profile a company’s risk management policy can be very distinct of its competitors. By implementing compensation schemes linking managers pay directly to share prices, stockholders can incentivize managers to adopt a more risk taking view of the business.

### 1.2.2 Tax motivations for Hedging

Taxes are also a factor in risk management as being a function of earnings. If taxes are a convex function of earnings, more volatile earnings stream leads to higher expected taxes than a less volatile earnings stream (Smith and Stulz, 1985). This encourages firms to hedge in order to reduce their expected level of taxes, increasing the expected profits.

Graham and Rogers (2000), show that if taxes are a linear function of the profit before tax there is no fiscal benefit in hedging

According to Modigliani and Miller (1963) financial gearing adds value to a business due to the fiscal benefits arising from the debt. The same authors define that the value of a geared firm is equal to sum of an ungeared one, totally financed by equity, and the present value of the fiscal benefits of debt.

### 1.2.3 Capital Structure and Gearing

Modigliani and Miller (1963) refer that Cost of debt and debt capacity also influence a company’s decision due to the fact that without hedging and in unfortunate market conditions they can find themselves in an adverse situation without the ability to repay its debt. Risk Management plays a vital role in the debt management of a firm, effectively allowing it to increase their level of debt without actually being in a significantly greater risk of defaulting, due to their hedging strategies. However, Canil and Rosser (2000) also bring the point that

hedging also carries significant costs and too much hedging has a negative effect on the expected value of a firm.

When referring the cost of debt for a company within its Risk Management structure it is also necessary to take into account the capital structure chosen by the directors as it is the minimisation of the cost of capital that maximises the value of a business. This model is defined by Durand (1952) as the Weighted Average Cost of Capital (WACC). This implies that a Risk Management policy must be linked with the firm's decision on their capital structure. There isn't a perfect capital structure as both equity funding as debt funding have its benefits and its downsides.

Modigliani and Miller (1958) have a contrary opinion to Durand and by assuming that (i) Investors behave rationally, (ii) Financial Markets are perfectly set up, (iii) firms issue bonds without default risk and shares with risk, (iv) homogenous risk classes, (v) treasury flows are constant , (vi) expectations of investors about the return on capital are similar, they indicate that a company's value is not dependent of its capital structure. They finalise saying that firms should finance their projects using debt to take advantage of the tax benefits arising from those, being that the optimal capital structure corresponds to maximum level of debt a company could sustain. Default costs are described as the reason to why enterprise investments are not solely financed by debt

DeAngelo and Masulis (1980) instate that debt financing is advantageous as long as the business can have profits to use the fiscal benefits, otherwise debt will have a negative impact on the company's value. However, debt funding also implicates agency costs. These are described by Jensen and Meckling (1976) as «a contract under which one or more persons (the principal(s)) engage another person (the agent) to perform some service on their behalf which involves delegating some decision making authority to the agent”.

Agency costs arise when there are diverging opinions of both managers and shareholders (Harris and Raviv, 1991) due to liquidation divergences, which is the fact that managers cannot diversify the risks associated with the company causing them to take decisions who prioritise the financial stability of the firm, in order to maintain its sustainability as opposed to shareholders who can diversify their portfolio and may want the business' liquidation. If a company reaches a level of debt that is unsustainable then the risk of default rises, especially if there is no hedging on their greatest risks. That impacts severely the business and even if it manages to survive, capital costs will rise and reputational losses can be very damaging.

When funding itself with equity a firm faces agency problems between its manager and shareholders (Jensen and Meckling, 1976), due to the fact that there is an opportunity cost due to different interests pursued by manager and shareholders and there is the need for the shareholder to control the director's performance and decisions, incurring in costs, as they do not have the access to the same information as managers. Jensen and Meckling (1976) explain that agency costs are equal to the sum of monitoring expenses incurred by the shareholders, the contractual obligations that restrict the agent's activity (Bonding Costs) and the residual losses, due to the divergent interests of both parties even with the use of monitoring and bonding.

Also by definition the cost of equity is bigger than the cost of debt as shareholders demand a higher return rate due to the greater uncertainty regarding repayments and profits. This is the biggest advantage of equity funding for managers, as there is less burden if the company does not turn a profit (A.Kunigis, 2013). Jensen and Mecklin (1976) finalise their opinion saying that debt financing is a solution to reduce agency costs as with the repayments of loans and interest managers have a reduced free cash flow to "play" and spend pursuing different interests than those of the shareholders.

Anyway, when analysing specifically how Risk Management can add value few literature and studies were found, being much more concentrated on the use of financial risk management tools. However, a holistic Risk Management system should have the goal of “understanding and managing risks with financial impact on cash flows, risks related to integrity events, such as fraud and corruption, and Health, Safety and Environment events, in order to support the achievement of the corporate objectives” (Statoil Book, 2011).

One misconception about Risk and Risk Management is the almost exclusive focus on the downsides. When talking about this topic, both the downside and upside have to be managed and despite not being independent they can be analysed separately. Ward & Chapman (2003) described that “often there is a solution to a decision problem that simultaneously offers a way to minimize threats and seize opportunities, which can provide an improvement in performance”.

### 1.3 Definition of value

When concluding whether or not Risk Management can add value to an enterprise we have to assess what is the actual definition of value and how it can be measured. Value can be defined, according to the Webster’s New World Dictionary of the American Language (Guralnik, 1979) as “ estimated or appraised worth or price/valuation “ or “ the worth of at thing in money or goods at a certain time; market price“. This takes the definition of value into something terms of money or other exchangeable goods. A firm’s value in this way is expressed in monetary terms (e.g. Coca Cola’s value is of 41.74 \$ per share). Berry (2007) describes value with a management focus, measuring it by the extent to which a firm improves people’s businesses or lives.

It is also true that value can be intangible and be defined by “that quality of a thing according to which it is thought of as being more or less desirable, useful, estimable and important”. This is due to the fact that to properly measure a company’s value is not advised to only include tangible factors as the only measurement, hence why the definition of value is quite broad and not fully agreed by theorists.

### 1.3.1 Risk Management as a value adding activity

The Committee of Sponsoring Organizations of the Treadway Commission (COSO) developed the Enterprise Risk Management framework, which links the admissible risk by a business with its strategic goals and several steps starting with the identification and acceptance of exposure to risks and their mitigation.

Inheriting the fact that the primary objective of every organization is to maximise value for stakeholders, Risk Management is linked with this same goal as every decision taken by the managers has a certain level of risk which has to be managed. The main role of Risk Management is to be a facilitator of decision making in order for the managers action to create value for the company’s stakeholders, by generating benefits superior to the resources employed in those activities.

Risks evolve on a daily basis and the goal of risk management is to able to constantly assess those risks by providing timely and robust information about potential threats arising within an organization which could compromise the objectives that were set previously and in the past it was the reliance on historical experience that left many organizations ill-prepared to respond to a changing environment - (COSO, 2009).

Dealing with risk has also become more complex with the advances in technology, globalization, speed of product cycles and the enormous volume of

business transactions, and there is need for the board to be more aware of new menaces to their firm and to oversee the risk management practices as it needs to be constantly adapting to an ever-changing reality. This emphasis on risk oversight has been increasing for a number of years. The New York Stock Exchange's 2004 Final Corporate Governance Rules require that audit committees of listed corporations to discuss risk assessment and risk management policies. There is a need "to make sure that shareholders fully understand how compensation structures and practices drive an executive's risk-taking" (Shapiro, 2009). This is a part of an increasing transparency and disclosure that is trying to be input in every business, especially since the financial crisis of 2008 which was largely caused by misjudgments of risk and over eagerness for profit combined with poor risk assessments.

COSO suggests that in order to strengthen risk management in both a strategic and value adding away, the implementation of Enterprise Risk Management (ERM) provides a holistic top-down view of key risks facing a business. This compromises not only strategy and risk but also key controls being put into place as well as corporate governance reducing main issues like agency problems. Enterprise Risk Management can then be defined as "a process, effected by the entity's board of directors, management, and other personnel, applied in strategy and across the enterprise, designed to identify potential events that may affect the entity, and manage risk to be within the risk appetite, to provide reasonable assurance regarding the achievement of objectives." (COSO, 2004)

In order to correctly implement an integrated Risk Management framework it is necessary to identify the risk appetite of said organization as it has a fundamental role in defining its strategy and in the key decisions of the management. This is not an easy process but it is critical that both the strategy and risk perspectives are aligned in order to secure the business's sustainability. It is a responsibility of the board to oversee the risks being taken by the

managements and in some cases limit it, if they are not connected with the developed strategy.

Hilson (2002) focuses on the risk responses mentioned in the COSO framework, splitting them into four familiar groups:

### **I. Avoidance**

Eliminate a threat by making it impossible to occur or finding another way which could reduce the impact of the risk to zero

### **II. Mitigation**

Reducing the likelihood or impact of a specific risk to an acceptable level by the organisation. This can be done in a number of ways:

- a) Buy insurance with a specialized company to cover the specific risk
- b) Outsource the function which creates said risk
- c) Reduce the probability of the event happening
- d) Use the derivatives market in order to hedge

### **III. Transfer**

Transferring the risk to another stakeholder which would be better suited to manage it

### **IV. Acceptance**

Embrace the risk and take no corrective action in order to affect the impact said risk could cause in the business.

A well implemented Risk Management practice has the quality of reducing surprises which means that the entity has the enhanced capability of identifying threats and responding to them before they damage their activity.

Also it enables organisations to manage multiple and diverse risks that are correlated in their impact and affect different parts of its structure and to the business with just one complete and integrated framework. With ERM a company can also seize opportunities and not just respond to potential threats but proactively explore benefits arising from market changes.

Despite this, Risk Management is still not used to its full potential and Olsson (2007) discovered that empirical evidence supports the fact risk management practices in entities which are proactive in project management, is still not exploring all the potential opportunities and acting reactively to arising situations instead of planning in advance.

According to a Sybase Study (2015), 38% of companies still do not have a Risk Dashboard and from the 62% that use this tool , 50% of those use it in the form of spreadsheets and written reports which cannot be updated real time, with only 29% of the companies actually having an interactive tool to manage risk.

## 1.4 Use of Derivatives

One of the most used tools in Risk Management are derivatives contracts. Despite being relatively recent (the first call options began being traded in 1973 at the Chicago Board Options Exchange), they have revolutionised how companies view and manage the risks they are exposed to. Derivatives, as described by Kimberly (2016) are contracts established between two counterparties whose price is derived from an underlying asset. In basic terms these work as an insurance. In options the buyer of the derivative contract pays a premium which allows him to exercise the optionality he just bought, in case of

options contracts. With this, the buyer can opt to exercise his contract if the price fluctuation goes in his favor and allows him to buy the asset for a cheaper price than in the market or sell it for a higher one. They can be traded at an exchange, being secured by a formal entity but most of them are personalized contracts, traded between two counterparties over-the-counter (OTC). This makes derivatives an easy financial instrument to acquire but at the same time increase the possibility of them being badly used. An alternative to Options are Futures and Forwards, which share the same characteristic as the instrument above apart from the fact that they do not have an optionality component, with its buyer effectively locking a price on the date the contract is traded, hence why the costs for these two instruments are smaller than with options contracts, as studied by Glen (2016).

However, the most common used derivative are Swaps, which Mc Craken (2005) defines as an exchange of cash flows between counterparties, which are derived from an underlying notional amount. One of the parties pays a fixed interest amount while the other pays a floating amount, tied to the evolution of a rate such as the EURIBOR. This allows for businesses to adjust their costs in accordance to their income streams.

Until very recently firms were not required to report their derivatives activity which led to suboptimal conduct in many cases such as the ones of Barings and Procter&Gamble. Their usage also varies according to the country and company culture as in a study conducted by Bodnar (1998) the author concluded that 78% of German firms use derivatives contrasting with a 57% results when analysing United States companies. They allow specific risks to be targeted and be sold off and despite being controversial instruments as their use is extremely dangerous and losses can be severe, they have gained enormous popularity and can be used for various reasons.

### **a) Hedging**

Derivatives, as described by Pettinger (2008) are used to sell off risks in the way that the company fixes a determined price for a commodity or an interest rate, effectively securing themselves from any market changes that could affect their business

### **b) Speculation**

Refers to taking a position with the perspective that the market will move in a favorable way. Derivatives have the possibility of making an investor profit in a falling market, which is something that is not attainable using other financial instruments. Carret (1930) affirms that it is used by individuals trying to outperform the market. It is also a risky way to use derivatives which has the potential to cause severe losses if this is done by someone who does not have enough knowledge of the instruments and its possible consequences

### **c) Arbitrage**

Arbitrage opportunities arise, as referred to by Mc Craken (2005), when a similar asset has different prices on different markets, meaning that an individual can buy for a lower price in one market to sell it for a higher price in another.

In this work we will focus on the use of derivatives for hedging purposes as that is the primary focus within Risk Management. Bartram (2009) refers that firms that use derivatives have higher leverage, are more profitable and larger than firms who do not use them. It is also explained by Geczy, Minton, and Schrand (1997) that businesses who are highly leveraged are more likely to hedge with derivatives in order to reduce their probability of not being able to service their debt.

Hentschnel and Kothari (2000) identified firms who use derivatives and concluded that there is an economically small difference in the equity return

volatility between users and non-users. Guay (1999) measured the volatility of equity return between the different groups at 2%, which is not a large difference that could be explained that despite not using derivatives, the non-users still manage their risk in alternative means through operational and financial strategies.

That is due to the fact that there is some controversy as to the role of derivatives in risk management and of how important they can be in a hedging strategy. Empirical studies have opposite opinions due to the complexity of the usage of derivatives used but because a great percentage of non-financial firms might not be using derivatives to a degree that is economically relevant.

One very important topic addressed by Spinner (1996) and Gamble (1998) relates to the fact that there is a correlation between the policy of the board members and its constitution and the use of derivatives for risk management purposes.

Tufano (1996) and Haushalter (2000) define the usage of derivatives as a continuous one, being that firms who hedge using derivatives tend to continue using them for the same purpose.

Bartram (2009) also analysed the reasons why companies hedge using derivatives and divided them in country-level factors and firm factors, attributing the greater importance to the later but also highlighting that the size of the local currency derivatives markets, measured by the daily turnover of over-the-counter FX and Interest Rate derivatives amongst financial institutions. This is due to the fact that the supply side and liquidity within a market is an important factor to whether a firm decides to use derivatives.

Froot, Scharfstein and Stein (1993) suggested that derivatives can reduce financing costs by reducing the fluctuations in the demand for external financing, particularly for informational opaque firms. This reduction in cash flow volatility will ultimately increase the firm's value.

### 1.4.1 Concept of Gearing

The main risk of derivatives traded over the counter (OTC) is associated with gearing, as investors do not need to invest a large sum of money in order to participate in the market and have its gains through price changes magnified. However that also brings more exposure to negative variations of a derivative which in many cases leads to overbearing losses and defaults.

## 1.5 Main Risks targeted by derivatives

In G.M. Bodnar (1998) study companies were using derivatives to hedge market risk mainly Foreign Exchange (FX) risk and Interest Rate risk. Also being targeted by firms is the price risk of commodities such as oil, gas or agricultural goods which are a vital component of their long term profits and sustainability.

### 1.5.1 Foreign Exchange Risk

Foreign Exchange risk is defined by Madura (1989) as to being related to effect of unexpected exchange rate changes on the value of the firm. It can be defined as the direct loss in firm's cash flows, assets or liabilities, profit or stock market value due to an exchange rate move.

FX has existed in other terms since before biblical times (J. Walmsley, 2000) but anyways, a proper FX market has only been established since the 1800s, when cable transfers were done from London to New York. Before World War II, currencies were measured in relation to what they were worth in Gold ounces, known as the Bretton Woods system.

At the present, exchange rates float, being controlled by the forces of supply and demand in the currency market as well as interest rates and the inherent risk to holding a specific currency.

Currency risk hedging strategies entail eliminating or reducing this risk, and require understanding of both the ways that the exchange rate risk could affect the operations of economic agents and techniques to deal with the consequent risk implications (Barton, Shenkir, and Walker, 2002).

While analysing this risk and as in most of this study we have to separate between financial and non-financial firms. A non-financial company usually assigns the management of FX Risk to its treasury department and according to Lam (2003) this is almost always monitored by a risk committee which has the duty to oversee the treasurer's strategy relating to foreign exchange.

Allen (2003) highlights the fact that aside from their cash position companies have assets and liabilities denominated in foreign currencies which also fluctuate in value and therefore increase the need for hedging. This is a common and unavoidable factor for multinational corporations. Dolde (1995) also found evidence that currency derivatives are used more frequently by firms with high growth opportunities, in order to reduce the underinvestment problem they could be faced in the beginning of their activity.

In order to address this risk, firms need to measure the impact of exchange rate movements which can be done mathematically using the VaR. Nevertheless, Hakala and Wystup (2002) state the need to quantify those risks and separate them by type. There are three main types of FX risk according to Shapiro (1986) and Madura (1989):

**a) Transaction Risk**

Cash flow risk regarding exposure related to firm's receivables and payables. Changes within the FX rate can increase the amount of cash that needs to be paid to suppliers or reduce the amount to be received from a sale that is awaiting settlement.

## **b) Translation Risk**

Balance Sheet Exchange Risk which related to changes in the valuation of foreign subsidiaries which have a different main currency than the one of Head Office. This exposure can be calculate by assessing the net assets of the subsidiary, however the actual impact of this exposure in an unhedged firm depends on the accounting treatment in relation of the exchange rate. The common practice in the presenting of a consolidated balance sheet is using the end of the year exchange rate, when producing the yearly reports.

## **c) Economic Risk**

The risk of present value of the firm being changed due to changes in future operating cash flows. It is related to the effects that exchange rates could have in revenue such as sales and exports and operating expenses i.e salaries on a foreign subsidiary or supplier costs.

After this analysis, firms need to decide whether to hedge or not those associated risks. Jacque (1996) defends that there is no settled strategy in international finance to manage FX risk. Allen (2003) contradicts this author by referring various currency risk management used by corporate treasurers which are chosen mainly taking into account the size of the firm and the prevalence of a certain type of risk.

Relating to hedging strategies, they also vary according to the factors described above. With hedging transaction risks, tactical hedging<sup>2</sup> is used the

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<sup>2</sup> Hedging done on a short term basis in order to respond to specific transactions that enhance the risk exposure of the firm (Jacque,1996)

most, in order to preserve cash flows and earnings and short term payables and receivables. Strategic hedging<sup>3</sup> is done on a long term basis.

Papaioannou (2006) states that hedging also relies on the treasurer's view of the market, which is the opposite of a passive strategy, incorporated by many firms worldwide, which uses the same hedging structure over a number of periods, irrespective of the expectations of exchange rate changes.

The same author also describes translation risk as being very infrequently hedged, in the way that it is done more in a responsive manner, to avoid abrupt changes in the value of net assets due to a currency shock. This hedging of this risk, also called balance sheet risk, is not a priority in most cases as it does not have a link to the income statement as the other two.

A point of great importance in the FX hedging of translation risk for a multinational, which produces a consolidated balance sheet, is the firm debt's profile. Jorion and Khoury (1996) and Marrison (2002) use the currency of the debt and maturity composition as the main factors for the susceptibility of its net equity and earnings to FX rate changes. Firms normally use an optimization model which creates an optimal set of strategies to manage the currency risk. Nevertheless, as in every hedging scenario, rates can move in the opposite direction leading to cash flow and earnings volatility in this case.

All in all, translation risk requires a careful analysis of the benefits and costs of hedging against the potential losses of not hedging.

Economic Risk is classified by Papaioannou (2006) as a residually hedged risk and it is difficult to quantify as it reflects the potential impact of exchange rate moves on the present value of future cash flows which are by nature uncertain. With that in mind, it is necessary to forecast the impact that an exchange rate

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<sup>3</sup> Long term hedging with the goal of increasing the risk management added benefits and effectively serve as a value creator activity for the business (Ptak,2002)

deviation from the benchmark rate 1 could have on the firm's future income and expenses.

Kritzman (1993) describes that treasurers are developing sophisticated corporate strategies to efficiently hedge currency risk instead of the mere use of a simple financial instrument at a time just to cover an imminent exposure. In effect, the author states that an efficient frontier measures the cost of the hedge against the degree of risk hedged meaning that an efficient frontier determines the most efficient hedging strategy as that which is the cheapest for the most risk hedged.

#### 1.5.1.1 Foreign Exchange risk hedging instruments

When the hedging structure is well defined and communicated, firms need to decide on which instruments to use to effectively hedge. Jacque and Shapiro (1996) state that the available hedging instruments are enormous, both in variety and complexity, and have followed the dramatic increase in the specific hedging needs of the modern firm.

When using exchange traded instruments, currency options and futures are the most used ones. Currency options are flexible such as the plain vanilla call (Allen, 2003) which defined it as buying an upside strike in a FX rate with no obligation to exercise which can be compared to buying insurance on the downside. It allows firms to effectively know what is their maximum loss – the premium paid for the option, hence why they are expensive to use. Currency futures, Papaioannou (2006), are contracts, exchange traded, that specify a standard volume of a particular currency to be exchanged on a normally quarterly settlement date. They have the benefit of being guaranteed by an exchange clearing house, which eliminates default risk. However they are

standardized which means that contract sizes are not tailored to fit each firm's needs.

Companies can opt to use over-the-counter instruments such as currency forwards or cross currency swaps. Papaioannou (2006) defines currency forwards as contracts for future delivery with a price set today. They can either be settled outright, with the physical delivery of the currency traded or on a net cash basis. This allows firms to lock the exchange rate and be safe against its variations but also carries a significant cost and potential losses when the FX rates moves in the opposite direction.

Regarding cross-currencies they can either be a coupon swap or a basis swap. A coupon swap involves buying the currency swap and paying fixed, while receiving floating interest payments. The basis swap differs in the fact that the firm receives and pays floating interest, disregarding in this manner the interest rate risk, which is still the most important risk company's face nowadays and that will be analysed in depth next.

Madura (1989) defended the natural hedging possibility which would mean that a firm should pair inflows in a foreign currency with its outflows, either in timing and amount, in order to be perfectly hedged against any possible FX change. Another solution could be the invoicing in a foreign currency, in order to reduce transaction risk related either to exports and imports.

### 1.5.2 Interest Rate Risk

In spite of the use of interest rate derivatives growing considerably over the past decades, its benefits are still somewhat hard to see for some authors, as in some cases the samples used to examine the use of these instruments are skewed towards the catastrophic use of derivatives by firms who speculate without the proper knowledge to do so. Faulkender (2004) shows that in the pharmaceutical

industry firms use interest rate derivatives for speculation purposes instead of hedging.

Interest Rate risk was described by Faulkender (2005) as possibly coming from two sources: the interest rate sensitivity of their assets and the sensitivity of their debt. The final goal is then to try to match volatile cash flows, which are costly, with the final exposure of their debt instruments. One of the factors that also needs to be taken into account is the correlation of the firm's cash flow with interest rates, as positively correlated cash flows will cause a preference for interest payments on floating liabilities and vice-versa.

One of the perks of addressing interest rate risk is the fact that identifying a firm's exposure is not straightforward, according to Faulkender (2005). Knowing this, Graham and Rogers (2002) estimate the IR exposure of the firm's cash flow prior to the incorporation of interest expense and earnings from derivative transactions. Then the authors classified as a hedgeable interest risk if the estimate is significantly different from zero and not actually off set by floating rate debt or if the firm does not have interest rate exposure while having floating rate debt.

In the case study of "Liability Management at General Motors" GM stated that the goal of an interest rate management programme is to "actively manage the Central office liabilities to take advantage of the cyclical nature and volatility of domestic interest rates and shifts in the shape of the yield curve to reduce the overall cost of funds".

Covitz and Sharpe (2005) studied the use of IR derivatives to hedge the liability side of the balance sheet and concluded that smaller and lower-rated firms have greater interest rate risk exposure from short-term and floating rate debt. This is partially due to the case that these kinds of businesses rely their activity in this type of financing more than the bigger corporations (Barclays and Smith, 1995).

They also have to recur to banks which means they are in most cases left with a floating interest rate which creates risk in that same rate variation.

According to Covitz and Sharpe (2005) also show that the debt structure is the main responsible for the choice of a derivative position by a firm which enhances the fact that derivatives are mostly used to hedge and ensure the company's ability to meet future responsibilities.

Visvanathan (1998) also analysed the relation between long term debt and leverage in the matter that they appear to induce firms to use floating rates in their swap interest payments.

When looking at the asset side of the balance sheet, Covitz and Sharpe (2005) found no evidence of the hedging of IR exposures from the operating assets. That is largely due to the fact that firms have difficulty in measure their operating exposures, which is not the case with their liabilities. These two authors also concluded that when accounting for derivatives, the net interest rate exposure of small and large firms are fairly similar, with the first ones having a larger position in pay-fixed swaps in order to hedge their bigger interest rate risk.

One of the key elements of an interest rate hedging strategy is the yield curve, as steep curves will benefit firms who opt for a floating interest rate exposure and it's the perception of the market by the firm that decides on the success of the hedging. (Faulkender, 2005). This translates in the fact that market timing is vital when deciding on a correct hedging and as market conditions worsen, firms are more inclined to switch from a floating rate exposure to a fixed rate. Faulkender also states that this response to the market is independent of the firm size, as yield spread movements conduct changes in hedging of either bank dependent small firms or multinational that are bond market users.

Other macroeconomics conditions, such as recessions, play also a significant role in the interest rate hedging strategy. Faulkender (2005) found evidence that as the expectation of a recession increases, firms are more likely to lock in the

interest rate of their newly issued debt, as there is a higher cost of interest rate volatility during economic downturns in relation to economic periods of prosperity.

#### 1.5.2.1 Interest Rate risk hedging instruments

When hedging interest rate risk, interest rate swaps are by far the most used instrument in the market. Jermann (2014) described them as derivative contracts in which two parties exchange fixed and floating rate coupon payments. This exchange of cash flows is done periodically at the agreed rates, with the fixed rate remaining unchanged for the duration of the contract and the chosen floating rate changing accordingly to the market.

Swaps were first used in the early 1980s and it is estimated that at the moment the notional amount in live swap deals is approximately around 10 trillion. It has also been empirically proved that most non-financial companies use swaps in order to stabilize their payments and to better forecast their future liabilities, leading to them being fixed rate payers. Li and Mao (2003) found that 44% of US non-financial firms were fixed rate payers, with 20% paying a floating rate and 18% being both. The remaining sample did not publicly present this information. Chernenko and Faulkender (2011) arrived to these conclusions as well as Saunders (1999) as these types of firms use swaps for stability and long term sustainability purposes instead of a “beating the market “ perspective.

As with other derivatives, Wall (1989) links swap usage to agency problems derived from long term debt which according to Myers (1977) can lead to under-investment, as creditors share the benefit of new investments through a reduced probability of default.

Wall (1989) highlights the benefits of swap usage to hedge the interest rate risk associated with short term borrowing, reducing the costs of said activity. Jermann (2014) concludes his study explaining that the share of debt that is swapped into fixed rates is dependent on market conditions, with the share of debt being reduced as long term rates are high relative to the short term ones. The same author also concludes that despite swaps not having an impact in the firm's investment behavior they minimize default costs and default rates in periods of recession, which in the end will reduce the cost of debt financing.

Visvanathan (1998) concludes that fixed rate swaps users have higher expected financial distress costs, in the way that the payment amounts do not oscillate accordingly to the market conditions. We can corroborate this by analysing the Portuguese case, in which public companies used fixed rates swaps just before the major decrease in interest rates which ended up costing several billions to the Portuguese tax payers. This author also refers that the debt maturity structure being targeted as ideal for a firm is one of the major consideration when deciding to enter into a swap contract, with the implicit assumption that firm prefer long term over short term debt, despite the first one only being obtained, in some cases, at much higher interest rates because of agency costs and asymmetry of information. Swaps have the advantage of allowing firms to create synthetic fixed rate debt at a lower rate than direct borrowing.

Other popular instruments used in the hedging of interest rate risk are Forward Rate agreements (FRA's), which is a forward contract based in an interest rate where one party pays a fixed interest rate and receives a floating rate, called the reference rate. They are paid on a net basis (the loser pays the winner). A FRA can be described as a one period swap, where borrowers and lenders are exposed to interest rate risk in a single future date. Futures have similar specifications as FRA's but provide counterparties with less risk, as they

are assured by an Exchange, effectively removing almost completely liquidity and default risk.

Swaptions are also used in specific cases, consisting in an option, purchased by the buyer, to enter in a pre-determined swap. Due to the optionality component, they are costly as the buyer has to pay a premium upfront.

### 1.5.3 Commodity Price Risk

Commodities such as oil, gas and gold play a major role in many developing countries that base their revenues in the exporting of these goods. According to UNCTAD statistics (1995), fifty seven developing countries depended for over 50% of their exports on three commodities. That can be proven by the cases of Angola, which is enduring a major crisis, not only due to the poor management and corruption that plagues the country since its inception but also due to the falling price of fuel.

Commodity prices are also volatile by nature which increases the instability of countries and firms that depend on them in the short and long term. Lason, Varangis and Yabuki (1998) discuss several attempts that have been done to achieve stabilization of commodity prices such as the use of buffer stocks, buffer funds, and actual government intervention in the commodity markets or commodity agreements. These attempts have not fared well with buffer funds being bankrupt and commodity agreements being suspended along with an ineffective and costly government intervention.

Ntamatungiro (1991) highlights the fact that literature does not give a great deal of importance to the possibility of hedging commodity price risk using derivatives. However, Breeden (1984) states that financial markets have contributed in improving the completeness of commodity markets.

Lason, Varangis and Yabuki (1998) emphasize the development of commodity risk management was aided by the globalization of commodity markets and liberation of the markets, including lower trade and capital barriers. In the 1990's several companies started using commodity derivatives in order to hedge their risks related to commodity prices which represented a boom in the market transactions for a specific number of commodities. One point addressed by these 3 authors relates to the inability of a small entity to access the market and trade commodity derivatives, being virtually impossible to hedge this risk as well as not existing a big enough market or liquidity for some commodities that are not as popular or heavily traded.

It is also important to notice that in the commodities markets, price volatility and income volatility have a strong connection as most of the commodity producers are developing countries which creates humanity problems apart from the market specific and inherent risks.

When analysing price volatility, several studies can be found and they provide contradictory results. Massell (1970) tried to empirically measure unanticipated price movements as well as Lam (1980) and Glezakos (1973).

In the option markets, we can actually calculate their volatility which corroborates the disparity that exists between commodity volatility and volatility of other financial instruments. (Lason, Varangis and Yabuki, 1998). These authors also highlight the fact that when addressing commodity risk agents also use instruments in order to achieve revenue stability, which also tackles production quantities stabilization, and not only price variations. Nevertheless, empirical studies agree that the price effect on commodities is indeed more relevant than the quantity effect, as Yabuki and Akyama (1996) concluded when examining export revenues of 12 major commodities, where 8 of them showed a higher price effect than quantity effect.

When accounting for the overall exposure to commodity price risk, firm's need also to assess if the price of the commodities they deal and trade on a regular basis is somewhat positively or negatively correlated. In case of being negatively correlated, the overall net exposure of a firm could theoretically be zero, despite using a vast range of commodities. Pindyck and Rotemberg (1990) examined the price movements of unrelated commodities and reached the conclusion that prices of different commodities tend to move in a similar way even after taking into account macroeconomic effects which is called the excess co-movement phenomenon. This is attributed to the herd effect which occurs when traders across different commodities behave in a similar way to non-economic factors and also due to liquidity constraints as if a commodity price rises, increasing other commodities prices as well, it will end up decreasing the liquidity of speculators which have a short position in several different commodities.

Palaskas and Varangis (1991) contradict the former authors by discovering that excess co-movement phenomenon is in fact an exception and not a common rule.

When assessing the benefits of commodity markets, Lason, Varangis and Yabuki (1998) underline the fact that market hedging tools allow a Pareto efficient allocation of resources and risks but only for those who have the financial possibilities and technical expertise to be able to use them. The commodity markets have risen partially due to the fact that there has been a changing approach to commodity problems by not only developed but also developing countries.

### 1.5.3.1 Commodity Price risk hedging instruments

The most used instruments when dealing with commodity price risk are spots, forwards and futures. Commodities futures have been traded since 1865, with the Chicago Board of Trade offering futures for agricultural commodities.

Spot markets, prices are set goods are delivered promptly which can be described as price discovery (Lason, Varangis and Yabuki ,1998) as prices are only valid at today's date.

When trying to secure a future price and as with hedging FX and IR risks, firms can opt to use either forwards or futures. These instruments add the time dimensions to a spot market. These instruments work in a similar fashion to spots and forwards in other markets, with the importance of differentiating between physical delivery of goods, which in this case would be a specific commodity, that is used mostly in the forward contracts to the ability of closing a position before maturity, used in future contracts and not involving actual settlement of the contract at the expiration date.

A problem highlighted by Lason, Varangis and Yabuki (1998) was the maturity of the hedging contracts which in most cases were done on a short/medium term basis with expiration dates around 1 or 2 years. That is largely due to the fact that forecasting some commodity prices deep into the future does not lead into good estimates and there is not enough demand for some commodities on a long term basis, which caused the OTC market to expand due to the possibility of developing tailored made deals. That is however changing with ten years contracts on oil prices increasing in popularity.

All in all, studies show that a market based risk management approach to commodities is of value added to reduce uncertainty despite not being accessible to all kind of individuals.

## 1.6 Other studies in the uses of derivatives by firms

After analysing risk and its implication in today's business activity as well as the most used and effective ways for companies to address the specific risks they face, we need to consider the previous workings that studied the use of derivatives by businesses for risk management purposes.

T.Muff (2008) analysed 277 UK non financial firms during the period of 1995 to 2001 and concluded that firms with low profitability, high growth opportunities and higher tax liabilities are more likely to use currency derivatives. The author also highlights the fact that US and UK firms hedge in very different manners with these referred factors not having a major weight in the US companies hedging decisions. In this paper he also highlighted the fact that firms with high exposure through foreign sales and sized are very likely to hedge or use foreign currency borrowing.

Howton and Perfect (1998) examined 461 randomly selected firms and 451 Fortune and S&P 500 (FSP) companies and reached the conclusion that 61% of the FSP firms use derivatives while only 36% of the random ones did use those instruments. The most used instrument were interest rate swaps and currency forwards and futures.

Bodnar and Gebhardt (1998) investigated a sample of German and US firms, with the conclusion that 78% of German corporations use derivatives compared to only 57% of the companies in the US sample. Foreign currency derivatives were deemed as the most common followed closely by interest rate derivatives. The authors also emphasize the fact that the hedging motivations are fairly different in both countries, which can be attributable to culture and management differences.

Guay and Kothari (2002) studied 234 large non-financial corporations and despite the fact that the magnitude of the derivatives position held by most firms was deemed as economically small in relation to their risk exposure the perceived benefits of derivatives usage are considered bigger than the operating costs of initiating and maintaining a derivatives program.

Berkman and Bradbury (1996) reach to the conclusion that only using fair value as a measure of hedging activity that it is possible to find a positive correlation between derivatives use and the value of a firm's growth options, while analysing New Zealand enterprises.

Focusing on the Portuguese reality, it is possible to find some studies regarding the derivative usage in Portuguese companies, which will be the main focus of our analysis. Cruz (2014) targeted the recent financial crisis by investigating the hedging policies of portuguese firms during the years of 2008 and 2009 and stated a positive correlation between the non-financial firms size and their policies of off-balance sheet hedging as well as the fact that firms with an international presence are more prone to use derivatives.

Galiano (2015) highlights the fact that Portuguese companies are increasing their usage of derivatives as well as addressing and explaining better the risks they are faced in their daily activity and how they target their mitigation.

Ferreira (2004) analysed 173 non-financial Iberian companies and concluded that 63.6% use derivatives to hedge while also stating an inverse relationship between the usage of derivatives and the variable remuneration of the CFO of the firm, indicating a substitution effect.

# Chapter 2

## Qualitative Analysis and Method

After defining the overall scheme on Risk Management and the use of the derivatives in order to create value in an enterprise, in this chapter we will conduct an analysis in order to try to assess how Portuguese top firms deal with financial instruments. It is understood that in many aspects Portugal is still lagging the market but as in most cases, there is a few outliers that will be present in our analysis.

Derivatives trading is regulated in Portugal by Comissão de Mercado de Valores Mobiliários (CMVM) and this entity is responsible for revising and investigating any misconduct in the financial markets.

This analysis will begin with a qualitative analysis driven from a pre-defined sample, where we will scrutinize financial data extracted from financial reports of the chosen firms. Then we will elaborate a regression in order to try to prove our preliminary findings and effectively reach to the conclusion that derivatives are either a value added or destroying tool in a Risk Management System.

### 2.1 Analysis of the Portuguese listed companies

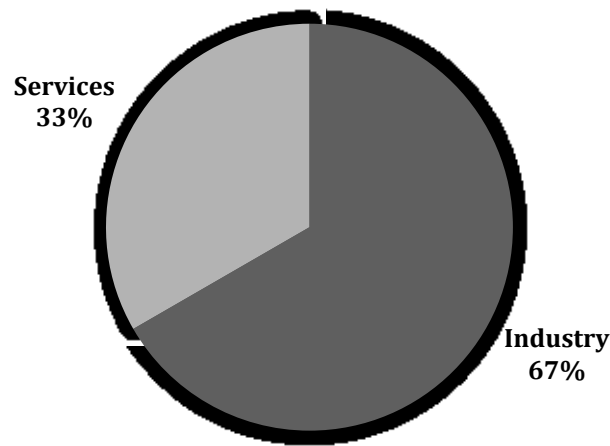
For the analysis we used the Portuguese firms listed in the PSI 20 Index from the 31st of December 2013 until the 31st of December 2015, without interruptions. It was also decided to exclude financial firms, which in this case were Millenium BCP, BPI and Unidades de Participação do Montepio as the use of derivatives by

this type of businesses is completely different than the one we want investigate in this study.

<b>Company</b>	<b>Sector</b>	<b>Turnover</b>	<b>Employees</b>
<b>Altri</b>	Industry	596 751 333,33	666
<b>Corticeira Amorim</b>	Industry	569 213 333,33	3637
<b>CTT</b>	Services	716 600 333,33	12774
<b>EDP</b>	Industry	15 087 735 666,67	11975
<b>EDP Renováveis</b>	Industry	1 380 000 000,00	1055
<b>Galp Energia</b>	Industry	17 681 000 000,00	6792
<b>Jerónimo Martins</b>	Services	12 745 333 333,33	89027
<b>Mota-Engil</b>	Industry	2 371 832 333,33	29283
<b>NOS</b>	Services	1 418 333 333,33	2477
<b>Pharol</b>	Services	6 530 733 333,33	12729
<b>REN</b>	Industry	788 010 333,33	671
<b>Semapa</b>	Industry	2 033 166 666,67	6016
<b>SONAE Capital</b>	Industry	168 656 666,67	1250
<b>SONAE SGPS</b>	Services	4 936 570 034,67	40738
<b>The Navigator Company</b>	Industry	1 566 966 666,67	3058

**Table 1** – List of analysed companies and respective sector, turnover and headcount

We can see in Figure 1 that the index is composed in two thirds by firms in the industry sector, with relevance in energy and cellulose. It is very important to acknowledge this fact as it will be look into more depth later in this study, as the sector is a component to be analysed in how a firm approaches derivatives and their risk management benefits.



**Figure 1 – Sector Analysis**

Our analysis comprehends various variables which are very important in assessing the financial position of a firm such as the Return on Assets (ROA), Turnover, Net Income, Margin, Earnings per Share(EPS) and Share Price.

During the three year period of scope as we can see according to Table 2, the average ROA on the Index was -1,76% but if analysed carefully we can actually confirm that this figure is heavily influenced by a -82% return from Pharol which has integrated major losses from its subsidiary Oi. Eliminating this outlier we have an average 3,98% ROA which is a pretty satisfactory number for the industries these firms are established, with inherent low asset turnover ratios.

Earnings per Share vary substantially across studied businesses with earnings either ranging from 1,05 and -0,54. One corroborating with the importance of these two metrics is the fact that the firms with EPS above the mean of 0,27 also seem to have an above average ROA, indicating some sort of underlying correlation, which agrees to conceptual corporate finance analysis.

<b>Companies</b>	<b>Return on Assets</b>	<b>EPS</b>
<b>Altri</b>	5,72%	0,34
<b>Corticeira Amorim</b>	6,29%	0,32
<b>CTT</b>	6,17%	0,47
<b>EDP</b>	2,32%	0,28
<b>EDP Renováveis</b>	0,99%	0,16
<b>Galp Energia</b>	3,36%	0,53
<b>Jerónimo Martins</b>	6,59%	0,54
<b>Mota-Engil</b>	1,83%	0,20
<b>NOS</b>	2,49%	0,12
<b>Pharol</b>	-82,18%	-0,54
<b>REN</b>	2,41%	0,22
<b>Semapa</b>	6,27%	1,05
<b>SONAE Capital</b>	-0,95%	-0,03
<b>SONAE SGPS</b>	4,82%	0,05
<b>The Navigator Company</b>	7,41%	0,27

**Table 2** – Return on Assets and Earnings per Share analysis

In relation to the Share Price three years do not represent a long enough timeline to effectively assess the impact of indicators into stocks, as those are driven by not only financial factors as well as the whole market volatility and future perspectives. Taking Table 3 into account, we cannot totally rely in percentage variances in the price but looking into nominal price of Semapa, Jerónimo Martins, Galp and CTT, there is a possibility of a fine line between share price and ROA, which would mean that firms with a long term higher share price are more capable of having a better return on their assets. On the opposite side

Pharol and Sonae Capital strengthen this idea, with below average scores in either categories.

Companies	Return on Assets	Share Price (2015)	Share Price Evolution 13-15	EPS
Altri	5,72%	4,81 €	114,73%	0,34
Corticeira Amorim	6,29%	5,95 €	169,23%	0,32
CTT	6,17%	8,85 €	58,32%	0,47
EDP	2,32%	3,32 €	24,34%	0,28
EDP Renováveis	0,99%	7,25 €	87,82%	0,16
Galp Energia	3,36%	10,72 €	-10,07%	0,53
Jerónimo Martins	6,59%	12,00 €	-12,79%	0,54
Mota-Engil	1,83%	1,93 €	-55,32%	0,20
NOS	2,49%	7,25 €	34,19%	0,12
Pharol	-82,18%	0,28 €	-91,22%	-0,54
REN	2,41%	2,78 €	2,96%	0,22
Semapa	6,27%	12,70 €	65,15%	1,05
SONAE Capital	-0,95%	0,51 €	54,55%	-0,03
SONAE SGPS	4,82%	1,05 €	0,00%	0,05
The Navigator Company	7,41%	3,60 €	23,71%	0,27

Table 3 – Return on Assets and Market Data Correlation Analysis

## 2.2 Derivatives Usage

Our qualitative approach was based on the analysis of the financial reports of the chosen firms and its indicators, while trying to quantify the use of derivatives by them, taking into account either the weight of derivatives in the Balance Sheet and Income Statement and also the quality of the information presented either of the risk management practices or the quantification of the instruments used to hedge the risks that these business face on their daily activity. The main point to

be retrieved from this financial statement's analysis is the fact that the weight of derivatives in the Balance Sheet and Income Statement is very volatile in most firms on a year to year analysis, with some companies having 500% variances. This can be inductive of the fact that derivatives are used as an ad-hoc tool to support specific transactions and changes in some business lines instead of being part of an Enterprise Risk Management plan. In the limit this can also corroborate the known fact that derivatives have done serious damage in some of Portugal's biggest public firms, with the government oversight. This situation perfectly illustrates the danger of derivatives and the issues arising from its misuse, when trying to use them to patch problems that need a long term approach.

Companies	Number of Employees	Derivatives Usage	Information Quality
Altri	666	2	3
Corticeira Amorim	3637	2	3
CTT	12774	0	0
EDP	11975	4	4
EDP Renováveis	1055	3	4
Galp Energia	6792	4	4
Jerónimo Martins	89027	1	3
Mota-Engil	29283	2	4
NOS	2477	3	4
Pharol	12729	4	2
REN	671	3	2
Semapa	6016	3	3
SONAE Capital	1250	2	2
SONAE SGPS	40738	2	3
The Navigator Company	3058	2	3

Table 4 – Derivatives Usage Qualitative Analysis

For the purpose of this analysis a rate has been given to the firms studied in relation of their derivatives usage, with 0 representing no identification of derivatives in the financial statements provided and a 5 being indicative of the use of derivatives as a part of a long term risk management strategy. The quality of information provided was also ranked on the same scale, with a concise grading explanation available in the appendix, taking into frame the disclosure of the firms of their derivatives policy, exposure and financial impact. This data is present in Table 4.

Measuring the average of both Derivatives Usage and Information Quality, we have results of 2,47 and 2,93. This is a fairly similar number between both variables although it can be said that derivative usage is, in this study's view, reasonably below market standards. Nevertheless, since derivatives weight on Balance Sheet and Income Statement have such a big variation on an annual basis, this could be a case that the data collected during 2013 until 2015 represents just a period of low volume of derivatives within most firms.

It is also noticeable that the firms in the energy sector are naturally the biggest derivative users, such as EDP, EDP Renováveis and Galp. This is also valid in absolute terms as these have a higher than average Balance Sheet due to nature of their business and relies on derivatives not only to reduce financing costs but to control commodity prices and currency risk exposure, as they main resource is transacted in other currencies other than the Euro.

Analysing the Quality of Information provided, we can see that firms indeed do make an effort to publicize their risk management policies. However there is a lack of clear effectiveness of the use of derivatives to fulfill these. It is understood that a firm cannot be too specific in how derivatives benefit their activity, however the information provided is in most cases too generic and with the sole purpose of being accepted by regulators, hence why the same description

of the derivatives role in risk management was seen for companies as different as Energy and Retail.

Table 5 also provides us with headcount data. In this case, we cannot really establish a correlation between size of a firm and its derivative usage, although that will be mathematically analysed later in this study. Jerónimo Martins with almost 90,000 in headcount as Sonae with around 40,000 employees have a very small derivatives usage despite having a massive staff. As referred before, they share the same industry, Retail, which is not prone to use these instruments, except for financing costs reducing purposes.

### 2.2.1 Financial Instruments commonly used

The most commonly used derivative instrument refers to the risk that all of the firms in this study share, the interest rate risk. Swaps and Forward Rate Agreements are actively used for firms to establish fixed interest rate levels and to better manage their debt financing costs, increasing the certainty of their future outflows. 93% of the firms explicit their use of Interest Rate derivatives and the large majority of those more specifically fix a pre-determined rate while receiving a floating payment of EURIBOR 6 Month Rate.

Also very popular is the managing of FX Risk, which is targeted by the firms who have a strong international presence and depend on other markets either for imports or exports. This is the case when firms have to acquire oil, which represents payables and future liabilities in other currencies such as US Dollars. In order to hedge FX Rate changes, firms lock those same rates by establishing forward contracts at the trade date's rate. Even though these businesses end up losing the possibility of positive rate variations, the main purpose of these contracts is for the company to be able to then assess almost exactly their future responsibilities in their own reportable currency. There is also the possibility, used by circa of 30% of the studied firms, of managing both interest rate and FX

risk within the same instrument, which is done via Cross Currency Swaps, firms lock an interest rate and payment in a currency and receive interest payment in another one.

One of the other targeted risks by these businesses is the price of the commodities that are relevant to their business. In this case, the commodities prices targeted are mainly the ones of oil and cellulose. The instruments used to hedge this exposure are future, forwards and commodity swaps. With these firms being largely exposed to these commodities and with any minimal change to their price affecting their profitability it is vital to have an effective hedging strategy against these prices, which are by nature volatile.

It is also note referring that OTC options can and are used as a hedging tool. However due to this instrument being an expensive way to hedge and requiring a deeper financial knowledge they are not relevant in the overall scheme of this study.

## 2.3 Qualitative Analysis Main Findings

Our preliminary findings regarding the sample we analysed can be synthesised into three conclusions.

This qualitative analysis concluded that the quality of information provided by the firms in their yearly reports is satisfactory and actually better than the derivatives usage of said companies. The information within financial statements is clear on the actual amount of derivatives companies have but does not allow for conclusions of their effectiveness, which is in part understood as risk management strategies at a micro level are not public and part of a company's competitive advantage. Nevertheless it is known that several firms had significant losses due to poor derivatives choices and that is not referred in any of the information released to the public.

The second conclusion to take from this data refers to the fact that derivatives are not used as a part of an integrated risk management system but as a solution that is attached to the business flow. This can be proved by the weight of derivatives in the firm's balance sheet from year to year which happened to change frequently and in great proportions during the three year period this study covers.

The last pattern identified is in relation to the sector of the firm's analysed and whether it has any relevance in the definition of the derivatives usage policy for hedging purposes. The 15 listed companies in this study share very similar markets and are mainly in the industry sector and their derivatives position seems to align in many cases as they have similar strategies and are exposed to the same risks.

We will now proceed to quantitative analysis in order to conclude if these patterns can be corroborated with statistical significance.

# Chapter 3

## Statistical Analysis

For our analysis we used a regression model to estimate if the derivatives usage is dependent on a set of variables. Previous studies on this matter are the ones of Rossi (2013) and Bernilde (2014).

Our regression is based on a sample of 45 results, as our scope of analysis has 15 firms in a three year period.

### 3.1 Dependent Variable

We defined a dependent variable (USAGE), which measures on a grade of 0 to 5 the usage of derivatives by the firms in the PSI 20 Index.

For the purpose of our study we define the use of derivatives as solely for Risk Management purposes, which means that we attribute residual importance to arbitragers and speculators which were not identified in our preliminary analysis. Firms in this study use derivative solely for hedging purposes, accordingly to IAS 39 – Financial Instruments: Recognitions and Measurement.

This variable is going to be tested in order to understand if the use of derivatives for hedging is affected by the other variables described below.

## 3.2 Independent Variables

### 3.2.1 Information Quality

One of our independent variables relates to the information quality (INFORMATION). It is defined by how firms present their exposure and use of derivatives in their financial statements. In our analysis it is graded from 0 to 5 and our objective with this study is to try to understand if the quality and means of presenting information for a firm are correlated with their derivatives usage.

### 3.2.2 Return on Assets (ROA)

Return on Assets (ROA) is calculated by dividing the net income by the total assets of a firm. In this case we analyse Returns on Assets as a possible correlated factor with the derivatives usage, in order to assess if businesses who hedge more using derivatives achieve better or worse returns.

### 3.2.3 Size of the firm

Our final independent variable is the size of the firm (SIZE). Firms with different sizes have, in theory, different strategies and tend to view risks in a different manner. For our sample we used the logarithm of the Turnover of our studied firms as Allayanis and Weston (2001) and Faulkender (2005) did in their studies.

We will now proceed to build a regression using this variables and analyse the results in order to discover if they can strengthen our previous considerations.



# Chapter 4

## Results

For this regression we used Microsoft Excel add-on for Data Analysis, using a 95% confidence interval and with the following estimation of regression coefficients:

$$\text{USAGE}_{i,t} = \alpha_{i,t} + \beta_1 \text{INFORMATION}_{i,t} + \beta_2 \text{ROA}_{i,t} + \beta_3 \text{SIZE}_{i,t} + \varepsilon_{i,t}$$

	<i>Regression Statistics</i>	<i>p values</i>
<b>Constant</b>	-2,06341408	0,2514
<b>INFORMATION</b>	0,577847534	0
<b>ROA</b>	-10,59782384	0,0257
<b>SIZE</b>	0,333458448	0,0879
<b>Significance F</b>	0,00000	0,05
<b>R Square</b>	0,599582812	
<b>Adjusted R Square</b>	0,567970929	
<b>Observations</b>	42	42

**Table 5 - Regression Data**

Analysing Table 5, we can assume that there is a dependency between derivatives usage and our independent variables of INFORMATION, ROA and SIZE, due to the values of these coefficients in our statistic.

An important indicator that seems to corroborate our previous findings is the fact the Significance F < p value = 0, 05, which allows us to reject  $H_0 = B_1 = 0$  and  $B_2 = 0$  and  $B_3 = 0$ , adding some strength to the theory that at least one of our independent variables has a weight in how intensively firms utilize derivatives, either in a positive or negative manner.

While analysing the coefficients, we can identify that INFORMATION is the variable who has a stronger influence in the USAGE of derivatives, as expected, and with the smallest standard deviation. It is common sense that a firm will publish more information about derivatives if they actually use them actively and in that case have a better knowledge on their impact both in the risk management strategy and in their financial statements. As we could see from Table 4 in our Qualitative Analysis, this correlation can be statistically proven even with a small sample.

The variable ROA seems to have too strong of a negative impact but that is, as in other cases, due to the astonishing ROI of Pharol that averaged -82% in the years of this study. While it is expected that firms who have a better ROA being naturally better hedgers, we need a higher time frame of analysis in order to prove it with statistical significance. Also the industry has a high effect on ROA, as in a capital intensive industry, even if the performance is remarkably good it is virtually impossible to achieve a ROA as high as virtual companies for example, who rely much less on assets to have revenue.

SIZE seems to be a positive affecting variable, with a Beta around 0,33, indicating that the turnover of the firms has some relation with how firms decide to tackle its risks. This goes in line with what was expected as firms with higher turnovers and high capacity have better financial and technical means to access the financial markets and participate in derivatives trading.

With the backup of this regression we can therefore make a reasonably trustworthy statement that the quality of information provided by a firm is intrinsically connected to the level of usage of derivatives by the business, meaning that firms who use derivatives more frequently and hedge their risks using this instrument are also more prone to demonstrate and inform the public about that strategy.

Nevertheless we must also reinstate the fact that the sample size is small, due to the nature of the Portuguese index, with a small number of listed companies and also because the time span covered in this study is fairly short. With this in mind, the value of outliers is overstated and effectively ends up changing the overall perception of variables such as ROA, which on our preliminary findings was presumed to be linked with a strong market capitalization.

This analysis could serve as a starting point for future endeavours with a focus on a longer period and covering a wider range of firms, for example across the European market.

## Conclusions

This study had the ambition to analyse in depth the usage of derivatives by Portuguese non-financial firms, an area that has been growing in popularity in the last decade, due to unfavourable reasons but whose literature is still very controversial and scarce in some specific countries, such as Portugal.

Behind the use of derivatives there are several motivations, such as the optimization of the cost of debt, the mitigation of currency risk for multinational firms or the enhanced predictability of future responsibilities by fixing interest rates. With this analysis we could see that there is a plethora of variables that can have an influence when a firm decides how to hedge. One very important point that needs to be focussed is the fact that, all in all, derivatives are a very good thing and bring inumerous benefits, if used correctly. Unfortunately, in the wrong hands, they have the potential to maximize losses instead of minimizing risks and as it has always been, the scandals and bankruptcies leave a mark that no hedging strategy can erase.

This analysis covered the financial reports of the 15 non-financial firms listed in the PSI 20 Index and we can conclude that Portuguese practices are still lagging the rest of the market, especially for the medium sized firms in the Index and the ones who are not tied to commodity prices variations. This study can also draw the conclusion that firms that hedge and use derivatives intensively to mitigate one type of risk they are exposed, are more than likely to also use this financial instrument to target other types of risk. Quality of Information is also deemed to be very important, in an era where compliance and regulatory reporting are key requirements for businesses. In this aspect, we can assume that the analysed firms performed satisfactorily and that the vast majority acknowledge the importance of derivatives and report their use with

transparency although neglecting to refer the risk management benefits of their contracted instruments.

Leaving a note for the future, it is believed that the use of derivatives will continue to grow exponentially, with an increasingly qualified range of stakeholders, with an easier access to information and systems who will be able in the future to build hedging strategies automatically. Anyway, it is of vital importance to not underestimate the gearing effect on derivatives and as its misuse has a contrary effect, effectively increasing risk instead of delivering its primary function of mitigation.

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## Appendix

<b>Companies</b>	<b>Information Quality</b>	<b>Commentary</b>
<b>Altri</b>	3	Good description of the derivatives usage including the notional amounts and terms of some of the trades
<b>Corticeira Amorim</b>	3	Weight of derivatives in Balance Sheet and Equity well described but lackluster description of risk management policy
<b>CTT</b>	0	No information on Derivatives
<b>EDP</b>	4	Well described Risk Management policy and detailed description of the various derivatives positions held
<b>EDP Renováveis</b>	4	Well described Risk Management policy and detailed description of the various derivatives positions held
<b>Galp Energia</b>	4	Well described Risk Management policy and detailed description of the various derivatives positions held
<b>Jerónimo Martins</b>	3	Weight of derivatives in Balance Sheet and Equity well described but lackluster description of risk management policy
<b>Mota-Engil</b>	4	Well described Risk Management policy and detailed description of the various derivatives positions held

<b>NOS</b>	4	Very good derivatives position description including year exposure analysis and BSheet weight
<b>Pharol</b>	2	Only Balance Sheet information provided regarding Derivatives
<b>REN</b>	2	Only Balance Sheet information provided regarding Derivatives
<b>Semapa</b>	3	Good description of the derivatives usage including the notional amounts and terms of some of the trades
<b>SONAE Capital</b>	2	Well described impact of derivatives in Income Statement but no well presented information on derivatives position in the Balance Sheet
<b>SONAE SGPS</b>	3	Derivatives position in financial statements well described but lackluster integration in Risk Management Policy
<b>The Navigator Company</b>	3	Derivatives position well described but lackluster integration in Risk Management Policy

Description of Information Quality Ratings