

Financial Derivatives usage by UK & Italian SMEs.

Empirical evidence from UK & Italian non-financial firms.

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Abstract

A number of studies have examined the risk management practices within non-financial companies. This research is a comparative study of derivative usage among UK and Italian non-financial listed SMEs over the time period 2005-2012. The aspects it refers concern the management of financial risks which to date (in Italy) has been little studied from the point of view of literature because of the paucity of data. The aim of this research is to provide evidence for UK and Italian non-financial listed SMEs on the determinants of hedging and on the types of financial derivatives used as hedging instruments.

Numerosi studi hanno esaminato le pratiche di risk management da parte delle imprese non finanziarie. Questa ricerca confronta l'utilizzo dei derivati da parte delle Piccole e Medie Imprese non finanziarie quotate del Regno Unito ed Italiane nell'arco temporale 2005-2012. Gli aspetti che vengono analizzati riguardano la gestione dei rischi finanziari che, a causa della scarsità dei dati, ad oggi in Italia sono stati poco approfonditi. Il presente lavoro intende dimostrare empiricamente quali sono i fattori che influiscono sulle scelte delle PMI Inglesi ed Italiane ad adottare gli strumenti derivati ai fini di copertura per proteggersi contro i rischi finanziari.

Keywords: Derivative, Interest Rate, Forward, Risk Management, SME.

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INTRODUCTION

The last decades, compared to the previous decades, have been characterized by a greater volatility in interest rates, foreign exchange rates, commodity prices and securities' markets prices. To reduce the significant negative effects that can be produced by those fluctuations on the firms' wealth, were made available to companies a numbers of risk management instruments such as financial derivatives that allowed them to transfer financial price risks to other parties.

The aim of this research is to provide evidence for United Kingdom and Italian non-financial listed Small and Medium Enterprises (SMEs) on the determinant of hedging and on the types of financial derivatives used as hedging instruments. It is a comparative study between United Kingdom and Italian SMEs that intends to evaluate whether differences exist between these two countries.

The limited research on the use of derivatives by non-financial SMEs in the United Kingdom and in Italy provides the motivation for this study.

The majority of these studies investigated about the use of derivative by U.S. non-financial companies such as Nance et al. (1993), Dodle (1993), Bodnar et al. (1995), Mian (1996), Geczy et al. (1997), Gay and Nam (1998), Allayannis and Ofek (2001), Graham and Rodgers (2002), Guay and Kothary (2003) and Kedia and Mozumdar (2003).

Also, there have been some studies on the use of financial derivatives by European companies such as Berkman and Bradbury (1996) about New Zeland non-financial firms, Hakkarainen et al. (1997) and Keloharju and Niskanen (2001) related to Finland firms, Bodnar and Gebhardt (1999) about Germany firms, Alkeback and Hagelin (1999) about Swedish companies, Loderer and Pichler (2000) about Switzerland companies, De Ceuster et al. (2000) about Belgium firms.

Meanwhile there is little literature about the use of financial derivatives in the United Kingdom and fewer in Italy. Grant and Marshall (1997), Mallin et al. (2001), El-Masry (2006) and Judge (2006) have conducted surveys to investigate the use of derivatives by UK non-financial firms. Fewer studies have been done to investigate this subject in Italy, Bison, Pelizzon and Sartore (2002) and Bodnar et al. (2013). Both of these UK and Italian empirical studies focus on large firms.

Therefore this research based on previous literature, proposed a series of hypotheses that have been tested with econometric techniques to check whether these hypotheses drawn from financial theories are met in UK and Italian non-financial listed companies or not. The econometric methods used have been univariate and multivariate logit tests. They have been used to analyse the data of a sample of 166 UK non-financial listed SMEs and a sample of and of 66 Italian non-financial listed SMEs, which have been handily collected.

The reminder of the thesis is organized as follows. The next section discusses the existing literature on the use of derivatives. Chapter two discuss the financial risks. Chapter three describes the data used and how the data for United Kingdom and Italian non-financial listed SMEs have been collected, further describes the methods implemented for testing the hypotheses. Chapter four further extend the theoretical aspects of the determinants of hedging into hypotheses, describes the effects in different variables used to measure the effects of hedging, and it explains the dependent and independent variables. Chapter five contains the descriptive analyses with an overview of the hedging data, quotes from annual reports, univariate and multivariate regression. The last section includes conclusions.

CHAPTER 1: LITERATURE

1.1: Introduction.

In the real world the financial market is imperfect and hedging can directly affect the firms' cash flow.

Risk management can be understood taking into account that the modern financial theory is based on three major paradigms the rational wealth maximization, the risk/return tradeoff and the no-arbitrage principle. At the same time each of these paradigms can be extended to three major areas of finance the corporate finance, the financial intermediation and the investments.

To understand why risk should be managed have been developed two different hypotheses. The first is the Value Maximizing Theory of Risk Management that is based on the fact that a company will engage in risk management policies if they enhance the firm's value and its shareholders' value. This value can arise from the minimization of costs of financial distress, from the minimization of the taxes and from the minimization of the possibility that the firm may be forced to forego positive net present value projects because it lacks the internally generated funds to do so. The second hypothesis is the Managerial Theory of Risk Management that is based on an agency argument. It considers the risk aversion of managers associated with their own forms of remuneration, the problems of information asymmetry and agency costs.

1.2: Risks faced by firms.

Generally firms face mainly three types of risks, business risk, strategic risk and financial risk.

Business risk is related to the firm's operation; in fact it can be identified as operating risk, technological risk, informational risk or distributional risk. These types of risk are assumed by a firm when it wants to profit by a competitive situation in the aforementioned fields. This kind of risk can be managed by management's internal operating decisions. Fatemi and Luft (2002) state that if firms are unable to mitigate their operating risk on advantageous terms may ultimately fail, and Montgomery Ward¹ is an excellent example of this type of failure. Business risk is influenced by numerous factors such as sales volume, per-

¹ It was an American retail giant enterprise. For more details see: "Montgomery Ward Goes Under": National Post Dec.29, 2000, "Montgomery Ward Closes Its Doors," Leslie Kaufman with Claudia H. Deutsch, The New York Times, Dec.29, 2000.

unit price, input costs, competition, overall economic climate and government regulations. A firm that has a higher business risk should choose a capital structure that has a lower debt ratio to ensure that it can meet its financial obligations at all times.

Strategic risk is those factors that can affect the firm and the value of its shareholders. It can be generated by economic, political, domestic or international factors. This type of risk has the characteristic to have a long duration and so can produce negative effect on the firm's value for long period of time. It can arise from making poor business decisions, from the substandard execution of decisions, from inadequate resource allocation and from failure to respond well to changes in the business environment.

Financial risk can be seen as an umbrella term that includes different types of risk that are associated with financing, including a financial transaction that includes the risk of default of a company. This type of risk is going to be discussed in deep in the next chapter.

1.3: Shareholders Maximizing Theory.

The first invocation to risk management occurs with Markowitz (1952) who introduced a crucial element: the risk. He considered the risk not as a general idea or as an emotion but as a number. With his model risk-return postulates the investors risk aversion and identifies the variables involved in investments decisions that are expected return and equity standard deviation. This model does not provide any information concerning the relationship between the performance and the risk of an equity/security. In fact, it explains the performance and the risk as input data.

The Capital Asset Pricing Model (CAPM) is the most well-known equilibrium model in the financial market. It was proposed by Sharpe (1964) and adjusted by Lintner (1965) and by Mossin (1966). It assumes the concept of informational efficiency, the absence of transaction costs, the homogeneity of expectations, and the presence of risk free rate and suggests the trade-off between risk and performance. It has three main variables: the risk free rate, the coefficient of systematic risk (beta) and the risk premium. The CAPM identifies a linear relationship between the yield of a security and its degree of risk, the latter is measured by a factor (beta), and this factor is proportional to the covariance between the bond yield and the market yield. Therefore, the CAPM identifies those

factors that affect the financial assets' profitability and identifies the investor' required return for each level of risk.

Each model point out that, the performance depends only on the contribution that the individual investor has on the market or on the systematic risk of the portfolio. Therefore the shareholders will not be willing to remunerate risk management interventions designed to cover specific risks that, for definition, can be diversified within their own investment portfolio.

Another important front of financial theory relevant to the study of the investment choices of the industrial and financial companies has further developed the debate on companies risk management. On one side the Modigliani and Miller (1958) theory shows that changes in the firm's financial policy do not affect its value if shareholders can replicate or reverse these decisions at zero costs. Since hedging policies are equivalent to general changes in the firm's financial structure, they also fail to enhance firm value as long as basic assumptions of Modigliani and Miller are met. In presence of market imperfections, reducing the firm's performance volatility can increase the net cash flows accruing to shareholders either directly and indirectly. Directly, by generating tax or transaction cost savings, or in the other hand by improving the contractual relations with company stakeholders. Corporate hedging can also help to reduce the firm's cost of capital which raises the present value of future net cash flow streams for corporate hedging; to make sense, it must however further hold that it is the least costly way of obtaining these value increases. Modigliani and Miller (M&M) as a theory has formalized the contribution of risk management in conditions of perfect markets. Later models recognized market imperfections, releasing the restrictive assumptions and ascribing to risk management a key role in the creation of value.

Since the mid-80s emerged a new vision of funding policies that gives the risk management a different role. The key concept of M&M, that the value is created through good investments, is not rejected but the financial risk management is considered a key element to enable companies to make good investments. It is evident how the M&M assumptions are, and therefore the perfect world considered by them does not exist. In a real context characterized by market imperfections, companies are exposed to economic and financial risks that if do not be hedged could generate costs for the companies.

The first front of research studies how risk management allows to reduce the destruction of value generated by the taxation asymmetry.

The tax-asymmetry topic has to be analysed with reference to two different situations: the progressive evolution of taxation and the different tax treatment of the two financing sources (risk capital and debt capital).

About the first point, the progressive evolution of taxation, it means that a company is required to pay a tax that increases with the value of the company before tax (pre-tax value). In a scenario like this, the best solution for a company is to present profits in the lowest tax rates in different accounting periods, rather than having negative profits for a year and profits, in the following years, that are positioned in the highest area. Therefore, through the risk manager you can achieve a reduction in the overall tax burden due to the leveling of the economic results obtained in the various exercises.

In the mid-80s appeared the first models that made a valuable quantitative support for the analysis of hedging on firm value. Clifford, Smith and Stulz (1985) in their research they develop a positive theory of hedging by value-maximizing corporations in which hedging is part of overall financing policy. They demonstrate how hedging, in special circumstances, can increase firm value. The researchers study how the M&M hypothesis can be related with hedging policies. For the first time they show that, if the firm's fiscal rates are a convex function, hedging can reduce taxes. Furthermore, more convex is the fiscal rate function higher the tax benefits can be. Thus, can be stated that the progressivity of taxation is the key element that makes the function that describes the rate convex. Other factors can contribute to generate a convex tax rate, as: operating losses fiscally deductible, fiscal credits investment and foreign fiscal credits. Much higher are these preferred items, the greater the tax benefits for a company that hedges.

With regard to the issue of tax asymmetries, a firm, thanks to increased exploitation of the tax shield, which increases its optimal leverage level could increase its "after-tax expected cash flow". Risk management increases the possibility to attract more debt capital because it reduces the gains volatility and therefore reduce the overall company risk, without reducing the net present value of the investments. With a lower level of risk a company can sustain a higher debt/equity ratio which means the ability to make greater use of the tax shelter.

Leland (1998) in his article demonstrates that through hedging policies firms could achieve a higher debt capacity. The primary benefit of financing with debt capital resides in the deductibility of interest. The study shows that hedging allows firms to increase their debt capacity and thus the firm value.

Graham, Clifford and Smith (1999) in their analysis, use a simulation method to test more than 80,000 Comupostat firm-year observations and find that approximately 50 percent of corporations face convex tax functions. Among these 50 percent, roughly one-quarter of these firms have potential tax savings from hedging that appear material, in extreme cases firms can save expected tax liability exceed 40 percent. While 25 percent have concave tax functions. Can be stated that firms facing convexity tax-function, hedging lowers expected tax liabilities, thereby providing an incentive to hedge. This paper reports the same results of Smith and Stutz (1985). The study of Graham and Rogers (2002) starts from these two assumptions: that hedging can increase the debt capacity and increase the tax deduction, and hedging can reduce expected tax liability when tax function is convex. They find that tax is a factor for firms to hedge. This because hedging can lead to larger debt capacity and tax deduction, and this research was the first evidence that suggested that hedging can increase debt capacity and firm value. They find no evidence support about the relationship between hedging and tax convexity. Graham and Rogers (2002) point out that there is a positive relationship between hedging and debt capacity. In fact they demonstrate that hedging can increase debt capacity but higher leverage can increase the incentive to hedge. Their findings show that firms facing high expected distress costs would hedge more with derivatives. Another research done by Carter, Rogers and Simkins (2003) demonstrate that the value increase from hedging increases with capital investment. The results show that in the airline industry investor value hedging more because they expect hedging can protect the ability for firms to invest in wicked times.

The second front of research is related to the reduction of financial distress costs. Risk management strategies allow reducing the total risk exposure of a firm, making the financial distress less likely to happen or reducing the costs.

Smith and Stutz (1985) show, by a quantitative model, that hedging reduces the probability of a firm to incur in a financial distress situation and thus reduce its expected costs. Financial distress costs and crisis costs have a negative impact on the shareholder wealth. In fact hedging becomes more profitable with the increment of long term debt because the probability that the firm is going to face these costs is directly related to the amount of these debt respects to the asset value. Therefore, is possible to conclude stating that a proper analysis of financial

distress' costs should take into account both, the probability of encountering these problems and also any related costs.

An important aspect of hedging is that if it increases the firm value, at the same time it shifts this wealth from shareholders to bondholders, and this makes shareholders poorest. At least there are two ways in which the market creates pressure implementation of hedging policies. The first is because hedging allows firms to reduce their debt cost. But if the probability of failure would be relevant, the gain resulting from the non-hedging policy would be sufficient to overcome the costs associated with the loss of reputation, because the firms' reputation is important only if allow it to not fail. On the other hand, hedging provides a means through which it is possible to reduce the costs of distress imposed by bond covenants. That because, hedging, reducing the content of the overall risk of the company, could make the debts more safe and secure and then ensure that the contracts do not become binding.

1.4: Underinvestment problems.

About the relationship between hedging and investment opportunities has to be taken in to account that firms often raise capital through internal capital and/or external capital. But a capital increase by internal funds is less costly than one done using external funds. That explain why firms to raise their capital use internal funds firstly. So, the third front of the research is the one related to underinvestment problem. This phenomenon arise when the firm's internal cash generation is not enough to fund growth opportunities and the funding from external sources is so expensive that lead the company to cut the investment level under the optimal level. Myers (1977) in his paper stated that investment opportunities must be assessed in relation to the possible conflict of interest between shareholders (holders of residual rights) and holders of debt (holders of fixed charges). Froot, Scharfstein and Stein (1993) with their research show that when external funds are more costly for firms than internally generated funds, there will be a benefit to hedging. Thus can be stated that hedging helps the firm to reduce the volatility/variability of internal funds assuring that it has enough internal funds that can be used for investment opportunities and reduce the possibility of underinvestment. The findings of this research have been extended by Gay and Nam (1998). These researchers examined the relationship between the use of derivatives and underinvestment hypothesis. Their study analyses the

interaction effects among a firm's investment opportunities, cash stocks, and internally generated funds to distinguish clearly the role of the underinvestment hypothesis. The study starts from the underinvestment problem as a determinant of corporate hedging policy. Have been found that there is a positive relationship between firm's derivative use and its growth opportunities. The research demonstrate that firms with enhanced investment opportunities use more derivative instruments when they have relatively low cash stocks. At the same time firms with a positive correlation between investment expenditures and internal cash flows, tend to have a smaller derivative exposure, and this suggests that they could use natural hedgers.

1.5: Positive role of hedging.

The firsts authors whose investigate the positive role of hedging are Allayannis and Weston (2001). They analyse if the use of foreign currency derivative (FCDs) is related with higher firm market value captured by Tobin's Q. The sample is composed by 720 large US non-financial firms over the time period 1990-1995. The results show that, in a sample of firms with foreign sales, there is a positive relation between the use of FCDs and firm value, and the hedging premium is around 4.78% of firm value. Therefore the results show that in those years which the dollar has appreciated, the hedging premium is much larger. The results from the analysis made by Carter, Rogers and Simkins (2003) are consistent with the ones of Allayannis and Weston (2001), because they show that the jet fuel hedging is positive related to airlines firm value, and the hedging premium is in range of 12-16%.

1.6: Managerial Theory of Risk Management.

Through information asymmetry managers have more information than outsiders. Thus can be stated that the decision concerning the use of hedging instruments, the types and the dimension depends on a manager's utility function, on a manager's views about the market and on the visibility of the firm's accounting information. About the manager's utility function, have to be taken in to account the theory of Williamson (1964). This theory assumes that the utility maximization is a manager's solo objective. It is only in a corporate form of business organization that a self-interest seeking manager can maximize his own utility, since there exists a separation of ownership and control. So, manager can

use their discretion to frame and execute policies which would maximize their own utilities rather than maximizing the shareholder's utilities. This represents the principal-agent problem². Smith and Stutz (1985) with their research show that managers' risk aversion can lead them to hedge but they do not necessarily do so. They point out that the hedging decisions for managers can be influenced by a linear or convex compensation function. If the firm's compensation function is convex the less the firm is expected to hedge, in the other hand when managers have significant fraction of the firm, is expect the firm to hedge more (linear function). De Marzo and Duffie (1995) stated that the optimal hedging policy adopted by managers depends on the type of accounting information available to shareholders. Therefore hedging could help outside investors to observe manager's ability. Breeden and Viswanathan (1998) in their research examine the importance of manager reputation. The key idea is that managers with greater skills in relation to the management of certain types of risks want to be sure to be able to communicate effectively in the market such superior ability. Therefore, their aim is to minimize the uncertainty about its performance. To do this, managers will tend to cover only the risks that they cannot control properly and with respect to which they do not have any special skills management. The authors argue that hedging reducing the volatility entails costs in terms of decrease in the value of the equity. Managers, therefore, undertake hedging policies only if they believe they have skills that are superior to other managers in the industry to offset these costs. The managers "less able" instead generally choose not to cover, either because their costs will be higher, and groped for the lot. Tufano (1996), analyzing the North American gold mining industry he tests whether cross-sectional differences in risk management activity can be explained by academic theory, such as those firms which more likely face financial distress would have more extensive risk management, otherwise risk management would be linked to risk aversion of managers. His findings suggests that firms whose managers hold greater equity stakes manage more gold price risks and those whose managers hold options may manage less gold price risks. His results are consistent with those of Smith and Stulz (1985).

There are other firm characteristic that can be related to hedging.

² The Principal-Agent problem is part of the agency theory, because it develops when a principal creates an environment in which the agent has incentives to align its interests with those of the principal, typically through incentives. Therefore, the principal crates incentives for the agent to act as the principal wants, because the principal faces information asymmetry and risk with regards to whether the agent has effectively completed a contract. (Michael Jensen and William H. Meckling).

The agency cost is a phenomenon that affects the opportunistic behavior that management can implement for their own exclusive benefit or for the benefit of its shareholders and to the detriment of third party lenders. Tufano (1998) recognizes and documents that the practice of risk management can be designed to protect investment with a negative net present value for the shareholders and are able to increase personal wealth managers.

Nance, Smith and Smithson (1993) with their research tested the hypothesis that hedging increases firm's value by reducing expected taxes, expected costs of financial distress or other agency costs. This test has been done using survey data related to the use of forwards, futures, swaps and options by firms combined with data on firms characteristics collected by Compustat. The analysis shows that firms using hedge instruments are larger, have higher research and development expenditure, have more growth opportunities and have higher dividends. Mian (1996), his paper provides empirical evidence on the corporate hedging decision. Finding show that larger firms are more likely to hedge and this supports the hypothesis that there are economies of scale in hedging and that hedging activities are more influenced by information and transaction consideration than by the cost of raising capital.

1.7: Empirical Evidence.

Empirically, the use of derivatives by firms appears to be widespread. A large number of studies have documented the extent and nature of derivatives use by non-financial firms. Some of these studies are based on survey data and other are based on disclosed data. The 90s were marked by a series of investigations whose purpose is to demonstrate and quantify from an empirical point of view the link between firm value and hedging risks. In this framework there are researches of various authors who have set themselves the goal of verifying whether the firms use those instruments with the same goals supported by theory.

The most quoted empirical investigation is the one of Nance, Smith and Smithson (1993). In their research they identify several motivations to explain why hedging increase the firm value. They define the hedging instruments such as the use of "off-balance sheet" instruments as opposed to the techniques of reducing the volatility of the results of "on-balance sheet" such as the creation of special funds or the conclusion of insurance contracts. The study wants to provide empirical evidence of the theoretical hypotheses about the utility of hedging

proposed in the literature, not only related with taxation, but also with regard to the costs of financial distress, to the underinvestment problem and the agency costs. For the purpose of research, the authors have collected by a survey addressed to the Chief Executive Officer of the companies belonging to the Fortune 500 and S&P 400. The analysis provides a first evidence of the hypothesis that states that firms which have a convex tax rates function hedge more, whilst there is no empirical evidence about the correlation between hedging and the possibility of incurring in a financial distress situation. Finally, the authors found evidence of a positive correlation between R&D expenditure and the use of derivative instruments. Block and Gallagher (1986) and Booth, Smith and Stulz (1984), in their researches, they argued that hedging programs exhibit informational scale economies and that larger firms are more likely to employ managers with the specialized information to manage a hedging program employing these instruments. This arguments imply that large firms are more likely to hedge.

Dolde (1993) with his research has been the first to confirm the hypothesis about the probability to incur in financial distress stated by Smith and Stulz (1985). He examined Fortune 500 companies by survey. His research shows that there is a positive relationship between leverage and financial distress expected costs, therefore firms with high level of leverage decide to hedge against financial risks that can occur. Also this study show the positive relationship between R&D costs and hedging, as the theory states.

Bodnar et al. (1995) have done the first surveys assessing the use of derivative instruments.³ Their surveys attempts to sample the entire U.S. non-financial corporate (listed) population. They find that usage is not widespread and is more common among large firms. They also try to understand the reasons that justify this utilization. Their focus on the prevalence of derivative usage, reason for use or non-use and preference among different instruments, including concerns about risk management programs and internal control issues.

Berkman and Bradbury (1996) they studied the financial accounts of 166 firms listed on the New Zealand Stock Exchange that had to report the fair value and notional value of all their off-and on-balance sheet financial instruments. Their results show that derivative usage increases with certain financial features such as leverage, tax losses, size, the proportion of shares held by directors and the dividend payout ratio. Firms whit high interest coverage and high liquidity hedge

³ Called the Wharton Surveys.

less. Also is shown that the use of derivative is not related with short-term asset growth, and this instrument might be used by firms that experienced difficulties in varying their operating activities in response to changes in economic variables. Furthermore the analysis demonstrates that hedging can be used to exploit economies of scale associated with transaction costs and firms with sophisticated financial management are more likely to hedge. Companies that use derivatives tend to be more highly geared and have higher dividend payout ratios than their non-user counterparts. The authors concluded that companies use derivatives to reduce the cost of financial distress and to increase the present value of tax losses, and they suggested that when firms are attempting lower agency costs, and in the meanwhile have low dividend payout ratio and a high proportion of liquid assets, are less likely to hedge

Detailed data on derivative use is available only for few industries, such as the one investigated by Tufano (1996). His study represents the most historically important contribution associated to the Managerial Theory of Risk Management. In this research have been used a sample of firms belonging to a single industry, the gold extraction. This sector is characterized by some special features that make it ideal for a survey on risk management. First of all, this type of business face a common exposure and the substantial fluctuations in the price of gold that financial markets are able to cope with a wide range of financial instruments. In addition, companies in this sector have adopted a rich variety of policies aimed at managing the risks involved in such volatility and finally the data related to the implementation of these policies are public. In accordance with the assumptions made by Smith and Stulz (1985), Tufano focuses on risk aversion of the manager as a cause of Financial Risk Management. As demonstrated by Smith and Stulz (1985), firms whose managers hold more stock options and therefore have a more convex payoff structure tend to hedge less the volatility of gold price. In addition, firms whose managers have greater wealth invested in shares of the company, are more likely to hedge against commodity risk.

The Geczy, Minton and Schrand (1997) research is an investigation based on corporate derivative information collected directly by annual reports. This study examines the use of currency derivatives with a sample of 372 non-financial firms in the U.S.. They identify firm characteristics that have not been considered in earlier studies and address issues of endogeneity. Also, they extended the market imperfections theories by considering how the costs of using hedging can affect

firms' decision to use currency derivatives. Their findings show that firms with the greatest economies of scale in implementing and maintaining a risk management program are more likely to use currency derivative⁴.

Grant and Marshall (1997) they have surveyed the treasurers of large UK firms about their use of derivatives instruments. Their results shows a widespread use of derivatives instruments as swaps, forwards and options. The mainly instrument used to hedge themselves against risk exposure are interest rate and currency risks instruments, but at the same time they shows that is increasing the use of derivatives instruments to manage commodity and equity risks.

There is another study by Hakkarainen et al. (1997) on European firms that is independent of the Wharton surveys. This research reports results of a survey made in 1994 about the management of interest rate risk by the top 1000 largest Finnish non-financial companies.

Gay and Nam (1998) focused on the underinvestment problem and the aim of their research is to find empirical evidence to what stated by the literature about underinvestment problem. As discussed in the previous paragraph, the study analyses the interaction effects among a firm's investment opportunities, cash stocks, and internally generated funds to distinguish clearly the role of the underinvestment hypothesis. The study starts from the underinvestment problem as a determinant of corporate hedging policy. Have been found that there is a positive relationship between firm's derivative use and its growth opportunities. The research demonstrate that firms with enhanced investment opportunities use more derivative instruments when they have relatively low cash stocks. At the same time firms with a positive correlation between investment expenditures and internal cash flows, tend to have a smaller derivative exposure, and this suggests that they could use natural hedgers.

Bodnar and Gebhardt (1999) completed two direct application of the Wharton surveys for Germany and show that German firms are more likely to use derivative contracts than U.S. firms. There is another research, done by Alkeback and Hagelin (1999) who provides evidence about the use of derivatives instruments among Swedish non-financial companies. This study compared its results with those presented in Bodnar et al. (1995) without taking in to account the differences in size and industry classification. The survey results show that between Swedish firms there is a marked lack of knowledge about derivatives instruments.

⁴ Geczy, Minton and Schrand (1997).

There are other researches that indicated that non-financial firms were not using derivatives for speculative purposes.⁵ One is the anonymous survey done by Graham, Clifford and Smith (1999) published a second investigation liked with the one done by Nance, Smith and Smithson published in 1993. In this research, Smith and Graham used different method. They collected 80.000 firm-year observations using Compustat and they find that approximately 50 percent of corporation face convex tax functions. Among these 50 percent, roughly one-quarter of these firms have potential tax savings from hedging that appear material, in extreme cases firms can save expected tax liability exceed 40 percent. While 25 percent have concave tax functions. Can be stated that firms facing convexity tax-function, hedging lowers expected tax liabilities, thereby providing an incentive to hedge. The Graham and Rogers research appeared in the Journal of Finance in April 2002. The study analyses data from the Electronic Data Gathering and Retrieval of the SEC (Securities and Exchange Commission). The authors concluded their analysis stating that companies hedge to increase the borrowing capacity in order to increase the value of the company due to the increased exploitation of the tax shield but do not engage in hedging policies when there is a convex tax function.

Jalivand, Switzer and Tang (2000) their research show that there is similarities and differences between Canadian, American and European risk managers. The results suggest that the use of derivatives is more widespread in Canada than in the USA and continental Europe.

Loderer and Pichler (2000) they surveyed 165 Swiss listed firms in 1996 and get 96 responses. Their sample contain more large Swiss listed firms, and those have an higher exposure to currency risk. they want to investigate risk management policies of Swiss industrial firms. The results show that less than 40% of the sample can quantify its exposure to currency risk, even though most of the sample reports using derivatives.

Fatemi and Glaum (2000) have done a study of risk management practices in large non-financial German firms. The research suggests as the scope of risk management expands, firms are likely to cover a larger number of areas of an organization's activities as well as the variety of risks including financial, environmental, industry and operational.

⁵ Francis and Stephan (1993), Berkman and Bradbury (1996) and Graham and Rogers (2002).

De Ceuster et al (2000) analysed the use of derivatives by large Belgium non-financial firms. They have surveyed 344 non-financial firms but got response from 74 companies. Data show that 65.8% of the companies used derivatives instruments. Bigger companies are more likely to use derivatives respect to small companies. The propensity to use derivatives depends also to the industry sector, in fact chemical companies are more likely to hedge. The interest rate and commodity risk are the mainly risks whose are hedged.

Mallin et al. (2001) surveyed the use of derivatives instruments among non-financial listed firms in the UK and compared their findings to the results in Bodnar et al. (1995). They found derivative usage among larger UK companies, but in earnings as the primary objective for using derivatives.

Allayannis and Ofek (2001) with their paper examines the use of foreign currency derivative and the impact on exchange rate risk by S&P 500 non-financial firms in the time period 1992-1993. They show that there is a positive relationship between the level of foreign debt and the ratio of foreign sales over total sales. Moreover the study finds that the use of foreign currency derivatives significantly reduces the exchange rate risk that companies face. Furthermore, firms also use foreign debt as an alternative or in conjunction with foreign currency derivatives.

Keloharju and Niskanen (2001) analyzed 44 non-financial listed companies during 1985-1991. The results show that the export-to-net-sales is positive and highly significant, that companies raise FX debt to hedge their foreign currency exposures, that larger firms are more likely to borrow foreign currencies and that is shown by a positive and highly significant log total book assets variable, that there is a significant and positive interest differential, furthermore the industrial concentration variable, dividend yield and the return on book assets are not significant but have the expected sign.

Guay and Kothari (2003) find that despite the widespread corporate use of interest rate and foreign exchange derivatives, the dollar impact of these contracts on earnings and cash flow appears to be rather modest. They also point out that is quite plausible that firms that hedge using derivatives also engage in other risk management activities, and that combined effect of these risk management strategies significantly raises the value of the firm.

Kedia and Mozumdar (2003) they examine the use of foreign currency denominated debt as a hedging instruments by large U.S. firms. They found strong

evidence that firms issue foreign currency debt in order to hedge exchange rate exposures.

Geczy, Minton and Schrand (1997) showed that some firms do not disclose in their annual reports the derivative instruments as speculative instruments and in some cases contradict their annual reports statements where they disclose the use of derivatives for hedging purposes only.

Faulkender (2005), his paper explores why managers are timing the interest rate market. His analysis is based on a very large, hand-collected dataset of swap activity. The results shows that swap usage and the choice of interest rate exposure are primarily driven by a desire to meet consensus earnings forecasts and to raise managerial pay.

El-Masry (2006) investigates the reasons for using or not derivatives instruments by 401 UK non-financial firms. This paper investigates the extent to which the derivatives have used and how they are used. The results suggest that larger firms are more likely to use derivatives than medium and smaller firms, at the same time public companies are more likely to use derivatives than private firms, and derivatives usage is greatest among international firms. The companies that do not use derivatives is because their exposure is not significant and another important reason that lead companies to not use derivatives is about disclosures of derivatives that is activity required under FASB rules, and costs of establishing and maintaining derivatives programmes exceed the expected benefits. UK companies use derivatives because want to hedge foreign exchange risk and interest rate risk, and another important reason for using hedging with derivatives is managing the volatility in cash flows

Judge (2006b) examining the academic debate identified the five main theoretical explanation for corporate hedging in the minimization of corporate tax liabilities, in the reduction of the expected costs of financial distress, in the mitigation of the conflict of interest between shareholders and bondholders, in the improving of the coordination between financing and investment policy and in the maximization of the value of the manager's wealth. Further his study supports the economies of scale arguments and provides further evidence for the expected costs of financial distress being an important factor for the decision to hedge foreign currency risk by using an alternative definition of hedging. Previous studies define hedgers as a firm that use derivatives. However these instruments also can

be used for speculative purposes and about that Judge⁶ states that if the motives for optimal hedging and speculation are correlated empirically results might not distinguish between these two activities.

Bartram, Brown and Conrad (2011) with their approach measured the effects of hedging on a firm's exposure to risk. They used this method on a large sample of companies operating in 47 countries, and their results show that the use of derivatives is related with lower cash flow volatility, idiosyncratic and systematic risk.

Bodnar, Consolandi, Gabbi e Jaiswal-Dale (2013) they have done a web-based survey, on Italian non-financial firms, about risk management practices and the use of derivatives instruments to manage risk, time period September 2007 January 2008. The results show that the most common risk faced by Italian non-financial firms is the foreign currency risk. Foreign currency options and swaps. are positively related to the level of managerial education and the involvement with international trade. At the same time the use of interest rate derivative depends on the firm size, location, firm rating and on the manager background.

⁶ Judge (2006a).

CHAPTER 2: RISKS

2.1: Risk evolution.

Until now literature has not provided a global definition of the concept of risk. There are many definitions of risk but most of these tend to highlight its downside. The Oxford Dictionary defines it as a “situation involving exposure to danger”, while the Italian Zanichelli-Zingarelli Dictionary gives the following definition “possibilità di conseguenze dannose o negative a seguito di circostanze non sempre prevedibili”⁷.

During the Renaissance the concept of risk began to assume importance. Pellicelli (2004) e Chiappori (2008) state that the origin of the concept of risk can be linked to the Hammurabi Code. This code bears some traces of a type of risk-sharing contract that contains both credit and insurance elements. Bernstein (1998) analysed the etymology of the word risk. It derives from the old Italian word “risicare” that is “osare”⁸, thus, the word risk can be understood as a choice rather than expectation of an uncertain fate. Pascal and Fermat in the late 1664 kept up a written correspondence about bets and from this emerged an essay about probability. For the first time a mathematical basis related to the theory of probability was formulated, and this established the basis for future developments of instruments that can be used to measure risk, those instruments are still in use today.

The economist Frank H. Knight in 1921 formulated the first definition of risk. He began with the distinction between risk and uncertainty. Risk must be understood as “randomness with knowable probabilities”, while uncertainty must be understood as “randomness with unknowable probabilities”. Some Italian authors have studied the relationship between risk and uncertainty. One of whom is Sassi (1940). With his research he showed that uncertainty, in its broadest sense, is a generic state that prevents a complete understanding, and that it always forms the basis of risk. Demaria (1950) proposed a tripartite division between uncertainty, risk and temporary uncertainty. Finally, Bertini (1987) in his study states that risk is generally connected to situations of cognitive impediment mainly of the subjective type, while uncertainty is associated with objective circumstances which are external to the cognitive capacity of the individual.

⁷ “Possibility of harmful or negative consequences due to circumstances not always foreseeable”.

⁸ “Osare” in English can be translated as “to dare”.

With the research of Von Neumann and Morgenstern (1944), economic theories have accepted and shared Knight's (1921 definition of risk). These two authors were the first proponents of the Expected utility Theory. This states that under conditions of uncertainty, individuals should always choose, according to a rational model, the alternatives that offer them the highest utility. About thirty years later Kahneman e Tversky (1979) developed the Prospect Theory, which is based on a subjective reference point in managerial choices as well as investment choices. This affirms a vision of risk concerned with quantitative-statistical methods of measurement, and at the same time a vision related to a subjective perception of reality.

Taking into account what is stated above a conclusion can be drawn on the concept of risk and it can be qualified as a relative concept that depends on both the expectations and the capacity of the subject affected.

By the early nineties a general standard of acceptance for the identification and classification of risk was established, especially with regard to the dimensions of organizational performance and joint business - COSO Framework 1992⁹. The Combined Code (1999)¹⁰ was the first organic compendium of corporate governance rules in which risk management was considered among the components of a good qualifying business management system, while the Turnbull Report (1999)¹¹ emphasized the relationship between systematic risk management and value creation. During the same year, 1999, the "Codice di Autodisciplina" (Code of Conduct)¹² was drawn up in Italy in which the responsibility for the identification and management of business risks was explicitly attributed to government bodies. In 2002 in the United States the Sarbanes-Oxley Act was enacted the purpose of which was to make internal systems control and the audit systems more effective and independent and to empower government bodies on risk management and on the correct disclosure information conveyed to the market.

The role played by national and international regulations regarding the disclosure of business risks is also important. On the one hand, these are designed to provide comprehensive and transparent information to stakeholders,

⁹ CoSo Framework 1992: The Committee of Sponsoring Organizations of the Treadway Commission 1992. In 2004 it gave the following definition of risk: "risk is the possibility that an event will occur and adversely affect the achievement of objectives".

¹⁰ Combined Code: London Stock Exchange (1999).

¹¹ Turnbull Report (1999): Institute of Chartered Accountants of England and Wales (1999).

¹² Codice di Autodisciplina: Borsa Italiana (1999).

on the other hand, to encourage companies to adopt instruments aimed at risk management.

2.2: Risks classification.

Several risk classifications are set out in literature, each one highlights certain properties and characteristics.

Initially attention will be paid to a classification that is not very common in literature but which is essential from the point of view of the management of medium size business¹³. This classification makes a macro division between business risks and associated risks¹⁴. Candiotto (1996) defines the first type of risk as the risk that stems from the choices related to the primary activities of the value chain and is measured by the resulting effects on company and stakeholders. Prandi (2008) on the other hand, defines associated risks as those that relate to ball side management components which are influenced by numerous external variables. Their technical-operational nature requires specific attention and measurement with the aim of reducing the potential impact through a preventive safeguard action or through the use of transfer instruments. The latter can be subdivided into two types: traditional risks, in which are included assets risks, product risks and human resources risks; and the other type is called new risks; these regard environmental risks, administrative offense risks and compliance risk. This macro division shows a methodology for the analysis and the management of the business dynamics.

What kind of impact can risks have in the business system?

The impact is direct when the consequences generated by the event directly affect the company's resources, otherwise the impact can be indirect when the effects indirectly affect the assets of the company. These two types of impacts described above have specific forms of prevention and insurance coverage. Finally, the impacts can be consequential as the consequence of direct and indirect impacts affect the image of the company and its reputation, furthermore they can increase the losses of market share. There are no forms of insurance which cover reputation.

¹³ It was decided to refer to this classification because the empirical analysis, which will be explained in the following chapters, relates to the use of derivatives by the UK and Italian non-financial listed Small and Medium Enterprises (SMEs).

¹⁴ Prandi P. (2010), Il risk management. Teoria e pratica nel rispetto della normativa, Economia & Management, Franco Angeli, pp. 57-60.

There are principally two classifications of risk events that are closely connected with risk management. The first classification distinguishes between pure risks and speculative risks. Pure risks are those risks that have only an unfavorable perspective and therefore are considered insurable. Tarallo (2000), Giorgino and Travaglini (2008) defined pure risks as those risks that arise from random events. When these events occur, they usually determine outcomes which can be observed immediately in the short term and the physical and economic consequences of the event can be reduced or contained through the adoption of timely measures. Pure risks can be positive and negative. These risks are in turn managed by ex-post control and by risk transfer activities.

At the same time speculative risks are those risks whose occurrence may lead to additional costs or profits. Tarallo (2000) in his investigation states that a company faces this kind of risk when has to bear an economic risk. The firm choose its strategic position because it produces assets or provides services in order to meet efficiency or quality parameters that allow it to generates revenues and profits. The risks described below can be identified as speculative risks:

- *Strategic risk*: this relates to the degree of prosecutions of corporate strategies.
- *Operational risk*: this includes those risks which are linked with business production processes.
- *Financial risk*: this concerns all the risks arising from financial structure, from the performance of the financial markets and from the transactions made with third parties. Within this category are the following risk factors, Giorgino and Travaglini (2008)
 - Exchange rate risk,
 - Commodity risk,
 - Interest rate risk,
 - Liquidity Risk,
 - Credit risk.

According to Floreani (2005) and Guelfi (2009) speculative risks are characterized by a gradual realization over time, by a delayed performance and examination, by the economic effects that progressively occur and by the lack of intervention to reduce the negative economic consequence of the events

These types of risks are not insurable. The main way to hedge against the speculative risks is hedging.

2.2.1: Financial Risk

Financial business risks are those that arise from the routine activity of a company and are linked to the price of instruments traded on financial markets. There are two types: internal risks which encompass all those risks arising from the financial management policy adopted by the company, and external risks that relate to those risks which arise from the market. In this latter category we can include foreign exchange risk, interest rate risk, commodity risk and credit risk. The existence of financial markets in which these are traded determines that business flows can be quantitatively estimated and evaluated by techniques widely shared among operators and that most of the financial risks incorporate a systematic component which can affect their assessment and management. Finally, the principal techniques used in managing financial risk are represented by hedging instruments.

Financial risks can be part of an active and/or passive management. An active management of risks exists when market prices do not necessarily reflect the value of the traded flows. Those involved will need to be able to make a quantitative assessment of risk which goes beyond that indicated by the market price. It is possible to take advantage of arbitrage opportunities and sophisticated evaluation systems and privileged information are required. Passive management is based on the notion that, when this approach is adopted management is not able to realise an effective quantitative evaluation of the risks traded beyond than that which is expressed by market prices.

2.2.1.1: Exchange Rate Risk.

The exchange rate risk represents the sensitivity of economic and financial flows of the company to exchange rates. The deferral of payments and receipts, combined with the volatile nature of currency markets causes uncertainty regarding payments and collections, as well as uncertainty related to revenues and/or costs. This risk is the most well-known risk. It represents a crucial problem because in this era of trade globalization, it plays a central role since even small businesses operate in foreign currencies.

The traditional classification distinguishes four types of exchange rate risk:

- *Settlement risk*: Facile (1996) states that the assumption of the existence of this risk is based on “a time interval between the definition of the contractual

conditions and the conclusion of the financial transaction, during which the risk of foreign exchange market is subject to change". This specific type of risk could affect both the importer (or an operator paid in foreign currency) and the exporter (or an investor in foreign securities). The former is affected because when a payment or refund must be made in a currency other than national there is the risk of an appreciation of the level of the foreign currency against the domestic currency. With respect to the latter when a payment is received in foreign currency, there is the risk of depreciation of the currency against the national currency. It is easy to identify this risk and it is linear because each unit change in the exchange rate corresponds to a proportional change in the business marginal variation.

- *Economic Risk*: this refers to the risk that changes in exchange rates produce on prices related to those market sectors in which the company operates.
- *Competitive Risk*: this is the risk which arises from changes in competitive relations as a consequence of increases in the foreign exchange market different costing systems and revenue structures with respect to competitors. It is hard to identify this risk when the company finds itself in a situation characterized by multiple competitors and by production which is located in countries with different currencies.
- *Translation Risk*: this relates to the conversion of foreign currency balance sheet assets in the national currency at the end of the year.

These four types of exchange rate risks are interconnected. A firm operating in markets with currency other than its national currency is exposed to changes in market rates and this could produce negative exchange rate effects on the company's income statement, consequently this could also affect its competitive position and could generate further short term and long term effects. This risk can be managed through instruments such as buying and selling currency futures and options on exchange rates. There is a wide range of options that allow firms to manage their exchange rate risks and they are extremely flexible and adaptable to any specific requirement. The use of these financial instruments requires specific expertise.

2.2.1.2: Interest Rate Risk

The interest rate risk (IRR) is more insidious than the exchange rate risk because it usually involves a longer period and represents the sensitivity of the business cash flows on interest rates. The fluctuations generated by IRR can impact both parts of the company balance sheet, especially the passive side because most companies have different types of debt exposure – long, medium and short terms debt maturity. Changes in interest rates could represent a risk/opportunity to be exploited in order to benefit from the level of interest rates; fixing the cost of debt for an extended period of time could allow the company to benefit from the optimal cost structure which guarantees the cost of debt in the long term. Any interest paid or received on a fixed basis does not represent a real risk, as it has been fixed in advance.

2.2.1.3: Commodity Risk

The commodity risk refers to the uncertainties of future market values and to the size of the future income determined by the fluctuation in commodity prices. This topic covers all industrial companies because none of them can operate without the use of raw materials. There is a directly proportional link between exposure to price risk and production costs, furthermore the higher the risk is, the more likely it is that the increase of the commodity price will be reflected on the final sale price. For this type of risk it is also possible to make a further classification:

- *Settlement Risk*: this is typical in those markets where the price of raw materials is based on a quotation value and therefore fixed on the day of delivery.
- *Economic-Competitive Risk*: this risk is supported by those parties (producers/users) that have not fixed the price of the commodities, therefore they are at a disadvantage compared to those competitors who have adequately dealt with such a risk or who have purchased their good in the most favorable period.
- *Replacement Risk*: this is the risk in which strong variations in prices lead to a shift in demand towards other products. This risk in the long term can generate devastating consequences for those companies that are not able to convert their structures to adapt to the market changes.

2.2.1.4: Credit Risk

Sironi (2005) states that credit risk can be understood as “the possibility that an unexpected change in the creditworthiness of a counterparty could generate a corresponding unexpected change in the fair value of the related credit exposure”. Thus credit risk can be understood as a default and migration risk, risk as an unexpected event and risk as credit exposure. Anolli e Gualtieri (1999) have defined credit risk as “the possibility that a debtor fails to comply even in part with its obligations: this event is the so-called default”

It is possible classify this risk as follow:

- *Default Risk & Migration Risk*: this is the risk of a deterioration in the creditworthiness of a counterparty (downgrade). This downgrade could be due by a debtor’s downgrade rating, by an agency or by trust analysts of the creditor bank.
- *Recovery Risk*: this refers to the possibility that the rate of recovery, related to counterparty exposure and consequent insolvency, turns out to be lower than the one originally estimated by the bank.
- *Risk Exposure*: this is a typical risk of credit lines and has an aleatory value, furthermore it refers to the actual amount of the loan at the time of insolvency.
- *Spread Risk*: this is the risk whereby the risk premium (spread) is increased due to requirements in capital markets.

2.3: Risk Classification Basel I Basel II and Basel III.

The revision of the Basel Accord on capital requirements for banks (Basel I and II) has prompted companies to enhance resources and instruments for risk management.

With Basel I credit risk was measured for all businesses in the same way. It did not take into account the time factor (as the temporal structure of maturities) and excluded risk factors such as operational risk.

Basel II scaled the pattern of minimum capital requirements through a more structured and efficient system of weighting, Resti (2008). It sets out, on three pillars, the level of capitalization that supervisors require from banks:

- *Pillar I - Minimum Capital Requirements*: this pillar contains all the regulations on banking capital requirements to cover risks that financial institutions assume. In particular, it introduces a new solvency coefficient,

which alongside credit risk, considers the market risks together with a new concept of risk; operational risk.

- *Pillar II - Supervisory Review Process*: this pillar states that taking into account business strategies in terms of capitalization and risk-taking, central banks will have greater discretion in assessing the banks' capital adequacy, and imposes higher coverage that could exceed the minimum requirements.
- *Pillar III - Market Discipline*: transparency rules are provided to give public information on capital levels, on risks and on their management.

With regard to credit risk, taking into account what is stated above, Basel II introduced two important innovations, first it allowed for the use of risk mitigation instruments such as traditional forms of collateral and collateral on financial and real assets, together with more innovative forms such as financial derivatives. Furthermore it recognized internal models for the assessment of credit risk, counterparty risk and transaction risk.

Another important novelty is the opportunity granted to intermediaries which allows them to adopt several alternatives in order to calculate the minimum capital requirements against credit risk:

- *Standard Approach*: this approach uses assessments established by the supervisory authority. The assessment of corporate borrowers (or to be given) will be carried out by external rating agencies specifically authorized by the Financial Regulator. Depending on the rating assigned, different weighting for the calculation of the provision of capital will be used. Depending on the type of business the weighting varies:

Tab. 1 – Weighting for the calculations.

Firm Type	Turnover (T)	Financing	Weighting
Corporate	> € 50 millions	> € 1 million	Rating based
SME Corporate	€ 5 millions < T < € 50 millions	> € 1 million	Rating based
Retail	T < € 50 millions	< € 1 million	Fix at 75%

Source: author's elaboration.

- *Internal Ratings Based Approach (IRB)*: This model is a calculation system based on quantitative input by which the capital requirement (K) is measured. Part of this requirement, the expected loss (EL) is represented by the following equation:

$$EL = EAD \times PD \times LGD \times M$$

Where PD (Probability of Default) indicates the probability that the customer shall be in default in a year, the EAD (Exposure at Default) shows what will be the exact amount borrowed at the time of insolvency, the LGD (Loss Given Default) suggests what percentage of the loan, less recoveries, will be lost if the party is in default, and finally M (Maturity) explains how value in the medium-long term is reduced if the customer is solvent but worsens its credit rating.

The IRB approach, is divided into:

- *Foundation Approach (IRB Base)*: in which banks use their own valuations to estimate the PD and adopt system valuations for the other variables.
- *Advanced Approach (IRB Advanced)*: in this model banks use their own valuations for all variables in the model including maturity (M).

A common feature of all these approaches is the role played by collaterals (risk migrants), which allow discounts to be obtained on the calculation of capital requirements. There are two types of collaterals: personal collaterals, when they are issued by governments, banks, and trust companies with high credit ratings, and collateral such as cash, gold, stocks and qualified bonds or funds (simple approach) or other listed stocks (integral approach).

What were the impacts of Basel II on the relationship bank-firm?

Under the Basel II agreement, lenders have to set aside capital to cover risks connected with their business activities, and the amount of capital to be set aside depends on the credit risk related to corporate borrowers. Banks ask companies to reduce their financial risk in order to improve their credit rating¹⁵ and thus to reduce their venture capital constrained in terms of loans issued to borrowers. Lower constrained venture capital means that the banks are able to use this capital in alternative ways. A reverse scenario is characterized by losses of investment opportunities, where costs would necessarily fall on businesses through increases in interest rates for those considered to be more risky.

Basel II implies that the financing costs for a firm are always linked to the rating of the borrowers. This means that the reduction of financial costs necessarily comes about through an increase in capital and a consequent improvement in the corporate credit rating.

¹⁵ Thereby lessening the credit risk.

Basel III is a set of new rules on Banking Supervision in response to the recent financial crisis. It came into operation in early 2013 and a long transitional period was foreseen (up to 1 September 2019). This approach was adopted in order to facilitate a gradual adjustment of the operational strategies of banks on economic recovery and avoid relapse. Its goals are to prevent excessive risk taking by operators, to reinforce the financial system and to establish a level playing field.

The measures that will be implemented will address the financial intermediaries and include:

- *The introduction of minimum standards of liquidity:* two rules were introduced:
 - *Liquidity Coverage Ratio*¹⁶: this rule requires banks to maintain a stock of liquid assets that can overcome a phase of heightened outflow of funds for a period of 30 days without having to resort to the market or refinancing at the central bank.
 - *Net Stable Funding Ratio*¹⁷: this rule requires that sources of stable funding are able to finance less liquid assets, and are needed to increase medium and long term funding.
- *The definition of regulatory capital, together with the establishment of higher capital requirements:* this confirmed the function of heritage as a garrison essential for the stability of financial intermediaries. Adequate and increased quality levels of capital increase banks' ability to cope with losses and ensure that intermediaries are able to take advantage of growth opportunities and to support families and businesses, also in moments of difficulty. Furthermore, more stringent requirements in terms of instruments and high-quality assets were envisaged, while the total capital requirement at 8% of risk-weighted assets remained unchanged.¹⁸
- *Better coverage of market risk and counterparty risk:* new rules provided that some key parameters for the calculation of requirements, such as value at risk and correlations between activities, have to be calculated taking into account conditions of stress.
- *The reduction of the level of leverage:* a minimum capital requirement (Tier 1) that banks must hold relative to total assets not risk-weighted (leverage

¹⁶ According to this rule, the ratio between high quality liquid assets and total net cash outflows in 30 days, must be greater than or equal to 100%.

¹⁷ According to this rule, the ratio between the available stable funding (Funds) and the stable funding request (Assets) must be greater than or equal to 100%

¹⁸ Common Equity increased from 2% to 4.5% and Tier1 increased from 4% to 6%.

ratio) was established. This was determined in such a way as to capture all activities of a bank (and balance sheet) and is neutral with respect to different accounting rules.

▪ *Of the counter-cyclical measures in order to reduce the pro-cyclical prudential rules:* measures to reduce the pro-cyclicality of prudential rules have been planned and consequently banks are required to hold more capital resources than the minimum (Buffer). Two sizes:

- Banks must be equipped with a capital buffer above the regulatory minimum (equal to 2.5 % of common equity ratio of assets risk).
- Introduction of an additional mechanism to ensure that banks build up capital resources in the early stages of excessive growth of the overall credit.

What is the philosophy and what are the consequences that lie at the basis of Basel III?

All transactions that a bank performs involve risk and therefore potential losses. The stronger the risk, the higher the potential losses are, and therefore the greater the amount of money that banks must set aside to protect themselves.

It must be borne in mind that the new provisions increase the percentage of capital that banks must set aside for safety. Thus the banks will have to incur an increase in costs and this will eventually be passed on to their customers in terms of increased commissions and spreads on bank loans. Company valuations will be more careful and specific with respect to at least two decisions: whether to lend and how much money to lend, together with decisions relating to the costs and conditions to apply.

CHAPTER 3: METHODOLOGY

3.1: Data Collection

This research intends to investigate how and why UK and Italian non-financial listed Small and Medium Enterprises (SMEs) used derivatives instruments during the time period 2005-2012. It wants to focus only on non-financial firms because they should concentrate their efforts on hedging transactions, meanwhile financial companies have risk management activities related with hedging and trading transactions. Furthermore the decision to focus on SMEs is due because, as shown in the table below, seems that no one has done investigation on the use of financial derivatives by Italian non-financial listed SMEs.

Tab. 2 – Summary of the most important empirical studies on hedging demands

Author/s	Publication Year	Size	Firm Type	Source	Country/s	Time Period	Aim
Nance et al.	1993	434	Non-Financial	Survey	USA	1986	Derivatives
Dolde	1993	244	Fortune 500 Companies	Survey	USA	NO Info	Derivatives
Bodnar et al.	1995	530	Non-Financial	Compustat & Survey	USA	1994	Derivatives
Berkman and Bradbury	1996	244	Non-Financial	Annual Reports	New Zealand	1994	Derivatives
Mian	1996	169	Non-Financial	Annual Reports	USA	1992	FX and IR Derivatives
Tufano	1996	48	Gold Mining	Survey	USA	1991-1993	Commodity Price Derivatives
Geczy et al.	1997	372	Non-Financial	Annual Reports	USA	1991	FX Derivatives
Grant and Marshall	1997	250	Top 250 UK Companies	Survey	UK	1994, 1995	Derivatives
Hakkarainen et al.	1997	84	Non-Financial	Survey	Finland	1994	Derivatives
Gay and Nam	1998	486	Non-Financial	Swaps Monitor Database	USA	1995	All and IR Derivatives
Bodnar and	1999	126	Non-	Survey	Germany	1997	Derivatives

Gebhardt			Financial				
Alkeback and Hagelin	1999	163	Non-Financial	Survey	Swedish	1996	Derivatives
Jalivand, Switzer and Tang	2000	154	Non-Financial	Survey & Montreal Exchange Database	Canada	1996	Derivatives
Loderer and Pichler	2000	96	Non-Financial	Survey	Switzerland	1996	Currency Risk
De Ceuster et al.	2000	73	CCs & Top200 Firms	Survey	Belgium	1997	Derivatives
Allayannis and Ofek	2001	724	Non-Financial	Annual Reports	USA	1992-1993	FX Derivatives
Keloharju and Niskanen	2001	44	Non-Financial	Survey	Finland	1985-1991	Foreign Currency Debt
Mallin et al.	2001	231	Non-Financial	Survey	UK	1997	Derivatives
Graham and Rodgers	2002	442	Non-Financial	SEC's EDGAR - Compustat	USA	1994 or 1995	FX and IR Derivatives
Bison, Pelizzon and Sartore	2002	150	Non-Financial	Annual Reports	Italy	1994-1999	Derivatives
Guay and Kothary	2003	234	Non-Financial	Compustat	USA	1997	FX, IR, Commodity Price Derivatives
Kedia and Mozumdar	2003	523	Non-Financial & Non-Utilities	Compustat & Moody's Investor Services	USA	1996	Foreign Currency-Denominated Debt
Geczy, Minton and Schrand	2004	372	US Industrial Corporation	Fortune's 1991 List & Annual Reports	USA	1990	Currency Derivatives
Faulkender	2005	133	Chemical Industry	SDC Platinum, DealScan, EDGAR, Compustat	USA	1994-1999	Interest Rate Derivatives
El-Masry	2006	401	Non-Financial	Survey & FAME	UK	March-May 2001	Derivatives
Judge	2006	400	Non-Financial	FT500, Survey &	UK	1995	Derivatives

				Annual Reports			
Bartram, Brown and Conrad	2011	6,888	Non-Financial & Non-Regulated Utilities	Thomson Analysis, Global Reports and Datastream	47 Countries	2000-2001	Derivatives
Bodnar et al.	2013	86	Non-Financial	Survey & AIDA	Italy	2007-2008	Derivatives

Source: author's elaboration.

Table 2 briefly summarizes information about previous empirical studies about hedging demand. In detail it shows by year: the sample size, the firm type analysed, the source where data have been collected, the country/s that compose the sample, the time period and the aim of the research. Therefore it suggests that at least fourteen of those empirical studies investigate the use of derivatives by United States companies, and one of these studies – Bartram, brown and Conrad (2011) – covers forty seven countries including United States. Furthermore, four empirical researchers analysed the demand for hedging with derivatives instrument from United Kingdom and only two papers examined this subject from the Italian companies' point of view. Moreover none of those studies focused on SMEs.

The starting point to build up the two SMEs samples – UK and Italian - has been the European Definition of Small and Medium Enterprises – Recommendation 2003/361/EC adopted on 1st January 2005 - which is similar to the UK definition – Company Act 2006 section 382 and 465 - except that the Italian definition includes a category called “micro”. Below are given the definitions with the Euro value and the Euro value converted into Sterling at the rate applicable when this text was drafted (July 2013)¹⁹.

¹⁹ Source: ec.europa.eu (infoeuro) - Exchange rate EUR/GBP € 1 = £ 0.8531.

Tab. 3 – EU SMEs Definition.²⁰

Category	Headcount	Turnover	Balance Sh. Total
Medium	< 250	≤ € 50 million	≤ € 43 million
		≤ £ 43 million	≤ £ 37 million
Small	< 50	≤ € 10 million	≤ € 10 million
		≤ £ 9 million	≤ £ 9 million
Micro	< 10	≤ € 2 million	≤ € 2 million
		≤ £ 2 million	≤ £ 2 million

Source: author's elaboration. The Euro value converted into Sterlin have been done using the following exchange rate: Exchange rate EUR/GBP € 1 = £ 0.8531 from ec.europa.eu (infoeuro).

Data have been collected from two different sources Bureaux Van Dijk databases (BVD) and Annual Reports (AR).

Beginning with the definition of SMEs and using Bureaux Van Dijk databases²¹ the two sample of UK and Italian non-financial listed SMEs have been created. In those samples are included all the companies that in 2005, at least, recorded between 10 and 250 number of employees and between 2 million and 50 million Euro (£ 2 million and £ 43 million) turnover. Once these two sample have been constructed have been collected, from FAME database for the UK companies and from AIDA database for the Italian companies, all the necessary variables to perform the calculation needed for this research.

Furthermore, since there are no databases that provide information on the use of financial instruments used by companies to cover themselves against risk exposure, it was decided to collect these data from the firms' annual reports instead of doing a survey. Because annual reports give a larger quantity and quality information than surveys do. Moreover, the Italian database – AIDA – does not split the Italian companies turnover into “Italian Turnover” and “Export Turnover” as FAME – UK database – does²², so AIDA gives only the macro variable. Thus this information, only for the Italian sample, has been collected in the annual reports of each firm. To do that have been taken into account what the Italian and the European accounting legislations states²³.

Therefore the information about the use of financial derivatives by the UK and Italian SMEs, the types of these instruments - Foreign Exchange (FX), Interest Rate (IR) and Commodity – and the Italian “Export Turnover” have been handy

²⁰ All the amounts in Sterling are rounded.

²¹ FAME for UK sample and AIDA for Italian sample.

²² FAME provides the macro data “Turnover” and the micro data “UK Turnover” and “Export Turnover”.

²³ Codice Civile (Civil Law) Article 2427 points 6 and 10 and International Accounting Standard (IAS) 14.

collected for all the companies that are in the two samples – 166 firms for UK and 66 firms for Italy – over the time period of eight years 2005-2012.

During the process of data collection have been noticed a better quality and quantity of the firms' financial statements in annual reports due to the changes in the reporting standards over the time period. And "larger" companies with more international dimension presented higher quality information about their strategies. Meanwhile, smaller companies disclosed essential information about their hedging strategies, and when they used financial derivatives gave limited information about the instrument adopted.

To obtain these data have been implemented two different methods. When the format of the annual report does not allowed to use keywords to catch these information, that was found looking into those sections where debt and risk information were specified throughout the document. Otherwise, when annual report presented a new format, the hedging information has been obtained by implementing a keywords search approach to find the financial risk management section in the notes to the account in annual reports for each year of 2005-2012. The data collection process includes the search for annual reports and the search for relevant hedging data in the reports. The keywords used have been: financial risk, derivative, notional, market risk, foreign exchange, foreign currency, forward contract, swap, interest rate. So, when a keyword is found, the surrounding text is read and interpreted to decide the value of hedging variable.

Therefore the UK sample is composed by a list of 166 UK non-financial listed companies and the Italian sample includes a list of 66 Italian non-financial listed companies. Those samples do not comprise financial firms because these companies may have different motivations for using financial derivatives instruments instead of hedging purposes.

3.2: Methodology

The study uses two balanced panel data sets, UK and Italian, as the firm data are built over a time period of eight years with multiple cross sections for each year. A panel data like this has a larger number of observation points which increase the degree of freedom and reduce the collinearity between independent variables, resulting in improved efficiency of the econometric estimates (Hsiao 2003). The validity of the estimation results is also increased as panel data set control for omitted variables (Hsiao 2003).

Have been used a binary variable to classify whether a firm is using derivatives or not. That variable takes the value 1 if the firm uses derivatives and 0 if otherwise or there is no information disclosed in the annual report. A derivative user can be defined as a firm that provide qualitative information about any derivative use in the annual report.

This study implemented a logit model because the dependent variables are binary variables and that requires the use of a model that allow to do the analysis of binary outcomes. The analysis is divided in two steps. In the first step, due to a large number of explanatory variables with the financial information of the firms in the samples, have been needed to reduce them to create the best possible model. In this regards has been run the Univariate Logit Regression for all the independent variables, to identify the most significant variables. So, each significant variable has been selected as candidate for run the multivariate model. The Univariate Logit Regression has been run for all the explanatory variables in relation with three main dependent variables. The first is "Use" which intend to test if firms use derivatives as hedging instrument or otherwise and the results show whose explanatory variables are theoretically more influential in the decision of hedging. The second and the third dependent binary variables are foreign exchange (FX use) and interest rate (IR use) dummies and is tested the significance of the different proxies for these specific hedging instruments.

The second step is the Multivariate Logit Regression whose purpose is to capture the correlation of the observation within a firm. It intends to examine the determinants of hedging hypotheses using a dependent binary variable that takes value 1 when the firm is hedging and 0 otherwise. Have been decided to use a logit model because it overcomes the limitations of the linear probability model (LPM) because it uses the maximum likelihood estimation (MLE) to calculate the regression coefficients. This model maximizes the probability that unobserved dependent and independent variables occur together. The model that is used by the Logit regression is written as²⁴:

$$L_i = \ln (P_i/(1-P_i)) = \beta_1 + \beta_2 X_i + \mu_i$$

With logit regression can be obtained three information:

²⁴ Gujarati and Porter (2009), p.555.

- *Estimated Coefficients*: that gives the change in the logit function given a change in the independent variable.
- *Odds Ratio*: that is the probability of the event happens divided by the probability of the event does not happens, in this context the event is the probability to hedge or not.
- *Marginal Effect*: that measures the actual change in probability.
- On this way is possible to determine the effect of the explanatory variables on the decision of hedging.

CHAPTER 4: HYPOTHESES

4.1: Introduction.

Three different dependent dummy variables have been used to measure the hedging activities by UK and Italian non-financial Small and Medium Enterprises. The first dependent variable is Hedgers (Use) and tests the firm's likelihood on using derivatives instruments. The second is IR Hedgers (IR Users) which tests the probability that a firm hedges by derivatives, and the third variable is FX Hedgers (FX Users) whose aim is the same of the one defined above – Hedgers and IR Hedgers.

Based on a comprehensive review of the existent literature have been identified six main research hypotheses.

4.1.1: H1 – Financial Distress.

A financial distress situation can occur when a firm is not able to meet or presents difficulty to pay off its financial obligations to its creditors. Hence, a company can incur in a situation like this when it has high fixed costs, illiquid assets or revenues that are sensible to the economic downturns. Smith and Stulz (1985) with their research showed that companies increased their value with hedging because this allowed them to smooth taxable income reducing expected tax liabilities. At the same time they confirmed that hedging can reduce the costs of financial distress. Therefore, companies seem to have a positive relationship between the financial distress and the probability to hedge. In fact, higher is the probability of a financial distress for a firm higher will be the probability that it is going to hedge.

To test these hypotheses have been used the following proxies:

- *Interest Coverage ratio (IC)*: this is used to determine how easily a firm can pay interest on outstanding debt. The lower is this ratio more higher is the probability to incur into a financial distress situation. Thus there is a negative relationship between IC ratio and the expected decision to hedge as argued by Judge (2006), Bartram et al. (2009) and Geczy et al. (1997). Have to be taken in to account that when this ratio is 1.5 or lower it means that the firm's ability to meet interest expenses could be questionable. And a ratio below 1 means that the firm is not generating enough revenues to cover interest expenses.

- *Leverage ratio*: it is a financial measure that gives an idea of the ability of a firm to meet its financial obligations. So, firms with higher leverage are keener to incur in distressed situation therefore are more likely to hedge. Thus, can be stated that should be a positive relationship between leverage and the probability to hedge. Higher leverage imply that the firms will have a higher probability of ending up in a distressed situation and thus are more likely to hedge. As stated by Campello, Lin, Ma and Zou (2011), Bartram et al. (2009) and Graham and Rogers (2002).
- *Profitability ratio*: this ratio shows a firm's overall efficiency and performance. This macro ratio can be divided in two types, the margin ratios that represent the firm's ability to translate sales into profits at various stages of measurement, and the returns ratios that show the firm's ability to measure the overall efficiency of the firm in generating returns for its shareholders. Bartram et al. (2009) argued that firm's with higher profitability could have a lower probability to incur in a financial distress situation thus are less likely to hedge. But Glaum (2002) stated that firm's with higher profitability will enable managers to conduct a more selective hedging strategy to take bets in the financial markets, so there should be a positive relationship between hedging and profitability.
- *Debt Maturity ratio*: this ratio refers to the short term and long term contracts between the issuer and the investors. It is measured by long term borrowings as a percentage of total debt, Bartram et al. (2009). So, could be stated that firms having long debt maturities are more likely to hedge, this because longer debt maturities can indicate a potentially higher amount of debt.
- *Z-Score ratio* - (Altman 1968): this ratio is used to predict the probability that a firm will goes into bankruptcy within two years. It is used to predict corporate defaults and it is used as a control measure for the financial distress status of firms in academic studies. The Altman Z-score ratio is based on five financial ratios that can be calculated from data found on a company's annual report. There are several version of this ratio, in this research has been use the one for listed companies. Below the z-score formula used:

$$z\text{-score} = 1.2A + 1.4B + 3.3C + 0.6D + 0.9E^{25}$$

A= Working Capital/Total Assets

²⁵ Altman (1968), "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy", The Journal of Finance, vol. 23 pp. 589-609.

- B = Retained Earnings/Total Assets
 C = Earnings Before Interest & Tax/Total Assets
 D = Market Value of Equity/Total Liabilities
 E = Sales/Total Assets

Tab. 4 – H1 Financial Distress Proxies.

Measure	Predictions
IC	-
Leverage	+
Profitability	+/-
Debt maturity	+
Z-Score	-

Source: author's elaboration.

4.1.2: H2 – Underinvestment Costs.

Bessembinder (1991) and Myers (1977) with their research show that when leverage is high the asymmetric information can lead to underinvestment. Bessembinder (1991) states that hedging can increase the debt capacity reducing the probability of financial distress and thus changes the default states of the firm, making the firm able to reduce the costs of underinvestment and accomplish lower borrowing costs. Froot, Scharfstein and Stein (1993) in their analysis show that hedging ensure firms to have enough internal funds to exploit attractive investment opportunities and thus increase the shareholders' value. Furthermore they suggest that whereas imperfect capital markets make external financing policy, smaller firms and firms with higher investment opportunities are more likely to hedge.

To test these hypotheses have been used the following proxies:

- *Capital Expenditure over sales ratio*: this ratio measures the level of investments that a firm is making into its future. It compares the capital expenditure to sales in a given period. This measure has been used by Tufano (1996), Geczy et al. (1997), Graham and Rogers (2002) and Judge (2006).
- *Market to Book ratio*: this ratio is used to find the value of a company comparing its book value with its market value. This ratio has been used by Froot et al. (1993).

It is expected a positive relationship between these ratios and the probability to hedge, because theories predict a positive association between investment

spending and hedging, indeed suggest that leveraged firms have greatest underinvestment problems and so are more likely to hedge.

Tab. 5 – H2 Underinvestment Costs Proxies.

Measure	Predictions
Capital expenditure over sales	+
Market to book ratio	+

Source: author's elaboration.

4.1.3: H3 – Financial Price Risk as Interest Rate Risk

Smith and Stulz (1985) investigated that firms with greater variation in cash flow or accounting earnings due to financial price exposure are more likely to hedge. And can be assumed that companies hedge a bigger amount of their risks. Brunzell, Hansson and Liljeblom (2009) stated that enterprises with greater leverage, long term debt and lower interest cover ratios are more likely to hedge.

To test this hypothesis has been use the following proxies:

- *Leverage ratio,*
- *Long Term Debt,*
- *Interest Coverage ratios.*

Brunzell, Hansson and Liljeblom (2009) showed that when is measured interest rate exposure is expected that firms with greater leverage and long term debt and a lower interest coverage ratio are more likely to hedge.

Tab. 6 – H3 Underinvestment Costs Proxies.

Measure	Predictions
Leverage	+
Debt Maturity	+
Interest Coverage	-

Source: author's elaboration.

4.1.4: H4 – Firm Growth.

The firm size has a crucial role to determine if a firm is going to hedge or not. Previous researches found opposed results. In fact Smith and Stulz (1985) with their outputs stated that there is a negative relationship between firm size and bankruptcy costs, so small firms have more incentive to hedge. Froot et al. (1993) with their study showed that small firms are more likely to hedge because of

greater information asymmetry and because the external financing are more costly due to higher transaction costs.

To test this hypothesis has been use the following proxies:

- *Ln total assets*: this proxy has been used also by Graham, and Rodgers (2002), Guay and Kothary (2003), Nguyen and Faff (2003), Bartram et al. (2004), Judge (2006) and by Campello, Lin, Ma and Zou (2011).
- *Ln total sales*.
- *Ln market capitalization*.

Tab. 7 – H4 Firm Growth.

Measure	Predictions
Ln Total Assets	+
Ln Total Sales	+
Ln Market Capitalization	+

Source: author's elaboration.

4.1.5: H5 – Overseas Operations and Foreign Exchange Risk.

Firms that have operation in foreign markets are more exposed to financial risks such as exchange rate. Hence these companies should be more likely to hedge by derivatives instruments to cover themselves against foreign currency exposure. Berkman and Bradbury (1996) with their research found that one of the main factors that influences the manager's decisions to use derivatives or not is the level of the overseas operations. Dominguez and Tesar (2001) demonstrated that firms that work in an high internationalized industry are more likely to hedge their exchange rate exposure. Judge (2006b) showed that companies with greater percentage of foreign sales or foreign assets are more likely to hedge.

To test this hypothesis has been use the foreign sales over total sales proxy. And is expected that it has a positive relationship with hedging, especially with foreign exchange derivatives use.

Tab. 8 – H5 Overseas Operations.

Measure	Predictions
Foreign Sales over Total sales	+

Source: author's elaboration.

4.1.6: H6 – Hedging Substitutes.

The use of hedging substitutes help firms to reduce their probability to incur into a financial distress situation and support agency problem costs, Nance et al. (1993). They also show that imposing dividend restrictions can be lowered the probability for a firm to incur in a financial distress situation. Haushalter (2000) shows that the relationship between dividend behavior and the decision to hedge can be positive and negative. Judge (2006) and Bartram et al. (2009) and Geczy et al. (1997) in their researches show that firms investing in more liquid or less risky assets will be less likely to hedge.

Tab. 9 – H6 Hedging Substitutes.

Measure	Predictions
Dividend Yield	+
Liquidity	-

Source: author's elaboration.

4.2: Summary of Measures and Predictions

A brief summary of the six research hypotheses:

H1: Firms with higher probability of *financial distress* are more likely to hedge.

H2: Firms exposed to *underinvestment costs* (firms with high leverage or with more growth opportunities) are more likely to hedge.

H3: Firms facing *interest rate exposure* are more likely to hedge a larger portion of their exposure.

H4: Larger firms are more likely to hedge due to benefits of *economies of scales* by engaging risk management activities.

H5: Companies with high degree of *overseas operations* are more likely to hedge.

H6: Firms using *hedging substitutes* are less likely to hedge.

The table below presents the variables predictions derived from the hedging theory and literature. Have to be taken in to account that one measure can proxy more than one argument at the same time.

Tab. 9 – Measure and Predictions.

Independent Variables	ID	Measures	Predictions					
			H1	H2	H3	H4	H5	H6
Debt/Equity	DEBTOEQUITY	Leverage	+	+	+			
Debt/Capital	DEBTTOCAPITAL	Leverage	+	+	+			
LT-Debt/Capital	LTDEBTCAPITAL	Leverage	+	+	+			
LT-Debt/equity	LTDEBTEQ	Leverage	+	+	+			
Liabilities/Assets	LIABASSETS	Leverage	+	+	+			
Gearing Ratio	GEARINGRAT	Leverage	+	+	+			
Book value Leverage	BVLEV	Leverage	+	+	+			
Market Value Leverage	MVLEV	Leverage	+	+	+			
EBIT/Int. Payments	EBITINT	IC	-		-			
EBITDA/Int. Payments	EBITDAINT	IC	-		-			
Interest Cover Ratio	INTERESTCOVERX	IC	-		-			
Assets Cover Ratio	ASSETCOBERX	IC	-		-			
Berryratio	BERRYRATIO	IC	-		-			
Grossmargin	GROSSMARGIN	IC	-		-			
Short Term Borrowing	STDTPCT	Debt Maturity	-					
Long Term Borrowing	LTDTPCT	Debt Maturity	+					
Current Ratio	CRAT	Liquidity	-					-
Quick Ratio	QRAT	Liquidity	-					-
Liquidity Ratio	LIQUIDITYRATIOX	Liquidity	-					-
Shareholders liquidity ratio	SHAREHOLDERSLIQUIDITYRATIO	Liquidity	-					-
Solvency ratio asset based	SOLVENCYRATIOASSETBASED	Liquidity	-					-
ROC	ROC	Profitability						
ROE	ROE	Profitability						
Profit Margin	PROFITMARGIN	Profitability						
Return on Shareholders' Funds	RETURNONSHAREHOLDERSFUNDS	Profitability						
Return on Total Assest	ROA	Profitability						
EBIT Margin	EBITMARGIN	Profitability	-		+			
EBITDA Margin	EBITDAMARGIN	Profitability	-		+			
Z-Score	ZSC	Likelihood of default	-					
Capital Expenditure/Sales	CAPEXPSALES	Growth Opportunities		+				
Market to Book ratio	MTB	Growth Opportunities		+				
Ln Market Capitalization	LNMACP	Firm Size	-	-		+		
Ln Total Sales	LNTS	Firm Size	-	-		+		
Ln Total Assets	LNTA	Firm Size	-	-		+		
Dividend Yield	DIVYIELD	Dividend Behaviour	-					+
Foreign Sales %	FSPCT	Foreign Exposure			+		+	

Source: author's elaboration.

4.3: Dependent Variables

The dependent variables that have been used in this study are binary variables and take the value 1 if a firm in the sample use derivatives and 0 if otherwise. It wants to identify specific firm characteristics that might determine a firm's decision to hedge. This method is applied also for the other two dependent variables, FX Hedgers and IR Hedgers. In both cases the dummy variable assumes the value 1 when the firm is using FX derivatives instruments (or IR derivatives instruments) and 0 otherwise. Using these as dependent variables allow the research to identify which firm's characteristics determine the firm's decision to use the specific types of derivatives, FX derivatives and IR derivative.

4.4: Independent Variables

Below is reported a table summarizing all the independent variables that have been used to analyse the objectives of this research.

Tab. 10 – Definitions and data sources.

VARIABLES	DEFINITION	SOURCE
Z-SCORE	1.2(working capital/total assets) + 1.4(retained earnings/total assets) + 3.3(earnings before interest and taxes/total assets) + 0.6(market value of equity/total liabilities) + 0.9(sales/total assets)	Bureaux van Dijk
EBIT/ INT. PAYMENTS	EBIT/Int. Payments	Bureaux van Dijk
EBITDA/INT. PAYMENTS	EBITDA/Int. Payments	Bureaux van Dijk
DIVIDEND YIELD	Dividend Yield – close	Bureaux van Dijk
DEBT/EQUITY	Total debt/Shareholder's Equity	Bureaux van Dijk
DEBT/ CAPITAL	Total debt/ Total capital	Bureaux van Dijk
LT-DEBT/CAPITAL	Long term debt/Capital Available	Bureaux van Dijk
LT-DEBT/EQUITY	Long term debt/ Shareholder's Equity	Bureaux van Dijk
LIABILITIES/ASSETS	Total liabilities/Total Assets	Bureaux van Dijk
LEVERAGE	Gearing ratio <i>Gearingratio</i> = - ((Short Term Loans & Overdafts+Long Term Liabilities)/Shareholders Funds)x100	Bureaux van Dijk
BOOK VALUE LEVERAGE	Total debt /(Total Equity + Total Debt)	Bureaux van Dijk
MARKET VALUE LEVERAGE	Total debt/(Total assets –Total equity + Market capitalization)	Bureaux van Dijk
LN MARKET CAPITALIZATION	Ln market capitalization <i>Market capitalization</i> (The market value of a listed company is calculated by multiplying its share price by the number of shares outstanding)	Bureaux van Dijk
LN TOTAL SALES	Turnover	Bureaux van Dijk
LN TOTAL ASSETS	Ln Total Assets	Bureaux van Dijk
CURRENT RATIO	Current assets/Current Liabilities	Bureaux van Dijk
QUICK RATIO	(Current assets-Inventories)/Current liabilities	Bureaux van Dijk
CAPITAL EXPENDITURE/SALES	Capital expenditure/sales	Bureaux van Dijk
MARKET TO BOOK RATIO	(Total assets-Total equity + market capitalization)/Total assets	Bureaux van Dijk
ROC	(Net income- Dividends)/Total Capital	Bureaux van Dijk
ROE	Net Income/Capital	Bureaux van Dijk
SHORT-TERM BORROWING	Short-Term Borrowing/Total debt	Bureaux van Dijk
LONG-TERM BORROWING	Long-Term Borrowing/Total debt	Bureaux van Dijk
FOREIGN SALES	Foreign Sales/Total Sales	Annual Report
LIQUIDITY RATIO	(Current Assets- Stock & W.I.P.)/Current Liabilities	Bureaux van Dijk
SHAREHOLDERS LIQUIDITY RATIO	Shareholders' Funds/ Long term liabilities	Bureaux van Dijk
SOLVENCY RATIO (ASSET BASED) (%)	Shareholders' Funds/Total Assets	Bureaux van Dijk
ASSET COVER	Total Assets/Long Term Debt	Bureaux van Dijk
PROFIT MARGIN (%)	Profit(Loss) before tax/Turnover	Bureaux van Dijk
RETURN ON SHAREHOLDERS' FUNDS (%)	(Profit(Loss) before tax/Shareholders 'Funds)%	Bureaux van Dijk
RETURN ON TOTAL ASSETS (%)	(Profit(Loss) before tax/Total Assets)%	Bureaux van Dijk
INTEREST COVER (%)	Profit (Loss) before Interest/ -Interest Paid	Bureaux van Dijk
GROSS MARGIN (%)	Gross Profit/Turnover	Bureaux van Dijk
BARRY RATIO (%)	-((Gross Profit+Other Operating Income pre OP)/(Administration Expenses + Exceptional Items pre OP))	Bureaux van Dijk
EBIT MARGIN (%)	Operating Profit/Turnover	Bureaux van Dijk
EBITDA MARGIN (%)	EBITDA/Turnover	Bureaux van Dijk

Source: author's elaboration.

CHAPTER 5: EMPIRICAL ANALYSIS

5.1: Methodology

This study employs a balanced panel data set as the firm-data is constructed over a time period of 8 years (2005-2012) with multiple cross sections for each year. A panel data set has a larger number of observation points which increase the degree of freedom and reduce the collinearity between independent variables, resulting in improved efficiency of economic estimates (Hsiao, 2003). The validity of the estimation results is also increased as a panel data set control for omitted variables (Hsiao, 2003).

This study employs a method to examine if there are any firm level factors that determine a firm's decision to hedge by using a multivariate logit regression.

5.1.1: Outliers

Winsorization is used to prevent any disturbance in the estimation outputs caused by outliers. As some of the variables may contain extreme values, it could create skewness in the samples and thus the variables may not be normally distributed (Allayannis and Ofek, 2001). The winsorization process removes any outliers by truncate the extreme values outside a fixed number of standard deviations from the mean, so that these extreme values will be equal to the highest or lowest number inside the parameter (Hellerstein, 2008). Moreover, the natural log has been applied on some variables to mitigate the problem of heteroscedasticity. To test for the normality of the variables this study uses the Shapiro-Wilk test where the null hypothesis states that the variable is normally distributed. As the test shows rejection of the null hypothesis this study takes use of robust (heteroscedastic) standard errors to mitigate the problem of heterogeneity and lack of normally distributed data.

5.1.2: Multicollinearity

When two or more explanatory variables in a model are correlated could arise the problem of multicollinearity. Therefore to determine which independent variables have the highest theoretical relevance to hedging, have been used the Wald chi-square statistic. It can be used to determine the statistical significance of each explanatory variable, where the null hypothesis is that the coefficient in a logit regression model is equal to zero.

5.2: Descriptive statistics UK non-financial listed SMEs

The data sample consists of 1328 firm-year observations. The table below shows the activity and the types of derivatives of hedging and the most used derivatives and derivative combinations for the firm-year observations in the UK sample. Panel A shows that 23.84% of the sample is classified as using derivatives to hedge. Panel B shows that 55.21% of the derivative users disclosed in their annual reports that they used IR derivatives, 51.74% used FX derivatives and 1.74% Commodity derivatives. The most used derivative combination was FX and IR derivatives 7.64%. Further, Panel D and E show that the most used FX derivative is FX Forwards 83.89%. The most commonly used IR derivative is IR Swaps 96.86%. Most used derivative combination is FX Forwards and IR Swaps 7.64%. The fact that forward contracts and swaps are more commonly used than options could be because of the cost required to pay upfront when buying an option. Forwards contracts and swaps require no such premium payment upfront but are quoted with a bid-ask spread, which means the buyer will always get the highest price and the seller the lowest price.

Tab. 11 - Hedging activity and types of derivatives used by UK non-financial SMEs.

This table presents data on the hedging activity with derivatives disclosed in the annual reports amongst the sample of 166 firms from the year 2005-2012. Panel data A shows the number of derivative users and non-users. Panel B presents data on the type of derivatives used. Panel C presents the combination of derivatives used and distinguishes between FX derivatives users, IR derivative users and Commodity users. Panel D and E present data on the most commonly used derivatives within the groups of FX and IR derivatives. Panel F shows the most common combinations of FX and IR derivatives used.

Panel A: Derivative Use	N	%
Use	288	23.84%
Do not use	920	76.16%
Total	1208	100%

Panel B: Types of derivatives used (calculated as a percentage of 288 derivative users – Panel A)	N	%
IR	159	55.21%
FX	149	51.74%
Commodity	5	1.74%

Panel C: Combination of derivative used	N	%
FX only	125	43.40%
IR only	136	47.22%
Commodity only	2	0.69%
FX & IR only	22	7.64%
FX & Commodity only	2	0.69%
IR & Commodity only	1	0.35%
Total	288	100.00%

Panel D: Most used FX derivatives (calculated as a percentage of 149 derivative users – Panel B)	N	%
FX Forwards	125	83.89%
FX Swaps	1	0.67%
FX Options	5	3.36%
FX Futures	2	1.34%

Panel E: Most used IR derivatives (calculated as a percentage of 159 derivative users – Panel B)	N	%
IR Forwards	0	0.00%
IR Swaps	154	96.86%
IR Options	5	3.14%
IR Futures	0	0.00%

Panel F: Combination of FX and IR derivative used (calculated as a percentage of 288 derivative users – Panel A)	N	%
FX Forwards only	101	35.07%
FX Options only	4	1.39%
FX Futures only	2	0.69%
IR Swaps only	132	45.83%
IR Options only	5	1.74%
FX Forwards + FX Swaps only	1	0.35%
FX Forwards + FX Options only	1	0.35%
FX Forwards + IR Swaps only	22	7.64%

The table below (Table 12) examines the differences in firm characteristics between hedgers and non-hedgers through the mean difference test and the Wilcoxon rank sum test. Looking into the financial distress measures can be seen that those are significantly higher for users than non-users derivatives. In more detail, about the *leverage proxies* first of all have been stated that four out of eight variables are significant and three out of four significant proxies are higher for the hedgers. And those are debt equity ratio, long term debt equity and market value. This shows what has been assumed by the literature that firms with higher leverage are more likely to hedge because are more keener to incur in financial distress situations.

Have been tested eight *profitability measures* and five of these are significant variables such as profit margin, return on shareholders' funds, return on total assets, EBIT margin and EBITDA margin. The results show what has been stated by Glaum (2002) that hedgers are those firms with higher profitability.

Five proxies have been use to test the relationship between *interest coverage* ratio and hedgers. These ratios show how easily a firm can pays interests on outstanding debt. Three of these are significant variables and two of these show that derivative users have higher interest coverage ratios. That is inconsistent with what the literature says because it states that there is a negative relationship between this ratio and the probability to hedge. So hedgers should have lower ratio because this would mean that they are more likely to go in a distressed situation. Asset coverage ratio is the only significant variable that shows the negative relationship.

About the *debt maturity ratios* both of them are significant and are consistent with the literature because the long term borrowing variable is significant for the hedgers and that shows that firms with long term debt maturity are more likely to hedge to cover themselves against expected future risk fluctuations.

The two proxies used to test the *growth opportunities* are both significant but only capital expenditure reflects what stated by the literature that companies hedge because investment.

To measure the *financial price risk* have been use mainly three proxies the foreign sales, leverage ratio and the interest coverage ratio. Foreign sales and leverage ratios show that there is a positive relationship between hedging and

financial price exposure. The interest coverage ratios show that firms that have a higher financial exposure are more likely to hedge and that is in contrast with what is stated by the literature because should exist a negative relationship. The foreign sales variable has been used also to test the relationship between hedging and *overseas operations* and as shown firms facing higher operations in foreign markets have been used hedging instruments to protect themselves against this risk.

All the variables measuring *firm size* are significantly higher for hedgers and that is consistent with the fact that higher firms enjoy information and transaction costs scale economies by engaging in risk management activities.

Finally to test the relationship between hedging and the use of other instruments to hedge have been used five *liquidity proxies* and three of them are significant such as current ratio, shareholder's liquidity ratio and solvency ratio asset based. Only the shareholder's liquidity ratio shows the right relationship stated by the literature such as more liquid is a firm less likely to hedge it is.

Tab. 12 - Mean difference test of hedgers vs non-hedgers.

This table presents the results from the Mean difference test and the Wilcoxon rank sum test. The tests are performed on a range of independent variables between derivatives users versus non-users, where ***, ** and * indicate the significance at 1%, 5% and 10% respectively.

Variable	Hedgers		Non-Hedgers		T-Stat			Wilcoxon rank sum test			
	N	Mean	N	Mean	Diff	T-stat	Sig.	H&NH	Z	Sign.	
ZSC	234	1,13	563	0,99	-0,14	-1,48	0,14	H=NH	-0,67	0,50	
DIVYIELD	152	3,42	242	3,66	0,24	0,89	0,40	H=NH	0,64	0,52	
<u>LEVERAGE</u>											
DEBTEQUITY	172	40,64	455	15,69	-24,96	-2,52	0,01***	H>NH	-3,63	0,00	
DEBTCAPITAL	172	0,27	455	0,31	0,05	0,60	0,55	H=NH	-1,51	0,13	
LTDEBTCAPITAL	187	0,20	515	0,19	-0,01	-0,41	0,68	H=NH	-2,98	0,00	
LTDEBTEQUITY	187	0,40	515	0,26	-0,14	-2,34	0,02**	H>NH	-4,18	0,00	
LIABASSETS	259	0,44	729	0,50	0,06	3,14	0,00***	H<NH	2,24	0,03	
GEARINGRAT	268	53,43	752	54,66	1,23	0,22	0,83	H=NH	-2,16	0,03	
BV	172	0,31	455	0,31	0,00	0,02	0,99	H=NH	-1,71	0,09	
MKTV	156	0,42	347	0,35	-0,07	-3,29	0,00***	H>NH	-3,16	0,00	
<u>LIQUIDITY</u>											
CRAT	286	2,37	911	2,11	-0,26	-1,87	0,06*	H>NH	-1,62	0,11	
QRAT	187	1,71	534	1,60	-0,11	-1,01	0,31	H=NH	-1,40	0,16	
LIQUIDITYRATIOX	286	1,78	911	1,80	0,01	0,11	0,91	H=NH	0,48	0,63	
SHAREHOLDERSLIQUIDITYRATIOX	266	25,03	731	36,30	11,27	1,70	0,09*	H<NH	1,58	0,11	
SOLVENCYRATIOASSETBASED	285	56,99	902	51,30	-5,69	-3,36	0,00***	H>NH	-2,19	0,03	
<u>PROFITABILITY</u>											
ROC	112	0,02	172	0,03	0,02	1,27	0,21	H=NH	0,65	0,52	

ROE	277	-0,01	868	-0,12	-0,10	-1,48	0,14	H=NH	-0,86	0,39
PROFITMARGIN	260	6,18	847	-0,94	-7,12	-4,46	0,00 ***	H>NH	-4,01	0,00
RETURNONSHAREHOLDER SFUNDS	282	1,96	849	-7,54	-9,50	-2,41	0,02 **	H>NH	-1,67	0,10
RETURNONTOTALASSETS	286	2,45	910	-4,52	-6,97	-3,82	0,00 ***	H>NH	-2,73	0,01
EBITMARGIN	280	6,32	888	-7,51	-13,83	-4,07	0,00 ***	H>NH	-5,55	0,00
EBITDAMARGIN	280	14,62	886	2,61	-12,01	-4,24	0,00 ***	H>NH	-5,65	0,00
GROSSMARGIN	241	45,83	770	48,33	2,49	1,44	0,15	H=NH	1,17	0,24
<u>IC</u>										
EBITINP	248	30,13	696	-17,55	-47,67	-2,98	0,00 ***	H>NH	-4,37	0,00
EBITDAINP	248	63,30	696	12,79	-50,51	-2,57	0,01 ***	H>NH	-3,75	0,00
INTERESTCOVERX	252	23,89	673	16,14	-7,75	-1,44	0,15	H=NH	-2,61	0,01
ASSETCOVERX	187	41,97	503	73,06	31,09	2,50	0,01 ***	H<NH	3,95	0,00
BERRYRATIO	241	1,20	767	1,12	-0,07	-1,22	0,22	H=NH	-4,20	0,00
<u>GROWTH OPPORTUNITY</u>										
CAPEXPSALES	32	0,00	261	-0,04	-0,05	-1,98	0,05 **	H>NH	-0,52	0,60
MKTTBRAT	253	0,44	681	0,49	0,05	2,64	0,01 ***	H<NH	1,79	0,07
<u>DEBT MATURITY</u>										
STBORROW	172	0,37	455	0,47	0,11	3,92	0,00 ***	H<NH	4,18	0,00
LTBORROW	172	0,63	455	0,53	-0,11	-3,92	0,00 ***	H>NH	-4,18	0,00
<u>FIRM SIZE</u>										
LNMKTCAP	254	3,11	680	2,48	-0,63	-5,94	0,00 ***	H>NH	-6,35	0,00
LNTOTSALES	272	10,00	858	9,32	-0,68	-10,11	0,00 ***	H>NH	-	10,13
LNTOTASSETS	277	10,47	869	9,52	-0,94	-10,74	0,00 ***	H>NH	-	11,08
<u>FOREIGN EXCHANGE</u>										
FOREIGNSALES	272	0,32	858	0,25	-0,07	-2,78	0,01 ***	H>NH	-1,76	0,08

Source: author's elaboration – FAME database.

The tables below provide differences in means between FX derivative users versus non-FX derivative users and IR derivative users versus non-IR derivative users with and without bias.

First of all must be done a comparison of the results from the next two tables – table 13 and table 14 - that gives an overview of which characteristics are important in case of hedging with FX derivative no bias and IR derivatives no bias. Those tables show that FX derivative users no bias have three out of eight non-significant leverage variables that are debt equity, debt capital and long term debt equity. It could be explained by the fact that the non-FX derivative users no bias should be IR derivative users no bias. In fact if look to the table 14 (IR hedgers non bias) the debt equity and the long term debt equity are both significant and show that higher leveraged firms are more likely to hedge. The fact that IR

derivative users have higher variables form the non-users could be explain because higher leveraged firms (firms with more debt, thus higher level of IR exposure) would be more concerned about interest changes on loans than lower leveraged firms, they are more likely to use IR derivatives than FX derivatives.

As expected FX hedgers no bias has a higher foreign sales variable that can be explain by the fact that companies with higher foreign exposure are more likely to hedge. And at the same time for the IR hedgers no bias the long term borrow variable is significant for those firms who have a long term debt exposure and that can be justified by the fact that those firms want to cover themselves against any fluctuation in interest rates risk. Furthermore IR derivative users no bias have one out of five higher significant variables of IC for hedgers.

Tab. 13 - Mean difference test of FX hedgers vs non-FX hedgers (no bias).

This table presents the results from the Mean difference test and the Wilcoxon rank sum test. The tests are performed on a rage of independent variables between FX derivatives users versus non-FX derivative users no bias, where ***, ** and * indicate the significance at 1%, 5% and 10% respectively.

Variable	Hedgers		Non-Hedgers		T-Stat		Wilcoxon rank sum test			
	N	Mean	N	Mean	Diff	T-stat	Sig n.	H&NH	Z	Sign.
ZSC	121	1,60	563	0,99	-0,61	-4,98	0,00 ***	H>NH	-5,13	0,00
DIVYIELD	76	3,28	242	3,66	0,39	1,05	0,29	H=NH	1,02	0,31
<u>LEVERAGE</u>										
DEBTEQUITY	65	19,19	456	17,52	-1,67	-0,13	0,89	H=NH	-0,19	0,85
DEBTCAPITAL	65	0,24	456	0,31	0,08	0,69	0,49	H=NH	1,93	0,05
LTDEBTCAPITAL	67	0,12	515	0,19	0,07	1,69	0,09 *	H<NH	2,25	0,02
LTDEBTEQUITY	67	0,21	515	0,26	0,04	0,44	0,66	H=NH	1,49	0,14
LIABASSETS	127	0,38	729	0,50	0,12	4,90	0,00 ***	H<NH	4,97	0,00
GEARINGRAT	136	25,99	752	54,81	28,82	3,92	0,00 ***	H<NH	3,99	0,00
BV	65	0,20	456	0,31	0,11	2,57	0,01 ***	H<NH	2,45	0,01
MKTV	62	0,26	348	0,35	0,09	2,89	0,00 ***	H<NH	2,72	0,01
<u>LIQUIDITY</u>										
CRAT	148	2,66	911	2,11	-0,56	-3,19	0,00 ***	H>NH	-5,24	0,00
QRAT	105	2,02	534	1,60	-0,42	-3,10	0,00 ***	H>NH	-4,12	0,00
LIQUIDITYRATIOX	148	2,20	911	1,80	-0,40	-2,76	0,01 ***	H>NH	-3,72	0,00
SHAREHOLDERSLIQUIDITYRATIOX	132	42,34	731	36,29	-6,05	-0,65	0,51	H=NH	-4,13	0,00
SOLVENCYRATIOASSETBASED	148	62,54	902	51,26	-11,28	-4,99	0,00 ***	H>NH	-4,93	0,00
<u>PROFITABILITY</u>										
ROC	148	7,36	903	-3,81	-11,17	-2,20	0,03 **	H>NH	-3,38	0,00
ROE	142	0,01	868	-0,11	-0,12	-1,29	9,20	H=NH	-2,00	0,05
PROFITMARGIN	145	6,23	847	-0,86	-7,09	-3,57	0,00	H>NH	-3,67	0,00

RETURNONSHAREHOLDER SFUNDS	147	8,44	849	-7,43	-15,87	-3,04	0,00 ***	H>NH	-3,19	0,00
RETURNONTOTALASSETS	148	5,61	910	-4,45	-10,07	-4,08	0,00 ***	H>NH	-4,34	0,00
EBITMARGIN	147	4,17	888	-7,42	-11,59	-2,79	0,01 ***	H>NH	-3,54	0,00
EBITDAMARGIN	147	10,47	886	2,71	-7,77	-2,32	0,02 **	H>NH	-3,08	0,00
GROSSMARGIN	131	46,20	771	48,37	2,17	0,98	0,33	H=NH	0,86	0,39
<u>IC</u>										
EBITINP	120	64,45	697	-17,52	-81,98	-3,59	0,00 ***	H>NH	-5,79	0,00
EBITDAINP	120	121,08	697	12,78	-108,31	-3,86	0,00 ***	H>NH	-6,19	0,00
INTERESTCOVERX	122	45,85	674	16,12	-29,72	-3,91	0,00 ***	H>NH	-4,95	0,00
ASSETCOVERX	65	89,51	503	73,31	-16,20	-0,78	0,44	H=NH	-2,67	0,01
BERRYRATIO	131	1,21	768	1,12	-0,09	-1,26	0,21	H=NH	-4,55	0,00
<u>GROWTH OPPORTUNITY</u>										
CAPEXPSALES	17	-0,03	261	-0,04	-0,02	-0,58	0,56	H=NH	-0,58	0,56
MKTTBRAT	135	0,37	681	0,49	0,12	4,52	0,00 ***	H<NH	4,54	0,00
<u>DEBT MATURITY</u>										
STBORROW	65	0,47	456	0,47	0,00	0,00	1,00	H=NH	0,10	0,92
LTBORROW	65	0,53	456	0,53	0,00	0,00	1,00	H=NH	-0,10	0,92
<u>FIRM SIZE</u>										
LNMKTCAP	135	3,07	680	2,48	-0,59	-4,35	0,00 ***	H>NH	-4,54	0,00
LNTOTSALES	142	10,14	858	9,32	-0,82	-9,20	0,00 ***	H>NH	-9,74	0,00
LNTOTASSETS	142	10,13	869	9,53	-0,60	-5,34	0,00 ***	H>NH	-6,88	0,00
<u>FOREIGN EXCHANGE</u>										
FOREIGNSALES	142	0,44	858	0,25	-0,19	-6,13	0,00 ***	H>NH	-5,23	0,00

Source: author's elaboration – FAME database.

Tab. 14 - Mean difference test of IR hedgers vs non-IR hedgers (no bias).

This table presents the results from the Mean difference test and the Wilcoxon rank sum test. The tests are performed on a range of independent variables between IR derivatives users versus non-IR derivative users no bias, where ***, ** and * indicate the significance at 1%, 5% and 10% respectively.

Variable	Hedgers		Non-Hedgers		T-Stat		Wilcoxon rank sum test			
	N	Mean	N	Mean	Diff	T-stat	Sig n.	H&NH	Z	Sign.
ZSC	132	0,73	563	0,99	0,26	2,26	0,02 **	H<NH	4,01	0,00
DIVYIELD	90	3,37	242	3,66	0,30	0,87	0,38	H=NH	0,60	0,55
<u>LEVERAGE</u>										
DEBTEQUITY	122	40,18	456	17,52	-22,66	-1,96	0,05 **	H>NH	-4,36	0,00
DEBTCAPITAL	122	0,28	456	0,31	0,03	0,37	0,71	H=NH	-3,23	0,00
LTDEBTCAPITAL	135	0,25	515	0,19	-0,05	-1,68	0,09 *	H>NH	-5,69	0,00
LTDEBTEQUITY	135	0,48	515	0,26	-0,22	-3,19	0,00 ***	H>NH	-6,75	0,00
LIABASSETS	151	0,49	729	0,50	0,01	0,34	0,74	H=NH	-0,99	0,32
GEARINGRAT	152	75,00	752	54,81	-20,19	-2,74	0,01 ***	H>NH	-6,70	0,00
BV	122	0,36	456	0,31	-0,05	-1,52	0,13	H=NH	-3,86	0,00

MKTV	109	0,50	348	0,35	-0,15	-6,34	0,00 ***	H>NH	-6,00	0,00
<u>LIQUIDITY</u>										
CRAT	158	1,96	911	2,11	0,15	0,83	0,40	H=NH	3,71	0,00
QRAT	90	1,36	534	1,60	0,24	1,74	0,08 *	H<NH	2,00	0,05
LIQUIDITYRATIOX	158	1,31	911	1,80	0,49	3,56	0,00 ***	H<NH	5,14	0,00
SHAREHOLDERSLIQUIDITY RATIOX	154	8,64	731	36,29	27,65	3,45	0,00 ***	H<NH	5,91	0,00
SOLVENCYRATIOASSETBA SED	157	51,92	902	51,26	-0,66	-0,30	9,76	H=NH	1,36	0,18
<u>PROFITABILITY</u>										
ROC	158	1,13	903	-3,81	-4,94	-1,00	0,32	H=NH	0,09	0,93
ROE	154	-0,01	868	-0,11	-0,11	-1,23	0,22	H=NH	0,29	0,77
PROFITMARGIN	137	5,87	847	-0,86	-6,73	-3,15	0,00 ***	H>NH	-2,67	0,01
RETURNONSHAREHOLDER SFUNDS	155	-1,03	849	-7,43	-6,40	-1,24	0,22	H=NH	0,18	0,86
RETURNONTOTALASSETS	158	0,90	910	-4,45	-5,36	-2,25	0,02 **	H>NH	-0,36	0,72
EBITMARGIN	153	11,41	888	-7,42	-18,83	-4,25	0,00 ***	H>NH	-5,44	0,00
EBITDAMARGIN	153	19,70	886	2,71	-16,99	-4,55	0,00 ***	H>NH	-6,04	0,00
GROSSMARGIN	123	46,95	771	48,37	1,42	0,62	0,54	H=NH	0,12	0,91
<u>IC</u>										
EBITINP	147	9,92	697	-17,52	-27,45	-1,37	0,17	H=NH	-1,68	0,09
EBITDAINP	147	21,50	697	12,78	-8,72	-0,37	0,71	H=NH	-0,45	0,66
INTERESTCOVERX	150	11,63	674	16,12	4,50	0,73	0,47	H=NH	0,11	0,91
ASSETCOVERX	138	16,90	503	73,31	56,41	4,23	0,00 ***	H<NH	6,98	0,00
BERRYRATIO	123	1,22	768	1,12	-0,10	-1,14	0,25	H=NH	-2,34	0,02
<u>GROWTH OPPORTUNITY</u>										
CAPEXPSALES	14	0,00	261	-0,04	-0,05	-1,36	0,18	H=NH	0,28	0,78
MKTTBRAT	137	0,49	681	0,49	0,00	-0,09	0,93	H=NH	-1,59	0,11
<u>DEBT MATURITY</u>										
STBORROW	122	0,30	456	0,47	0,17	5,80	0,00 ***	H<NH	5,93	0,00
LTBORROW	122	0,70	456	0,53	-0,17	-5,80	0,00 ***	H>NH	-5,93	0,00
<u>FIRM SIZE</u>										
LNMKTCAP	138	3,21	680	2,48	-0,74	-5,52	0,00 ***	H>NH	-6,09	0,00
LNTOTSALES	149	9,92	858	9,32	-0,60	-6,95	0,00 ***	H>NH	-6,82	0,00
LNTOTASSETS	154	10,80	869	9,53	-1,27	-11,34	0,00 ***	H>NH	-	0,00
<u>FOREIGN EXCHANGE</u>										
FOREIGNSALES	149	0,21	858	0,25	0,04	1,33	0,18	H=NH	1,47	0,14

Source: author's elaboration – FAME database.

The next two tables show the differences in means between FX hedgers and IR hedgers. They show that also in this scenario is verified what stated for FX and IR hedgers no bias about the leverage and the Interest coverage proxies. So that debt equity, debt capital and long term debt equity are the only three leverage variables that are no significant – see table 15 that shows the results about FX hedgers. And the firsts two of these variables are significant in the table 16 showing the results for the IR hedgers. Furthermore the significant variables as

interest coverage proxies still the same for IR and FX hedgers. That strengthens what have been said before.

Tab. 15 - Mean difference test of FX hedgers vs non-FX hedgers (bias).

This table presents the results from the Mean difference test and the Wilcoxon rank sum test. The tests are performed on a range of independent variables between FX derivatives users versus non-FX derivative users, where ***, ** and * indicate the significance at 1%, 5% and 10% respectively.

VARIABLE	Hedgers		Non-Hedgers		T-Stat		Wilcoxon rank sum test			
	N	Mean	N	Mean	Diff	T-stat	Sig n.	H&NH	Z	Sign.
ZSC	121	1,60	676	0,93	-0,68	-5,72	0,00 ***	H>NH	-6,04	0,00
DIVYIELD	76	3,28	318	3,64	0,36	1,03	0,30	H=NH	1,04	0,30
<u>LEVERAGE</u>										
DEBT-EQUITY	65	19,19	562	22,93	3,73	0,26	0,80	H=NH	0,57	0,57
DEBT-CAPITAL	65	0,24	562	0,31	0,07	0,62	0,53	H=NH	2,63	0,01
LT-DEBT-CAPITAL	67	0,12	635	0,20	0,08	2,02	0,04 **	H<NH	3,23	0,00
LT-DEBT-EQUITY	67	0,21	635	0,30	0,09	0,96	0,34	H=NH	2,60	0,01
LIAB-ASSETS	127	0,38	861	0,50	0,12	5,10	0,00 ***	H<NH	5,38	0,00
GEARING-RAT	136	25,99	884	58,70	32,71	4,47	0,00 ***	H<NH	5,23	0,00
BV	65	0,20	562	0,32	0,13	2,94	0,00 ***	H<NH	3,25	0,00
MKT-V	62	0,26	441	0,38	0,12	4,04	0,00 ***	H<NH	3,92	0,00
<u>LIQUIDITY</u>										
CRAT	148	2,66	104 9	2,10	-0,56	-3,12	0,00 ***	H>NH	-5,56	0,00
QRAT	105	2,02	616	1,56	-0,46	-3,48	0,00 ***	H>NH	-4,50	0,00
LIQUIDITY-RATIO-X	148	2,20	104 9	1,74	-0,46	-3,25	0,00 ***	H>NH	-4,31	0,00
SHAREHOLDERS-LIQUIDITY-RATIO-X	132	42,34	865	31,91	-10,43	-1,21	0,23	H=NH	-5,37	0,00
SOLVENCY-RATIO-ASSET-BASED	148	62,54	103 9	51,26	-11,28	-5,18	0,00 ***	H>NH	-5,34	0,00
<u>PROFITABILITY</u>										
ROC	148	7,36	104 1	-3,58	-10,94	-2,25	0,02 **	H>NH	-3,69	0,00
ROE	142	0,01	100 3	-0,10	-0,11	-1,25	0,21	H>NH	-2,22	0,03
PROFIT-MARGIN	145	6,23	962	-0,09	-6,32	-3,14	0,00 ***	H>NH	-3,37	0,00
RETURN-ON-SHAREHOLDER-FUNDS	147	8,44	984	-7,20	-15,64	-3,09	0,00 ***	H>NH	-3,45	0,00
RETURN-ON-TOTAL-ASSETS	148	5,61	104 8	-4,05	-9,66	-4,09	0,00 ***	H>NH	-4,56	0,00
EBIT-MARGIN	147	4,17	102 1	-5,40	-9,57	-2,18	0,03 **	H>NH	-2,81	0,01
EBIT-DAMARGIN	147	10,47	101 9	4,78	-5,70	-1,55	0,12	H=NH	-2,26	0,02
GROSS-MARGIN	131	46,20	880	47,96	1,76	0,80	0,42	H=NH	0,73	0,47
<u>IC</u>										
EBIT-INP	120	64,45	824	-15,14	-79,60	-3,78	0,00 ***	H>NH	-5,93	0,00
EBIT-DAINP	120	121,0 8	824	12,23	-108,86	-4,21	0,00 ***	H>NH	-6,56	0,00
INTEREST-COVER-X	122	45,85	803	14,06	-31,78	-4,54	0,00	H>NH	-5,35	0,00

ASSETCOVERX	65	89,51	625	62,04	-27,46	-1,44	0,15	H=NH	-3,79	0,00
BERRYRATIO	131	1,21	877	1,13	-0,08	-1,10	0,27	H=NH	-4,25	0,00
<u>GROWTH OPPORTUNITY</u>										
CAPEXPSALES	17	-0,03	276	-0,04	-0,01	-0,42	0,67	H=NH	-0,58	0,56
MKTTBRAT	135	0,37	799	0,49	0,12	4,74	0,00 ***	H<NH	5,03	0,00
<u>DEBT MATURITY</u>										
STBORROW	65	0,47	562	0,44	-0,03	-0,85	0,40	H=NH	-0,76	0,45
LTBORROW	65	0,53	562	0,56	0,03	0,85	0,40	H=NH	0,76	0,45
<u>FIRM SIZE</u>										
LNMKTCP	135	3,07	799	2,58	-0,49	-3,62	0,00 ***	H>NH	-3,72	0,00
LNTOTSALES	142	10,14	988	9,39	-0,75	-8,56	0,00 ***	H>NH	-9,31	0,00
LNTOTASSETS	142	10,13	100 4	9,70	-0,43	-3,62	0,00 ***	H>NH	-5,37	0,00
<u>FOREIGN EXCHANGE</u>										
FOREIGNSALES	142	0,44	988	0,24	-0,20	-6,59	0,00 ***	H>NH	-5,63	0,00

Source: author's elaboration – FAME database.

Tab. 16 - Mean difference test of IR hedgers vs non-IR hedgers (bias).

This table presents the results from the Mean difference test and the Wilcoxon rank sum test. The tests are performed on a range of independent variables between IR derivatives users versus non-IR derivative users, where ***, ** and * indicate the significance at 1%, 5% and 10% respectively.

Variable	Hedgers		Non-Hedgers		Diff	T-Stat		Wilcoxon rank sum test		
	N	Mean	N	Mean		T-stat	Sig n.	H&NH	Z	Sign.
ZSC	132	0,73	665	1,09	0,36	3,12	0,00 ***	H<NH	5,14	0,00
DIVYIELD	90	3,37	304	3,63	0,26	0,80	0,43	H=NH	0,55	0,58
<u>LEVERAGE</u>										
DEBT-EQUITY	122	40,18	505	18,28	-21,90	-1,96	0,05 **	H>NH	-4,43	0,00
DEBT-CAPITAL	122	0,28	505	0,30	0,02	0,28	0,78	H=NH	-3,74	0,00
LT-DEBT-CAPITAL	135	0,25	567	0,18	-0,06	-2,03	0,04 **	H>NH	-6,29	0,00
LT-DEBT-EQUITY	135	0,48	567	0,25	-0,23	-3,34	0,00 ***	H>NH	-7,27	0,00
LIAB-ASSETS	151	0,49	837	0,48	-0,01	-0,41	0,68	H=NH	-1,94	0,05
GEARING-RAT	152	75,00	868	50,72	-24,28	-3,46	0,00 ***	H>NH	-7,55	0,00
BV	122	0,36	505	0,30	-0,06	-1,97	0,05 **	H>NH	-4,46	0,00
MKT-V	109	0,50	394	0,33	-0,17	-7,06	0,00 ***	H>NH	-6,67	0,00
<u>LIQUIDITY</u>										
CRAT	158	1,96	103 9	2,20	0,24	1,39	0,17	H<NH	4,51	0,00
QRAT	90	1,36	631	1,67	0,31	2,19	0,03 **	H<NH	2,60	0,01
LIQUIDITY-RATIO-X	158	1,31	103 9	1,87	0,56	4,04	0,00 ***	H<NH	5,82	0,00
SHAREHOLDERS-LIQUIDITY-RATIO-X	154	8,64	843	37,80	29,16	3,62	0,00 ***	H<NH	6,81	0,00
SOLVENCY-RATIO-ASSET-BASED	157	51,92	103 0	52,78	0,86	0,40	0,69	H=NH	2,24	0,03
<u>PROFITABILITY</u>										
ROC	158	1,13	103 1	-2,73	-3,86	-0,82	0,41	H=NH	0,66	0,51

ROE	154	-0,01	991	-0,10	-0,10	-1,15	0,25	H=NH	0,61	0,54
PROFITMARGIN	137	5.87	970	0.01	-5.86	-2.84	0,00 ***	H>NH	-2.32	0.02
RETURNONSHAREHOLDER SFUNDS	155	-1,03	976	-5,82	-4,79	-0,96	0,34	H=NH	0,67	0,50
RETURNONTOTALASSETS	158	0,90	103 8	-3,43	-4,33	-1,88	0,06 *	H<NH	0,29	0,77
EBITMARGIN	153	11,41	101 5	-6,55	-17,96	-4,18	0,00 ***	H>NH	-5,27	0,00
EBITDAMARGIN	153	19,70	101 3	3,35	-16,35	-4,57	0,00 ***	H>NH	-5,95	0,00
GROSSMARGIN	123	46,95	888	47,84	0,89	0,39	0,70	H=NH	-0,15	0,88
<u>IC</u>										
EBITINP	147	9,92	797	-7,78	-17,70	-0,91	0,36	H=NH	-0,69	0,49
EBITDAINP	147	21,50	797	26,91	5,41	0,23	0,82	H=NH	0,65	0,51
INTERESTCOVERX	150	11,63	775	19,54	7,91	1,22	0,22	H=NH	1,02	0,31
ASSETCOVERX	138	16,90	552	76,56	59,66	4,35	0,00 ***	H<NH	7,56	0,00
BERRYRATIO	123	1,22	885	1,13	-0,09	-1,11	0,26	H=NH	-1,91	0,01
<u>GROWTH OPPORTUNITY</u>										
CAPEXPSALES	14	0,00	279	-0,04	-0,04	-1,27	0,20	H=NH	0,35	0,73
MKTTBRAT	137	0,49	797	0,47	-0,02	-0,83	0,41	H=NH	-2,53	0,01
<u>DEBT MATURITY</u>										
STBORROW	122	0,30	505	0,48	0,18	5,98	0,00 ***	H<NH	6,11	0,00
LTBORROW	122	0,70	505	0,52	-0,18	-5,98	0,00 ***	H>NH	-6,11	0,00
<u>FIRM SIZE</u>										
LNMKTCAP	138	3,21	796	2,55	-0,67	-4,98	0,00 ***	H>NH	-5,67	0,00
LNTOTSALES	149	9,92	981	9,41	-0,51	-5,81	0,00 ***	H>NH	-5,58	0,00
LNTOTASSETS	154	10,80	992	9,59	-1,21	-11,02	0,00 ***	H>NH	-	0,00
<u>FOREIGN EXCHANGE</u>										
FOREIGNSALES	149	0,21	981	0,27	0,06	2,06	0,04 **	H<NH	2,05	0,04

Source: author's elaboration – FAME database.

Summary Mean difference test and Wilcoxon rank sum test

What can be concluded is that companies using derivatives are those with an higher level of leverage and that can be explained by the fact that higher leveraged firms – enterprises with more debt and thus higher level of interest rate exposure – would be more concerned about the interest changes on loans than lower leveraged firms. And that is shown in table 12 by the fact that three out of four significant leverage variables are higher for hedgers and in table 14 and 16 where all the five significant variables are higher for IR hedgers. And the debt maturity proxies in the same tables shows that firms facing long term borrowing are more likely to use hedge instruments as derivatives. But at the same time the use of FX derivative can be justified by the fact that in tables 12, 13 and 15 the foreign sales variable is significant and higher for hedgers.

5.2.1: Univariate logit regression: UK non-financial listed SMEs

With the mean difference test and the rank sum test have been examined the different features between hedgers and non-hedgers. In this paragraph are going to be presented the results of univariate logit tests run with all the variables examined in the previous part. By doing this is get an estimated idea of the effect of every individual variable in the decision of hedging, so can choose with more confidence the most significant variables to run multivariate logit regression and construct the best model to explain the determinants of hedging. The same test has been run to check the effect of every variable on users of derivatives, users of FX derivatives and users of IR derivatives without bias.

The *leverage measure* for hedgers and IR hedgers is market value leverage because it is significant and it has a positive coefficient. The FX hedgers has liability assets as most significant variable but have to be taken into account that it has a negative coefficient. These results are consistent with the one shown in tables 12, 13 and 14 where those proxies are higher for hedgers and IR hedgers.

Liquidity variables present different results for different groups. For users and FX derivative users the significant liquidity ratio is solvency ratio asset based, but it has a positive coefficient that is in contrast with what the literature says. That it is also shown in tables 12 and 13. For the IR derivative users the liquidity ratio is significant and have a negative coefficient so a negative influence in the hedging decision and it agrees with what stated in table 14.

Profitability variable for FX derivative users is ROA, for IR derivative users is EBITDA Margin and for Users is Profit Margin. All of these variables have a positive coefficient as stated by the literature. Furthermore this positive relationship is verified also by the mean difference test tables 12, 13 and 14.

Interest coverage the most significant variable for Users is EBIT interest payment but it has a wrong coefficient, thus at the same time as IC measure with a negative coefficient there is Asset coverage ratio. About the FX derivatives users, Interest coverage ratio represents the most significant variable but with a negative coefficient. IR Users as significant variable Asset coverage ratio that has a negative coefficient as expected. In fact also in the previous tests have been shown that what the literature says is not verified by our data.

About the *firm growth* in the group of derivative users and FX derivative users the variable with more relevance is mark to book ratio and has negative coefficient as not predicted. But for IR derivative users there is no firm growth significant

variables. Also through the mean difference test there is a negative relationship between growth opportunity and hedging that could be explained by the fact that the sample is composed by SMEs and could be that those companies do not intend to use derivatives to hedge growth opportunity, could be that they use other tools.

Debt maturity variable for users and IR derivative users is the long term debt (ltborrow) and it is the most significant debt maturity variable and as the literature says and the previous test shown there is a positive relationship. For FX derivative users there is no debt maturity significant variables. That agrees with what have been shown in the mean difference test.

To capture the effect of the *firm size* the natural log of total sales is the variable with more relevance for users and FX derivative user. IR derivative users have natural log of total assets as significant variable to be explain that. In all of these cases the previous results confirms what have been just stated.

To measure the *risk of default* and *dividend yield* we have used the z-score and dividend yield respectively because they are the only variables available in their respective categories, although dividend yield is not significant when it is analysed in all of the groups and the z-score is statistically significant in the group of IR and FX users but in the FX users its coefficient is positive instead of negative.

Tab. 17 - Univariate Logit of hedgers.

This table presents the results from univariate logit regression using a binary variable equal to 1 if firms use derivatives and 0 if otherwise. The table presents the number of observations, coefficients, robust standard errors, z-statistics, p-values and Wald chi-square statistics. ***, ** and * indicate the significance at 1%, 5% and 10% respectively.

	Variables	N	Coeff		Robust std.errors	Z-stat	P- value	chi2
	Zsc	797	0,097		0,062	1,58	0,11	2,50
	Divyield	394	-0,033		0,038	-0,85	0,39	0,73
LEVERAGE	debtquity	627	-1,018	**	0,001	2,26	0,02	5,12
	debtcapital	627	-0,061		0,088	-0,69	0,49	0,47
	ltdebtcapital	702	0,109		0,236	0,46	0,64	0,21
	ltdebtquity	702	0,266	***	0,105	2,54	0,01	6,43
	liabassets	988	-0,970	***	0,284	-3,41	0,00	11,62
	gearingrat	1020	0,000		0,001	-0,23	0,81	0,06
	Bv	627	-0,005		0,243	-0,02	0,98	0,00
	Mktv	503	1,378	***	0,424	3,25	0,00	10,57
LIQUIDITY	Crat	1197	0,057	*	0,303	1,87	0,06	3,50
	Qrat	721	0,067		0,065	1,03	0,30	1,06
	liquidityratiox shareholdersliqui	1197	-0,005		0,042	-0,11	0,91	0,01
	dityratiox	997	-0,002	*	0,001	-1,64	0,10	2,69
	solvencyratioass etbased	1187	0,010	***	0,003	3,83	0,00	14,68
	Roc	1189	0,002	**	0,001	2,37	0,02	5,63
PROFITABILITY	Roe	1145	0,117	*	0,064	1,83	0,07	3,34
	profitmargin	1107	0,153	***	0,003	4,39	0,00	19,30
	returnonsharehol dersfunds	1131	0,003	***	0,001	2,55	0,01	6,49
	Returnontotalass ets	1196	0,133	***	0,003	4,10	0,00	16,78
	ebitmargin	1168	0,008	***	0,002	2,74	0,01	7,51
	ebitdamargin	1166	0,008	***	0,003	3,25	0,00	10,57
	grossmargin	1011	-0,005		0,003	-1,48	0,14	2,19
	Ebitinp	944	0,001	***	0,000	3,30	0,00	10,90
IC	ebitdainp	944	0,001	***	0,000	2,65	0,01	7,02
	interestcoverx	925	0,001		0,009	1,47	0,14	2,17
	assetcoverx	690	-0,002	**	0,001	-2,04	0,04	4,16
	berryratio	1008	0,102		0,084	1,21	0,23	1,47
	capexpsales	293	3,281	**	1,477	2,22	0,03	4,93
GROWTH OP.	mktbrat	934	-0,828	***	0,282	-2,93	0,00	8,60
	stborrow	627	-1,199	***	0,328	-3,66	0,00	13,38
DEBT MATURITY	ltborrow	627	1,198	***	0,328	3,66	0,00	13,37
	lnmktcap	934	0,303	***	0,055	5,47	0,00	29,90
FIRM SIZE	Intotsales	1130	0,799	***	0,084	9,54	0,00	91,01
	Intotassets	1146	0,557	***	0,059	9,51	0,00	90,42
FOREIGN EXPOSURE	foreignsales	1130	0,550	***	0,202	2,72	0,01	7,42

Source: author's elaboration – FAME database.

Tab. 18 - Univariate Logit of IR (bias).

This table presents the results from univariate logit regression using a binary variable equal to 1 if firms hedge with IR derivatives and 0 if otherwise. The table presents the number of observations, coefficients, robust standard errors, z-statistics, p-values and Wald chi-square statistics. ***, ** and * indicate the significance at 1%, 5% and 10% respectively.

	Variables	N	Coeff		Robust std.errors	Z-stat	P- value	chi2
	Zsc	797	-0,222	***	0,060	-3,68	0,00	13,52
	Divyield	394	-0,037		0,045	-0,82	0,41	0,67
LEVERAGE	debtquity	627	0,001	*	0,001	1,84	0,07	3,40
	debtcapital	627	-0,032		0,110	-0,29	0,77	0,08
	ltdebtcapital	702	0,589	**	0,288	2,05	0,04	4,19
	ltdebtquity	702	0,402	***	0,114	3,52	0,00	12,41
	liabassets	988	0,139		0,274	0,51	0,61	0,26
	gearingrat	1020	0,003	***	0,001	3,90	0,00	15,19
	Bv	627	0,532	**	0,232	2,29	0,02	5,25
	Mktv	503	3,301	***	0,465	7,10	0,00	50,37
LIQUIDITY	Crat	1197	-0,067		0,070	-0,96	0,34	0,92
	Qrat	721	-0,243	**	0,120	-2,03	0,04	4,13
	liquidityratiox shareholdersliqui	1197	-0,344	***	0,116	-2,97	0,00	8,80
	dityratiox	997	-0,019		0,013	-1,49	0,14	2,23
	solvencyratioass etbased	1187	-0,001		0,003	-0,52	0,60	0,28
PROFITABILITY	Roc	1189	0,001		0,001	1,22	0,22	1,49
	Roe	1145	0,119	*	0,064	1,86	0,06	3,47
	profitmargin	1107	0,012	***	0,005	2,52	0,01	6,34
	returnonsharehol dersfunds	1131	0,002		0,001	1,17	0,24	1,37
	returnontotalass ets	1196	0,007	***	0,003	2,70	0,01	7,28
	ebitmargin	1168	0,012	***	0,005	2,60	0,01	6,77
	ebitdamargin	1166	0,012	***	0,004	3,19	0,00	10,19
	grossmargin	1011	-0,002		0,004	-0,41	0,68	0,17
IC	Ebitinp	944	0,000		0,000	1,50	0,14	2,24
	ebitdainp	944	0,000		0,000	-0,41	0,68	0,17
	interestcoverx	925	-0,002		0,002	-1,21	0,23	1,46
	assetcoverx	690	-0,011	**	0,005	-2,27	0,02	5,15
	berryratio	1008	0,115		0,120	0,96	0,34	0,92
GROWTH OP.	capexpsales	293	3,916		2,153	1,35	0,18	1,83
	mktbrat	934	0,270		0,266	1,02	0,31	1,03
DEBT MATURITY	stborrow	627	-2,226	***	0,418	-5,33	0,00	28,40
	ltborrow	627	2,226	***	0,418	5,33	0,00	28,40
FIRM SIZE	lnmktcap	934	0,316	***	0,067	4,74	0,00	22,46
	Intotsales	1130	0,557	***	0,081	6,88	0,00	47,40
	Intotassets	1146	0,695	***	0,070	9,94	0,00	98,71
FOREIGN EXPOSURE	foreignsales	1130	-0,583	**	0,271	-2,15	0,03	4,62

Source: author's elaboration – FAME database.

Tab. 19 - Univariate Logit of FX (bias).

This table presents the results from univariate logit regression using a binary variable equal to 1 if firms hedge with FX derivatives and 0 if otherwise. The table presents the number of observations, coefficients, robust standard errors, z-statistics, p-values and Wald chi-square statistics. ***, ** and * indicate the significance at 1%, 5% and 10% respectively.

	Variables	N	Coeff		Robust std.errors	Z-stat	P- value	chi2
	Zsc	797	0,586	***	0,098	5,93	0,00	35,15
	Divyield	394	0,052		0,052	-0,99	0,32	0,98
LEVERAGE	debtquity	627	0,000		0,001	-0,40	0,69	0,16
	debtcapital	627	-0,085		0,065	-1,32	0,19	1,75
	ltdebtcapital	702	-0,805	***	0,271	-2,97	0,00	8,83
	ltdebtquity	702	-0,183		0,158	-1,16	0,25	1,33
	liabassets	988	-2,542	***	0,462	-5,50	0,00	30,24
	gearingrat	1020	-0,012	***	0,004	-3,49	0,00	12,15
	Bv	627	-2,067	***	0,656	-3,15	0,00	9,91
	Mktv	503	-2,677	***	0,614	-4,36	0,00	19,03
LIQUIDITY	Crat	1197	0,105	***	0,029	3,59	0,00	12,89
	Qrat	721	0,247	***	0,067	3,67	0,00	13,48
	liquidityratiox shareholdersliqui	1197	0,141	***	0,040	3,49	0,00	12,17
	dityratiox	997	0,001		0,001	1,33	0,18	1,76
	solvencyratioass etbased	1187	0,024	***	0,004	5,77	0,00	33,28
	Roc	1189	0,004	***	0,001	3,45	0,00	11,92
PROFITABILITY	Roe	1145	0,137		0,093	1,48	0,14	2,19
	profitmargin	1107	0,014	***	0,003	3,86	0,00	14,93
	returnonsharehol dersfunds	1131	0,008	***	0,002	3,81	0,00	14,50
	returnontotalass ets	1196	0,025	***	0,006	4,21	0,00	17,73
	ebitmargin	1168	0,005	***	0,002	3,15	0,00	9,92
	ebitdamargin	1166	0,004	***	0,001	2,75	0,01	7,55
	grossmargin	1011	-0,003		0,004	-0,88	0,38	0,77
	Ebitinp	944	0,002	***	0,000	4,03	0,00	16,28
IC	ebitdainp	944	0,001	***	0,000	3,90	0,00	15,17
	interestcoverx	925	0,004	***	0,001	4,13	0,00	17,07
	assetcoverx	690	0,001		0,001	1,49	0,14	2,23
	berryratio	1008	0,111	*	0,061	1,82	0,07	3,32
	GROWTH OP.	capexpsales	293	0,888		0,832	1,07	0,29
mktbrat		934	-2,314	***	0,442	-5,24	0,00	27,42
DEBT MATURITY	stborrow	627	0,359		0,437	0,82	0,41	0,67
	ltborrow	627	-0,359		0,437	-0,82	0,41	0,67
FIRM SIZE	lnmktcap	934	0,231	***	0,065	3,57	0,00	12,75
	Intotsales	1130	0,884	***	0,107	8,25	0,00	68,14
	Intotassets	1146	0,237	***	0,053	4,50	0,00	20,24
FOREIGN EXPOSURE	foreignsales	1130	1,514	***	0,242	6,27	0,00	39,28

Source: author's elaboration – FAME database.

In the table below have been summarized in order by significance, all the significant independent variables for each dependent binary variable. To build up the multivariate regression for each proxy have been taken into account the independent variables that the dependent variables have in common and at the same time those who have the high number of observations.²⁶

²⁶ The data sample consists of 1328 firm-year observations.

Tab. 20 - Summary independent variables for multivariate model.

HEDGERS	No. Obs.	IR	No. Obs.	FX	No. Obs.
		Z-Score	797	Z-Score	797
Leverage					
Liability Assets	988	Market Value	503	Liability Assets	988
Market Value	503	Gearing Ratio	1020	Market Value	503
Long Term Debt	702	Long Term Debt	702	Gearing Ratio	1020
Equity		Equity			
Debt Equity	627	Book Value	627	Book Value	627
		Leverage		Leverage	
		Long Term Debt	702	Long Term Debt	702
		Capital		Capital	
Liquidity					
Solvency Ratio	1187	Debt Equity	627	Solvency Ratio	1187
Asset Based				Asset Based	
Currency Ratio	1197	Liquidity Ratio	1197	Quick Ratio	721
Shareholders	997	Quick Ratio	721	Currency Ratio	1197
Liquidity Ratio				Liquidity Ratio	
Profitability					
Profit Margin	1107	EBITDA Margin	1166	ROA	1196
ROA	1196	ROA	1196	Profit Margin	1107
EBITDA Margin	1166	EBIT Margin	1168	Return on	1131
				Shareholders	
				Funds	
EBIT Margin	1168	Profit Margin	1107	ROC	1189
Return on	1131	ROE	1145		
Shareholders'					
Funds					
ROC	1189				
ROE	1145				
Interest Coverage					
EBIT Interest	944	Asset Coverage	690	Interest Cover	925
Payment					
EBITDA Interest	944			EBIT Interest	944
Payment				Payment	
Asset Coverage	690			EBITDA Interest	944
Ratio				Payment	
				Berry Ratio	1008
Growth Opportunities					
Market To Book	934			Market To Book	934
Ratio				Ratio	
Capital	293				
Expenditure					
Debt Maturity					
Long Term Borrow	627	Long Term Borrow	627		
Short Term Borrow	627	Short Term Borrow	627		
Firm Size					
Ln Total Sales	1130	Ln Total Assets	1146	Ln Total Sales	1130
Ln Total Assets	1146	Ln Total Sales	1130	Ln Total Assets	1146
Ln Market	934	Ln Market	934	Ln Market	934
Capitalization		Capitalization		Capitalization	
Foreign Exposure					
Foreign Sales	1130	Foreign Sales	1130	Foreign Sales	1130

Source: author's elaboration.

5.2.2: Multivariate logit regression: UK non-financial listed SMEs

To run the Multivariate logit regression have been used the following independent variables:

Tab. 21 - Summary independent variables and relative literature.

Independent Variables	Literature
Z-SCORE	Altman (1968)
<u>Leverage</u>	
Market Value	Stulz (1996) Leland (1998)
<u>Liquidity</u>	
Solvency Ratio Asset Based	Froot (1993)
Currency Ratio	
Quick Ratio	
<u>Profitability</u>	
Profit Margin	Glaum (2002) Bartram et al. (2009)
ROA	
Return on Shareholders' Funds	
ROC	
ROE	
<u>Interest Coverage</u>	
EBIT Interest Payment	Geczy (1997) Judge (2006)
Asset Coverage	Bartram et al. (2009)
<u>Growth Opportunities</u>	
Market To Book Ratio	Myers (1977) Bressembinder (1991) Froot et al. (1993)
<u>Debt Maturity</u>	
Long Term Borrow	Stulz (1996) Leland (1998)
Short Term Borrow	
<u>Firm Size</u>	
Ln Total Sales	Graham and Rodgers (2002) Judge (2006)
Ln Total Assets	Campello et al. (2011)
<u>Foreign Exposure</u>	
Foreign Sales	Smith and Stulz (1985) Allayannis and Ofek (2001)

Source: author's elaboration.

Univariate tests have given an indication of the relationship between hedging and the different firm characteristics. However, these tests tend to be weak since the interaction between different independent variables is not taken into account. The table below presents the results from a cluster-specific logit regression between the probability of hedging and several independent variables. The results in model 1-7 suggest that firm size and hedging substitute ratios are the most significant variables to determine the probability of hedging. The first showing a positive relationship between the use of derivatives and the firm's dimension. In the other hand, hedging substitute measure highlight that small and medium enterprises which use hedging substitute are less likely to hedge by derivatives instruments.

Foreign sale has been used as a proxy for foreign exposure. It has a positive coefficient in six out of seven of the models studied but at the same time in four out of seven is not significant. The positive coefficients support what have been said by Smith and Stulz (1985). Their idea was that firms with more foreign exposure are more likely to hedge. Allayannis and Ofek (2001) with their findings suggested that the foreign sales is the most significant factor in explaining the use of derivatives.

Leverage and debt maturity. The variables that have been used (market value leverage and long term borrow) show that there is a positive relationship with the probability of hedging. That is consistent with what Stulz (1996) and Leland (1998) demonstrated, that is the existence of a strong relation between debt and hedging. They showed how companies hedging reduce the likelihood of bankruptcy and therefore are able to increase their level of debt. In fact market value of leverage has the greatest elasticity and odds value. In model 3 an increase of 1% in leverage would argument the probability of hedging by 23.44% and the odds of using derivative for companies with greater leverage is 3.18 times higher than for companies with low leverage ratios.

Solvency ratio assets based has been used as liquidity variable and as predicted has a negative impact in hedging probability and that is consistent with Froot et al. (1993). They predicted a negative association between liquidity and hedging.

The *Interest Coverage* proxies used have been EBIT Interest Payments and Asset coverage ratio, these variables are all significant but EBIT Interest Payment

has a positive coefficient instead of negative as the theories of Froot et al. (1993) say. For them the volatility seems to have opposite effects. They affirmed that hedging reduces cash flow volatility leading to better rates for financing, therefore those companies with higher rates of volatility are more likely to use derivatives in order to reduce the financial risk and get an easier and better conditions access for funding.

The *profitability variables* that have been employed to measure the relationship with the probability of hedging are profit margin and the return on total assets. These two variables have a positive coefficient and are significant. Bartram et al. (2009) argue that firms having a lower probability of financial distress are less likely to hedge. Glaum (2002) argues that firms with high profitability will enable managers to conduct a more selective hedging strategy to take bets in the financial markets, thus there should be a positive relationship between hedging and profitability.

After analyzing all variables can be concluded that the decision of using derivatives as hedging instruments is closely related to factors determining the liquidity costs, the firm size and the overseas operations, the variables of these proxies are significant in almost all the models.

The *market to book ratio* has been used as a proxy of underinvestment costs. It is significant in all the seven models but at the same time it has a negative coefficient instead of positive. The literature says that is expected that companies with more growth opportunities are more likely to hedge in order to protect investments and get a constant flow of financing avoiding unexpected disturbances, Froot et al. (1993).

The last two tables show the results for models having as dependent variable the probability of using FX and IR derivative respectively.

The Table 25 shows the relationship between the probability that a firm hedges with IR derivatives and proxies for incentives to hedge. The market value leverage and short and long term borrow are important factor in determining whether to hedge with IR derivatives. The most important factor as financial distress proxies is leverage, and also it is the one who is ranked as the most important variable when comparing the marginal effect across models, which gives strong support to the notion that firms' with more exposure to interest rate changes are more likely to hedge. According to Bessembinder (1991) and Myers (1977), the significantly positive effect of leverage on the likelihood of hedging is

consistent with the notion that asymmetric information can lead to underinvestment when leverage is high, resulting in increased agency costs which creates incentives for firms to hedge.

Scale economies also create benefits for small and medium firms to hedge, which is indicated by the positive relationship between firm size and IR hedging.

The last table suggests that FX exposure resulting from foreign operating revenues is an important factor in determining whether firm hedges FX risks. This support the argument that firms with more volatile income resulting from changes in the exchange rate are more likely to hedge with FX derivatives, which is supported by the findings in the multivariate logit regression. As for the hedgers, there is a positive link between firm size and probability of hedging and that supports scale economies hypothesis. The liquidity ratios are negative related to hedge with FX derivatives, which is consistent with the notion that firms can invest in more liquid and less risky assets and thus reduce the probability of financial distress.

With the multivariate analysis have been tried to identify a model with all the most significant variables. Hence, have been started creating the model with the most significant variables and then based on trial and error method adding other variables have been tried to find those that are meaningful to create the model with the largest number of explanatory variables which reflects the best possible decision of hedging. At the end have been obtained a model composed of six independent variables statistically significant: ROA, market to book ratio, foreign sales, natural log of total assets and solvency ratio asset based – Model 5.

As might be expected when this model has been applied to specific cases as the probability of using foreign exchange derivatives or interest rate derivatives have been found that some variables are no longer significant. For IR Hedgers those variables are: ROA and market to book ratio. Whilst for FX Hedgers all these variables are significant.

Looking into the summary statistics of each table is possible to demonstrate why model 5 has been choose as the best model. Taking into account the summary table related to the probability of hedging (Use) model 5 has the highest number of observation (914) and correctly predicted the 75.00% of the derivatives users and the 59.76% of the no derivatives users. Thus the 36.11 % of the sample are misclassified cases. But the same model at the same time when predicts the probability of hedging by IR its correctly predicted only the 35.90% would use

derivatives and the 89.49% would not use those instruments. So the 18.48% of the sample are misclassified cases. For the probability of hedging instruments by FX the 18.87% of the sample are misclassified cases so the 45.45% would use derivatives and 87.54% would not use derivatives. In both the probability tables of Use and FX Hedgers the chi square is high, respectively 102.33% for Use and 98.82% for FX Hedgers but for IR hedgers the chi square is 55.05%.

Is interesting focusing on the numbers of users and non-users displayed in table 25 and 26. The table 25 shows the probability of hedging by IR derivative and the data show that over 78 observation as users only 28 are classified as users IR derivatives and at the same time there are 50 misclassified non derivatives users, so that could be explained in two ways the first is that the 47 misclassified IR users could be FX users or otherwise they should not be users. In all the seven model the sensitivity is very lower for IR derivative users compared with the one in table of the FX hedging. But at the same time the sensitivity is higher in table 24. About the misclassification for the Probability of hedging by FX derivatives presents a similar situation with the one presented by the IR derivatives users so could justify the misclassification.

Tab. 24 - Logit Regression on the probability of hedging (Use).

This table presents logit regression estimates of the relation between the probability that a firm hedge as proxies for incentives to hedge (Panel A). the dependent variable equals 1 if a firm provides qualitative information of any derivative use in the annual report, an 0 if otherwise. The model presents log of odds coefficients (Coef.), marginal effects (ME), odds ratios and the respective p-values in parenthesis. The estimated coefficients give the change in the logit function given a change in the independent variable. The marginal effect (elasticities) measures the actual change (percentage change) in the probability of hedging for 1% increase in the independent variable. The higher the elasticity' value more important is the variable in the model. The odds ratio gives the likelihood of Y = 1 when X is increased by one unit. The p-values are calculated using the robust (heteroscedastic) standard errors. ***, ** and * indicate the significance at 1%, 5% and 10% respectively.

Indep. Variables	MOD.1			MOD.2			MOD.3			MOD.4			MOD.5			MOD.6			MOD.7			
	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	
EBIT INT PAYMENT	0.002 (0.003) ***	0.000 (0.002) ***	1.002 (0.003) ***																			
ASSETCOVERERX				- 0.001 (0.292)	- 0.000 (0.291)	0.999 (0.292)																
MKTV							1.156 (0.017) **	0.234 (0.017) **	3.176 (0.017) **													
PROFIT MARGIN										0.008 (0.069) *	0.001 (0.068) *	1.008 (0.069) *										
ROA													0.010 (0.057) *	0.002 (0.053) *	0.010 (0.057) *							
ST BORROW																0.996 (0.007) ***	0.201 (0.006) ***	0.370 (0.007) ***				
LT BORROW																			0.995 (0.007) ***	0.201 (0.006) ***	2.706 (0.007) ***	
MKTTBRAT	- 73.587 (0.007) ***	- 14.136 (0.005) ***	0.000 (0.007) ***	- 77.580 (0.017) **	- 15.841 (0.016) **	0.000 (0.017) **	- 75.952 (0.025) **	- 15.407 (0.023) **	0.000 (0.025) **	- 80.844 (0.002) ***	- 14.106 (0.001) ***	0.000 (0.002) ***	- 67.703 (0.007) ***	- 12.138 (0.005) ***	- 67.703 (0.007) ***	- 78.911 (0.019) **	- 15.970 (0.018) **	0.000 (0.019) **	- 78.916 (0.019) **	- 15.971 (0.018) **	0.000 (0.019) **	
FOREIGN SALES	0.251 (0.299) *	0.048 (0.299) *	1.285 (0.299) *	0.014 (0.962) *	0.003 (0.962) *	1.014 (0.962) *	0.101 (0.737) *	0.020 (0.737) *	0.904 (0.737) *	0.278 (0.237) **	0.048 (0.237) **	1.320 (0.237) **	0.469 (0.034) **	0.084 (0.034) **	0.469 (0.034) **	0.020 (0.948) ***	0.004 (0.948) ***	1.020 (0.948) ***	0.020 (0.948) ***	0.004 (0.948) ***	1.020 (0.948) ***	
LN SALES							0.679 (0.000) ***	0.138 (0.000) ***	1.971 (0.000) ***	0.730 (0.000) ***	0.127 (0.000) ***	2.075 (0.000) ***				0.649 (0.000) ***	0.131 (0.000) ***	1.913 (0.000) ***	-0.786 (0.020) **	-0.159 (0.018) **	0.456 (0.020) **	

LN ASSETS	0.462 (0.000) ***	0.089 (0.000) ***	1.589 (0.000) ***	0.464 (0.000) ***	0.095 (0.000) ***	1.590 (0.000) ***							0.515 (0.000) ***	0.092 (0.000) ***	0.515 (0.000) ***						
Q-RATIO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SOLVENCY RATIO	0.727 (0.008) ***	0.139 (0.006) ***	0.483 (0.008) ***	0.774 (0.017) **	0.158 (0.016) **	0.461 (0.017) **	0.752 (0.026) **	0.153 (0.025) **	0.471 (0.026) **	0.795 (0.002) ***	0.139 (0.001) ***	0.451 (0.002) ***	0.672 (0.007) ***	0.121 (0.006) ***	0.672 (0.015) **	0.786 (0.020) **	0.159 (0.018) **	0.456 (0.020) **	0.786 (0.020) **	0.159 (0.018) **	0.456 (0.020) **
Z-SCORE																					
_cons	67.568 (0.013) **		2.2e+2 9 (0.013) **	72.003 (0.026) **		1.9e+3 1 (0.026) **	67.800 (0.045) **		2.8e+2 9 (0.045) **	71.933 (0.006) ***		1.7e+3 1 (0.006) ***	61.180 (0.015) **		61.180 (0.015) **	72.063 (0.033) **		2e+31 (0.033) **	71.020 (0.035) **		7.4e+30 (0.035) **

Source: author's elaboration – FAME database.

Summary Statistic for Logit Regression.

Statistics	MOD.1	MOD.2	MOD.3	MOD.4	MOD.5	MOD.6	MOD.7
N.	752	532	498	860	914	498	498
No. of Users	224	163	153	229	248	153	153
Classified as Users	182	132	127	173	186	122	122
Classified as Non-Users	42	31	26	56	62	31	31
Sensitivity	81.25%	80.98%	83.01%	75.55%	75.00%	79.74%	79.74%
No. of Non-Users	528	369	345	631	666	345	345
Classified as users	264	186	181	247	268	184	184
Classified as Non-Users	264	183	164	384	398	161	161
Specificity	50.00%	49.59%	47.54%	60.86%	59.76%	46.67%	46.67%
Correctly Specified	59.31%	59.21%	58.43%	64.77%	63.89%	56.83%	56.83%
Chi-Square	85.54%	54.53%	52.04%	99.22%	102.33%	53.92%	53.91%
Probability	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R-Square	0.0934	0.0832	0.0847	0.0995	0.0958	0.0878	0.0877
Log pseudo likelihood	-415.23412	-300.546	-281.1772	-448.7783	-483.1410	-280.2411	-280.2424

Source: author's elaboration – FAME database.

Tab. 25 - Logit Regression on the probability of hedging (IR).

This table presents logit regression estimates of the relation between the probability that a firm hedge with IR derivatives as proxies for incentives to hedge. The dependent variable equals 1 if a firm provides qualitative information of any derivative use in the annual report, an 0 if otherwise. The model presents log of odds coefficients (Coef.), marginal effects (ME), odds ratios and the respective p-values in parenthesis. The estimated coefficients give the change in the logit function given a change in the independent variable. The marginal effect (elasticities) measures the actual change (percentage change) in the probability of hedging for 1% increase in the independent variable. The higher the elasticity' value more important is the variable in the model. The odds ratio gives the likelihood of Y = 1 when X is increased by one unit. The p-values are calculated using the robust (heteroscedastic) standard errors. ***, ** and * indicate the significance at 1%, 5% and 10% respectively.

Indep. Variables	MOD.1			MOD.2			MOD.3			MOD.4			MOD.5			MOD.6			MOD.7				
	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds		
EBIT INT PAYMENT	-	-	-																				
	0.000	0.000	0.999																				
	(0.989)	(0.989)	(0.989)																				
ASSETCOVERERX				-	-	-																	
				0.012	0.001	0.988																	
				(0.034)	(0.002)	(0.008)																	
				**	***	***																	
MKTV							3.037	0.352	20.835														
							(0.000)	(0.000)	(0.000)														
							***	***	***														
PROFIT MARGIN										0.012	0.001	1.012											
										(0.085)	(0.084)	(0.085)											
										*	*	*											
ROA													0.001	0.000	1.001								
													(0.930)	(0.930)	(0.930)								
ST BORROW																-	-	-					
																1.644	0.197	0.193					
																(0.008)	(0.005)	(0.008)					
																***	***	***					
LT BORROW																					1.644	0.197	5.177
																					(0.008)	(0.005)	(0.008)
																					***	***	***
MKTTBRAT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	0.327	0.037	0.721	1.916	0.190	0.147	2.927	0.339	0.053	1.186	0.123	0.305	0.186	0.019	0.830	1.854	0.222	0.156	1.854	0.197	5.177		
	(0.656)	(0.655)	(0.656)	(0.053)	(0.044)	(0.053)	(0.011)	(0.007)	(0.011)	(0.123)	(0.117)	(0.123)	(0.800)	(0.800)	(0.800)	(0.059)	(0.052)	(0.059)	(0.059)	(0.005)	(0.008)	(0.008)	
				*	**	*	**	***	**							*	*	*	*	***	***	***	
FOREIGN SALES	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	1.029	0.117	0.357	0.957	0.095	0.384	1.231	0.143	0.292	0.982	0.102	0.374	0.949	0.097	0.387	1.146	0.137	0.318	1.146	0.137	0.318		
	(0.008)	(0.008)	(0.008)	(0.025)	(0.037)	(0.025)	(0.008)	(0.007)	(0.008)	(0.017)	(0.015)	(0.017)	(0.015)	(0.015)	(0.015)	(0.016)	(0.013)	(0.016)	(0.016)	(0.013)	(0.016)	(0.016)	
	***	***	***	**	**	**	***	***	***	**	**	**	**	**	**	**	**	**	**	**	**	**	
LN SALES							0.702	0.081	2.017	0.683	0.071	1.981				0.696	0.083	2.005	0.696	0.088	2.005		
							(0.000)	(0.000)	(0.000)	(0.000)	(0.000)*	(0.000)				(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
							***	***	***	***	**	***				***	***	***	***	***	***	***	
LN ASSETS	0.651	0.074	1.917	0.561	0.056	1.752				0.677	0.069	1.968											

	(0.000) ***	(0.000) ***	(0.000) ***	(0.000) ***	(0.001) ***	(0.000) ***						(0.000) ***	(0.000) ***	(0.000) ***							
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Q-RATIO	0.249 (0.071)	0.028 (0.066)	0.779 (0.071)	0.353 (0.033)	0.035 (0.039)	0.702 (0.033)	0.208 (0.296)	0.024 (0.287)	0.812 (0.296)	0.318 (0.045)	0.033 (0.038)	0.728 (0.045)	0.288 (0.038)	0.029 (0.035)	0.749 (0.038)	0.354 (0.093)	0.042 (0.086)	0.702 (0.093)	0.354 (0.093)	0.042 (0.086)	0.702 (0.086)
	*	*	*	**	**	**				**	**	**	***	**	**	*	*	*	*	*	*
SOLVENCY RATIO																					
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Z-SCORE	0.080 (0.650)	0.009 (0.649)	1.083 (0.650)	0.204 (0.327)	0.020 (0.320)	1.227 (0.327)	0.101 (0.577)	0.012 (0.578)	0.904 (0.577)	0.585 (0.000)	0.061 (0.000)	0.557 (0.000)	0.027 (0.038)	0.029 (0.035)	0.749 (0.038)	0.131 (0.453)	0.016 (0.454)	0.877 (0.453)	0.131 (0.453)	0.016 (0.454)	0.877 (0.453)
										***	***	***	**	**	**						
_cons	7.620 (0.000)		0.001 (0.000)	5.509 (0.001)		4.1e-03 (0.001)	7.630 (0.000)		0.000 (0.000)	6.582 (0.000)		0.557 (0.000)	7.908 (0.000)		0.000 (0.000)	5.928 (0.004)		0.003 (0.004)	7.572 (0.000)		0.000 (0.000)
	***		***	***		***	***		***	***		***	***		***	***		***	***		***

Source: author's elaboration – FAME database.

Summary Statistic for Logit Regression.

Statistics	MOD.1	MOD.2	MOD.3	MOD.4	MOD.5	MOD.6	MOD.7
N.	470	373	356	507	525	356	356
No. of Users	77	70	63	72	78	63	63
Classified as Users	30	42	12	26	28	36	36
Classified as Non-Users	47	28	51	49	50	27	27
Sensitivity	38.96%	60.00%	19.05%	34.67%	35.90%	57.14%	57.14%
No. of Non-Users	393	303	293	432	447	293	293
Classified as users	53	65	12	58	47	8	61
Classified as Non-Users	340	238	281	374	400	285	232
Specificity	38.96%	78.55%	95.90%	86.57%	89.49%	97.27%	79.18%
Correctly Specified	78.72%	75.07%	82.30%	78.90%	81.52%	82.58%	75.28%
Chi-Square	47.91%	54.40%	50.66%	41.16%	55.05%	47.86%	38.66%
Probability	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R-Square	0.1143	0.1510	0.1524	0.0969	0.1248	0.1440	0.1163
Log pseudo likelihood	-185.65042	-152.89319	-140.8361	-191.9024	-193.0930	-142.2396	-146.8384

Source: author's elaboration – FAME database.

Tab. 26 - Logit Regression on the probability of hedging (FX).

This table presents logit regression estimates of the relation between the probability that a firm hedge with FX derivatives as proxies for incentives to hedge. The dependent variable equals 1 if a firm provides qualitative information of any derivative use in the annual report, an 0 if otherwise. The model presents log of odds coefficients (Coef.), marginal effects (ME), odds ratios and the respective p-values in parenthesis. The estimated coefficients give the change in the logit function given a change in the independent variable. The marginal effect (elasticities) measures the actual change (percentage change) in the probability of hedging for 1% increase in the independent variable. The higher the elasticity' value more important is the variable in the model. The odds ratio gives the likelihood of Y = 1 when X is increased by one unit. The p-values are calculated using the robust (heteroscedastic) standard errors. ***, ** and * indicate the significance at 1%, 5% and 10% respectively.

Indep. Variables	MOD.1			MOD.2			MOD.3			MOD.4			MOD.5		
	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds
EBIT INT PAYMENT	0.000 (0.675)	0.000 (0.675)	1.000 (0.675)												
ASSETCOV ERX				0.001 (0.235)	0.000 (0.239)	1.001 (0.235)									
MKTV							- 4.097 (0.000) ***	- 0.271 (0.000) ***	0.017 (0.000) ***						
PROFIT MARGIN										- 0.009 (0.149)	- 0.001 (0.150)	0.991 (0.149)			
ROA													- 0.036 (0.005) ***	- 0.003 (0.006) ***	0.964 (0.005) ***
ST BORROW LT BORROW															
MKTTBRAT	80.036 (0.029) **	7.154 (0.026) **	0.000 (0.029) **	46.185 (0.319)	3.472 (0.314)	0.000 (0.319)	44.835 (0.343)	2.961 (0.339)	0.000 (0.340)	88.880 (0.011) **	8.025 (0.010) ***	0.000 (0.011) **	74.556 (0.028) **	7.146 (0.025) **	0.000 (0.028) **
FOREIGN SALES	1.067 (0.001) ***	0.095 (0.001) ***	2.908 (0.000) ***	0.124 (0.002) ***	0.093 (0.002) ***	3.442 (0.002) ***	1.660 (0.000) ***	0.110 (0.000) ***	5.260 (0.000) ***	0.914 (0.002) ***	0.082 (0.003) ***	2.495 (0.002) ***	1.137 (0.000) ***	0.109 (0.000) ***	3.118 (0.000) ***
LN SALES	0.580 (0.000) ***	0.052 (0.000) ***	1.786 (0.000) ***	0.558 (0.002) ***	0.042 (0.002) ***	3.442 (0.002) ***	0.827 (0.000) ***	0.055 (0.000) ***	2.286 (0.000) ***	0.747 (0.000) ***	0.067 (0.000) ***	2.111 (0.000) ***			
LN ASSETS													0.424 (0.000) ***	0.041 (0.000) ***	1.529 (0.000) ***
Q-RATIO SOLVENCY															

RATIO	0.775 (0.034) **	0.069 (0.032) **	0.460 (0.034) **	0.453 (0.328)	0.034 (0.323)	0.636 (0.328)	0.449 (0.342)	0.023 (0.338)	0.638 (0.342)	0.858 (0.014) **	0.077 (0.013) **	0.424 (0.014) **	0.723 (0.033) **	0.069 (0.030) **	0.485 (0.033) **
Z-SCORE	0.605 (0.000) ***	0.054 (0.000) ***	1.831 (0.000) ***	0.482 (0.004) ***	0.036 (0.002) ***	1.619 (0.004) ***	0.391 (0.015) **	0.026 (0.014) **	1.478 (0.015) **	0.732 (0.000) ***	0.066 (0.013) **	2.079 (0.000) ***	1.202 (0.000) ***	0.115 (0.000) ***	3.327 (0.000) ***
_cons	70.135 (0.055) *		2.9e+30 (0.055) *	37.111 (0.424)		1.3e+1 6 (0.424)	35.017 (0.459)		1.6e+1 5 (0.459)	76.821 (0.028) **		2.3e+3 3 (0.028) **	65.489 (0.054) *		2.8E+2 8 (0.054) *

Source: author's elaboration – FAME database.

Summary Statistic for Logit Regression.

Statistics	MOD.1	MOD.2	MOD.3	MOD.4	MOD.5
N.	688	531	498	747	795
No. of Users	107	60	62	118	121
Classified as Users	52	19	28	64	55
Classified as Non-Users	55	41	34	54	66
Sensitivity	48.60%	31.67%	45.16%	54.24%	45.45%
No. of Non-Users	581	471	436	629	674
Classified as users	82	29	45	83	84
Classified as Non-Users	499	442	391	546	590
Specificity	85.89%	93.84%	89.68%	86.80%	87.54%
Correctly Specified	80.09%	86.82%	84.14%	81.66%	81.13%
Chi-Square	95.14%	41.90%	70.05%	111.53%	98.82%
Probability	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R-Square	0.1600	0.1119	0.1871	0.1711	0.1457
Log pseudo likelihood	-249.7635	-166.34738	-152.1217	-270.1340	-289.6630

Source: author's elaboration – FAME database.

Summary Multivariate Logit Regression

Table 17 shows the estimation results for the extent to which firms hedge their risk exposure with derivatives instruments as users, interest rate and foreign exchange hedgers. The table shows seven different model specifications that have been obtained from different combinations of explanatory variables. All seven models estimated the three different dependent variables, the hedgers, the interest rate hedgers and the foreign exchange hedgers, and include one at a time measures such as interest coverage ratios, leverage ratio, profitability ratios, debt maturity ratios, growth opportunity ratio, financial price risk and overseas operation ratio, firm size ratios, hedging substitutes ratios and likelihood of default ratio. The results show that estimates can be quite different depending on the dependent variable used. In model 1 when have been tested the relationship between hedgers and the other six hypotheses has been excluded the z-score variable because since univariate logit regression this variable it was insignificant. At the same time has to be taken in to account that as firm size and liquidity variables have been used the one who's in the univariate logit regression where more significant taking in to account the dependent variable tested. At this point the analysis should concentrate on the estimated results provided by the model specification which uses as dependent variable "use". Looking in the previous tables is shown that models run using "use" as dependent variable get a higher chi2 compared to the others. So it is believed that "use" better captures the decision to hedge. In model 2 is shown that the estimate asset coverage ratio is very insignificant (p-value 0.292), on the other hand the most significant coefficient is market value leverage because it has the higher coefficient (1.156) compared with the one of the other variables that have been used to test the relationship between hedging and financial distress exposure.

This results show that market value leverage has been used as a leverage proxy and it measures how leveraged a firm is and its degree of leverage is often a measure of risk. Therefore could be stated that firms with higher leverage ratio may not be able to generate enough cash to satisfy their debt obligations, so they might face bankruptcy or default scenarios, thus are more likely to hedge. Another important aspect is that market value leverage is the variable with the highest significant coefficient for all the dependent variables (USE, IR and FX) and for IR and FX hedgers it is more significant and has an higher coefficient (IR: 3.037 and FX: 4.097). therefore this strengthens the fact that firms enter into IR and FX derivatives contracts to limit their risks and thus their debt exposure.

This is reinforced by the fact that long term and short term borrow, debt maturity proxies, are both significant and with a high coefficient, but only for USE and IR. That could be explained as FX hedgers are used to cover more the companies against financial risk exposure related to overseas operations. In fact the row testing the foreign sales suggests that the highest coefficients are those in the FX hedgers column, and that demonstrate a positive relationship between hedging and FX derivative use. Firm size is another measure who plays an important role because data show that larger is the company higher is the probability that it is going to hedge with derivative instruments. That could be related to economies of scale. Furthermore liquidity ratios (quick ratio and solvency ratio), which have been used to test the relationship between hedging substitutes and derivatives use, show that when companies decide to implement alternative instruments to cover themselves against risk exposure they do not use at the same time derivative instruments. After all market to book ratio tested the dependence between hedging and growth opportunity. This ratio has a negative coefficient and shows that the higher the growth opportunities of the leveraged firm the lower the corporate demand for hedging. That could be explained by the fact that the sample tested is composed by non-financial SMEs listed in the UK market. Moreover risk management at firm level is economically possible only if the increase in firm value is higher than the hedging costs and shareholders personally do not be support any costs.

Tab. 27 - Empirical results: summary table about the corporate demand for financial derivatives

Indep. Variables	MOD.1			MOD.2			MOD.3			MOD.4			MOD.5			MOD.6			MOD.7			
	USE.	IR	FX	USE.	IR	FX	USE.	IR	FX	USE.	IR	FX	USE.	IR	FX	USE.	IR	FX	USE.	IR	FX	
EBIT INT PAYMENT	0.002 (0.003) ***	0.000 (0.989)	0.000 (0.675)																			
ASSETCOVE RX				- 0.001 (0.292)	- 0.012 (0.034) **	0.001 (0.235)																
MKTV							1.156 (0.017) **	3.037 (0.000) ***	- 4.097 (0.000) ***													
PROFIT MARGIN										0.008 (0.069) *	0.012 (0.085) *	- 0.009 (0.149)										
ROA													0.010 (0.057) *	0.001 (0.930)	- 0.036 (0.005) ***							
ST BORROW																- 0.996 (0.007) ***	- 1.644 (0.008) ***	- 0.034 (0.948)				
LT BORROW																			0.995 (0.007) ***	1.644 (0.008) ***	0.034 (0.948)	
MKTTBRAT	-73.587 (0.007) ***	- 0.327 (0.656)	- 80.036 (0.029) **	-77.580 (0.017) **	- 1.916 (0.053) *	- 46.185 (0.319)	-75.952 (0.025) **	- 2.927 (0.011) **	- 44.835 (0.343)	80.844 (0.002) ***	- 1.186 (0.123) **	- 88.880 (0.011) **	-67.703 (0.007) ***	- 0.186 (0.800) **	- 74.556 (0.028) **	-78.911 (0.019) **	- 1.854 (0.059) *	- 33.534 (0.467)	-78.916 (0.019) **	- 1.854 (0.059) *	- 33.534 (0.467)	
FOREIGN SALES	0.251 (0.299) *	1.029 (0.008) ***	1.067 (0.001) ***	0.014 (0.962) *	0.957 (0.025) **	0.124 (0.002) ***	0.101 (0.737)	1.231 (0.008) ***	1.660 (0.000) ***	0.278 (0.237)	0.982 (0.017) **	0.914 (0.002) ***	0.469 (0.034) **	0.949 (0.015) **	1.137 (0.000) ***	0.020 (0.948)	1.146 (0.016) **	1.354 (0.001) ***	0.020 (0.948)	1.146 (0.016) **	1.354 (0.001) ***	
LN SALES																						

			0.580 (0.000) ***			0.558 (0.002) ***	0.679 (0.000) ***	0.702 (0.000) ***	0.827 (0.000) ***	0.730 (0.000) ***	0.683 (0.000) ***	0.747 (0.000) ***			0.649 (0.000) ***	0.696 (0.000) ***	0.575 (0.002) ***	0.786 (0.020) **	0.696 (0.000) ***	0.575 (0.002) ***	
LN ASSETS	0.462 (0.000) ***	0.651 (0.000) ***		0.464 (0.000) ***	0.561 (0.000) ***								0.515 (0.000) ***	0.677 (0.000) ***	0.424 (0.000) ***						
Q-RATIO		- 0.249 (0.071) *		- 0.353 (0.033) **				- 0.208 (0.296)			- 0.318 (0.045) **			- 0.288 (0.038) ***			- 0.354 (0.093) *			- 0.354 (0.093) *	
SOLVENCY RATIO	- 0.727 (0.008) ***	- 0.775 (0.034) **	- 0.774 (0.017) **	- 0.453 (0.328)	- 0.752 (0.026) **	- 0.449 (0.342)	- 0.795 (0.002) ***	- 0.858 (0.014) **	- 0.672 (0.007) ***	- 0.723 (0.033) **	- 0.786 (0.020) **	- 0.322 (0.484)	- 0.786 (0.020) **	- 0.322 (0.484)	- 0.786 (0.020) **	- 0.322 (0.484)	- 0.786 (0.020) **	- 0.322 (0.484)	- 0.786 (0.020) **	- 0.322 (0.484)	
Z-SCORE		- 0.080 (0.650)	0.605 (0.000) ***		0.204 (0.327)	0.482 (0.004) ***		- 0.101 (0.577)	0.391 (0.015) **		- 0.585 (0.000) ***	0.732 (0.000) ***		- 0.027 (0.038) **	1.202 (0.000) ***		- 0.131 (0.453)	0.549 (0.001) ***		- 0.131 (0.453)	0.549 (0.001) ***
_cons	- 67.568 (0.013) **	- 7.620 (0.000) ***	- 70.135 (0.055) *	- 72.003 (0.026) **	- 5.509 (0.001) ***	- 37.111 (0.424)	- 67.800 (0.045) **	- 7.630 (0.000) ***	- 35.017 (0.459)	- 71.933 (0.006) ***	- 6.582 (0.000) ***	- 76.821 (0.028) **	- 61.180 (0.015) **	- 7.908 (0.000) ***	- 65.489 (0.054) *	- 72.063 (0.033) **	- 5.928 (0.004) ***	- 24.094 (0.601)	- 71.020 (0.035) **	- 7.572 (0.000) ***	- 24.060 (0.602)

Source: author's elaboration – FAME database.

5.3: Descriptive statistics Italian non-financial listed SMEs

The data sample consists of 528 firm-year observations. The table below shows the activity and the types of derivatives of hedging, the most used derivatives and derivative combinations for the firm-year observations in the Italian sample. Panel A shows that 32.95% of the sample is classified as using derivatives to hedge. Panel B shows that 87.93% of the derivative users disclosed in their annual reports that they used IR derivatives and 37.36% used FX derivatives. Further, Panel D and E suggest that the most used FX derivative is FX Forwards 75.38% and the most commonly used IR derivative is IR Swaps 97.39%. The most used derivative combination is FX Forwards and IR Swaps 13.22%. The fact that forward contracts and swaps are more commonly used than options could be because of the cost required to pay upfront when buying an option. Forwards contracts and swaps require no such premium payment upfront but are quoted with a bid-ask spread, which means the buyer will always get the highest price and the seller the lowest price.

Tab. 28 - Hedging activity and types of derivatives used by Italian non-financial SMEs.

This table presents data on the hedging activity with derivatives disclosed in the annual reports amongst the sample of 66 firms from the year 2005-2012. Panel data A shows the number of derivative users and non-users. Panel B presents data on the type of derivatives used. Panel C presents the combination of derivatives used and distinguishes between FX derivatives users and IR derivative users. Panel D and E present data on the most commonly used derivatives within the groups of FX and IR derivatives. Panel F shows the most common combinations of FX and IR derivatives used.

Panel A: Derivative Use	N	%
Use	174	32.95%
Do not use	354	67.05%
Total	528	100%

Panel B: Types of derivatives used (calculated as a percentage of 174 derivative users – Panel A)	N	%
IR	153	87.93%
FX	65	37.36%

Panel C: Combination of derivative used	N	%
FX only	21	12.07%
IR only	109	62.64%
FX & IR only	44	25.29%
Total	174	100.00%

Panel D: Most used FX derivatives (calculated as a percentage of 65 derivative users – Panel B)	N	%
FX Forwards	49	75.38%
FX Swaps	8	12.31%
FX Options	8	12.31%

Panel E: Most used IR derivatives (calculated as a percentage of 153 derivative users – Panel B)	N	%
IR Swaps	149	97.39%
IR Options	3	1.96%

Panel F: Combination of FX and IR derivative used (calculated as a percentage of 174 derivative users – Panel A)	N	%
FX Forwards only	16	9.19%
IR Swaps only	112	64.37%
FX Forwards + FX Options only	2	1.15%
FX Forwards + IR Swaps only	23	13.22%
FX Forwards + IR Swaps + FX Swaps only	5	2.87%
FX Options + IR Swaps only	3	1.72%
FX Forwards + FX Swaps + FX Options + IR Swaps only	3	1.72%
IR Swaps + IR Options only	3	1.72%

Source: author's elaboration of data handily collected from annual reports of UK non-financial listed SMEs.

The table below examines the differences in firm characteristics between hedgers and non-hedgers through the mean difference test and the Wilcoxon rank sum test. To analyse the relationship between financial distress and hedging have been used the following measures. The *leverage proxies* have two out of eight significant variables and the long term debt capital is higher for hedgers. This

shows what has been assumed by the literature that firms with higher leverage are more likely to hedge because are more keener to incur in financial distress situations.

Have been tested seven *profitability measures* and three of these are significant variables such as ROC, ROE and profit margin. The results demonstrate what has been stated by Glaum (2002) that hedgers are those firms with higher profitability.

Four proxies have been use to test the relationship between *interest coverage* ratio and hedging. These ratios show how easily a firm can pays interests on outstanding debt. Only one of these variables is significant and non hedgers have higher interest coverage ratios. That is consistent with what the literature says because there is a negative relationship between this ratio and the probability to hedge.

About the *debt maturity ratios* both of them are significant and are consistent with the literature because the long term borrowing variable is significant for the hedgers which shows that firms with long term debt maturity are more likely to hedge to cover themselves against expected future fluctuations.

To test the *growth opportunities* have been used the market to book ratio that is insignificant.

As measures of *financial price risk (IR and FX)* have been used three proxies the foreign sales, leverage ratio and the interest coverage ratio. Foreign sales is not significant and the leverage ratios show that there is a positive relationship between hedging and financial price exposure. The interest coverage ratio suggests that firms with lower ratio are more likely to hedge and that agrees with what is stated by the literature. The foreign sales variable has been used also to test the relationship between hedging and *overseas operations* and it is not significant.

All the variables measuring *firm size* are significantly higher for hedgers and that is consistent with the fact that higher firms enjoy information and transaction costs scale economies by engaging in risk management activities.

Finally to test the relationship between hedging and the use of other instruments to hedge have been implemented five *liquidity proxies* and four of them are significant such as current ratio, quick ratio, liquidity ratio and shareholders liquidity ratio. Noone shows the right relationship stated by the literature such as more liquid is a firm less likely to hedge it is.

Table 29 - Mean difference test of hedgers vs non-hedgers.

This table presents the results from the Mean difference test and the Wilcoxon rank sum test. The tests are performed on a range of independent variables between derivatives users versus non-users, where ***, ** and * indicate the significance at 1%, 5% and 10% respectively.

Variable	Hedgers		Non-Hedgers		diff	T-Stat		Sign.	Wilcoxon rank sum test		
	N	Mean	N	Mean		T-stat	H&NH		Z-stat	Sign	
Zsc	171	0.53	346	0.77	0.24	***	2.95	0.00	H<NH	4.01	0.00
<u>LEVERAGE</u>											
DEBT-EQUITY	171	12.58	346	11.43	-1.16		-0.46	0.64	H=NH	0.85	0.40
DEBT-CAPITAL	171	3.37	346	3.15	-0.23		-0.20	0.84	H=NH	-0.75	0.46
LT-DEBT-CAPITAL	171	0.94	346	0.59	-0.35	*	-1.68	0.09	H>NH	-6.35	0.00
LT-DEBT-EQUITY	171	3.10	346	2.17	-0.93		-1.54	0.23	H=NH	-5.09	0.00
LIAB-ASSETS	171	0.48	346	0.47	-0.01		-0.50	0.62	H=NH	-0.57	0.57
GEAR-RATIO	174	3.40	354	3.90	0.51	**	0.67	0.05	H<NH	-0.13	0.89
BV	171	0.71	346	0.71	0.00		-0.10	0.92	H=NH	0.85	0.40
MKT-V	171	0.61	348	0.57	-0.04		-1.27	0.20	H=NH	-1.46	0.14
<u>LIQUIDITY</u>											
CRAT	171	1.79	346	2.18	0.39	*	1.88	0.06	H<NH	1.76	0.08
QRAT	171	1.59	346	1.92	0.33	*	1.68	0.09	H<NH	2.15	0.03
LIQUIDITY-RATIO-X	171	1.59	346	1.92	0.33	*	1.68	0.09	H<NH	2.15	0.03
SHAREHOLDERS-LIQUIDITY-RATIO-X	160	9.89	271	33.98	24.09	*	1.73	0.08	H<NH	2.86	0.00
SOLVENCY-RATIO-ASSET-BASED	171	0.00	346	0.00	0.00		0.45	0.65	H=NH	-1.42	0.16
<u>PROFITABILITY</u>											
ROC	174	-0.27	354	1.79	2.05	**	2.39	0.02	H<NH	2.99	0.00
ROE	174	3.31	354	-0.82	-4.13	*	-1.92	0.06	H>NH	-1.53	0.13
PROFIT-MARGIN	171	0.14	334	-0.23	-0.37	**	-2.03	0.04	H>NH	-2.80	0.01
RETURN-NON-SHAREHOLDERS-FUNDS	171	0.33	335	0.11	-0.22		-0.56	0.58	H=NH	-0.03	0.97
RETURN-NON-TOTAL-ASSETS	174	0.58	354	-0.20	-0.79		-0.69	0.49	H=NH	1.79	0.73
EBIT-MARGIN	171	-0.20	345	-0.24	-0.05		-0.63	0.53	H=NH	2.02	0.04
EBIT-DA-MARGIN	171	-0.09	345	-0.13	-0.04		-0.62	0.54	H=NH	1.51	0.13
<u>IC</u>											
EBIT-INP	171	-0.16	341	-3.84	-3.68		-0.54	0.59	H=NH	2.30	0.02
EBIT-DA-INP	171	2.25	341	8.73	6.47		0.95	0.34	H=NH	3.83	0.00
INTEREST-COVER-X	171	-0.16	341	-3.84	-3.68		-0.54	0.59	H=NH	2.30	0.02
ASSET-COVER-X	160	31.40	271	181.99	150.60	***	2.87	0.00	H<NH	5.20	0.00
<u>GROWTH OPPORTUNITY</u>											
MKT-TBRAT	171	0.81	346	0.79	-0.01		-0.50	0.62	H=NH	1.47	0.14
<u>DEBT MATURITY</u>											
ST-BORROW	171	0.63	346	0.80	0.18	***	8.51	0.00	H<NH	7.79	0.00
LT-BORROW	171	0.37	346	0.20	-0.18	***	-8.51	0.00	H>NH	-7.79	0.00
<u>FIRM SIZE</u>											
LN-MKT-CAP	148	4.62	202	3.72	-0.90	***	-5.73	0.00	H>NH	-4.94	0.00

LNTOTSALES	171	10.30	345	9.68	-0.62	***	-6.55	0.00	H>NH	-6.00	0.00
LNTOTASSETS	171	12.09	346	10.68	-1.41	***	-	0.00	H>NH	-10.19	0.00
							10.94				
<u>FOREIGN EXCHANGE</u>											
FOREIGNSALES	59	0.25	39	0.25	0.00		0.05	0.96	H=NH	1.26	0.21

Source: author's elaboration – AIDA database and Annual Reports for foreign sales measure.

In the following table are provided the differences in means between FX derivative users versus non-FX derivative users and IR derivative users versus non-IR derivative users with and without bias.

First of all must be done a comparison of the results from the next two tables – table 30 and table 31 - that gives an overview of which characteristics are important in case of hedging with FX derivative no bias and IR derivatives no bias. The data reported in table 31 show that IR hedgers have only one significant leverage variable, long term debt capital that is consistent with what stated by the literature and at the same time hedgers have higher firm size variables then non hedgers and that is consistent with scale economies. Long term debt borrow as proxy of debt maturity is a significant variable for IR users. Hedgers have higher long term debt that could be explain as their intention to cover themselves against risk exposure. But at the same time this variable is statistically significant also for FX hedgers, with a positive relationship that could be explained as the companies likelihood to hedge to cover themselves against currency risk exposure due to foreign debt exposure.

Tab. 30 - Mean difference test of FX hedgers vs non-FX hedgers (no bias).

This table presents the results from the Mean difference test and the Wilcoxon rank sum test. The tests are performed on a range of independent variables between FX derivatives users versus non-FX derivative users no bias, where ***, ** and * indicate the significance at 1%, 5% and 10% respectively.

Variable	Hedgers		Non-Hedgers		diff	T-Stat		Wilcoxon rank sum test			
	N	Mean	N	Mean		T-stat	Sign.	H&NH	Z-stat	Sign	
Zsc	64	0.51	346	0.77	0.25	**	2.01	0.05	H<NH	3.20	0.00
<u>LEVERAGE</u>											
DEBTEQUITY	64	12.03	346	11.43	-0.60		-	0.81	H=NH	-	0.48
DEBTCAPITAL	64	2.89	346	3.15	0.26		0.23	0.16	0.87	H=NH	0.71
LTDEBTCAPITAL	64	0.79	346	0.59	-0.20		-	0.45	H=NH	-	0.51
LTDEBTEQUITY	64	2.73	346	2.17	-0.56		0.76	-	0.46	H=NH	3.42
LIABASSETS	64	0.47	346	0.47	0.00		0.73	-	0.88	H=NH	2.98
							-			-	0.72

							0.15			0.36	
GEARINGRAT	65	2.33	354	3.90	1.57		1.47	0.14	H=NH	0.23	0.82
Bv	64	0.74	346	0.71	-0.03		-	0.32	H=NH	-	0.48
							0.99			0.71	
MKTV	64	0.58	348	0.57	-0.01		-	0.81	H=NH	-	0.64
							0.25			0.47	
<u>LIQUIDITY</u>											
CRAT	64	1.70	346	2.18	0.48		1.55	0.12	H=NH	0.33	0.74
QRAT	64	1.49	346	1.92	0.43		1.46	0.15	H=NH	0.67	0.50
LIQUIDITYRATIOX	64	1.49	346	1.92	0.43		1.46	0.15	H=NH	0.67	0.50
SHAREHOLDERSLIQUIDITYRATIOX	59	23.69	271	33.98	10.29		0.45	0.65	H=NH	1.56	0.12
SOLVENCYRATIOASSETBASED	64	0.00	346	0.00	0.00		0.90	0.37	H=NH	0.29	0.77
<u>PROFITABILITY</u>											
Roc	65	-3.19	354	1.79	4.98	***	3.85	0.00	H<NH	4.73	0.00
ROE	65	3.51	354	-0.82	-4.33		-	0.19	H=NH	-	0.20
							1.32			1.27	
PROFITMARGIN	64	-0.06	334	-0.23	-0.17		-	0.54	H=NH	-	0.54
							0.61			0.61	
RETURNONSHAREHOLDERSFUNDS	64	1.06	335	0.11	-0.95	*	-	0.10	H>NH	-	0.91
							1.65			0.11	
RETURNONTOTALASSETS	65	-1.13	354	-0.20	0.93		0.51	0.61	H=NH	3.17	0.00
EBITMARGIN	64	-0.42	345	-0.24	0.17		1.48	0.14	H=NH	4.72	0.00
EBITDAMARGIN	64	-0.29	345	-0.13	0.16		1.58	0.11	H=NH	4.83	0.00
<u>IC</u>											
EBITINP	64	-3.03	341	-3.84	-0.81		-	0.94	H=NH	3.14	0.00
							0.07				
EBITDAINP	64	0.02	341	8.73	8.71		0.78	0.43	H=NH	4.28	0.00
INTERESTCOVERX	64	-3.03	341	-3.84	-0.81		-	0.94	H=NH	3.14	0.00
							0.07				
ASSETCOVERX	59	70.37	271	181.99	111.63		1.29	0.20	H=NH	2.37	0.02
<u>GROWTH OPPORTUNITY</u>											
MKTTBRAT	64	0.82	346	0.79	-0.03		-	0.40	H=NH	-	0.87
							0.84			0.17	
<u>DEBT MATURITY</u>											
STBORROW	64	0.65	346	0.80	0.15	***	5.04	0.00	H<NH	3.99	0.00
LTBORROW	64	0.35	346	0.20	-0.15	***	-	0.00	H>NH	-	0.00
							5.04			3.92	
<u>FIRM SIZE</u>											
LNMKT CAP	57	4.94	202	3.72	-1.22	***	-	0.00	H>NH	-	0.00
							6.07			5.26	
LNTOTSALES	64	10.08	345	9.68	-0.39	***	-	0.01	H>NH	-	0.03
							2.75			2.14	
LNTOTASSETS	64	12.10	346	10.68	-1.42	***	-	0.00	H>NH	-	0.00
							7.70			7.10	
<u>FOREIGN EXCHANGE</u>											
FOREIGNSALES	23	0.44	39	0.25	-0.19		-	0.15	H=NH	-	0.16
							1.46			1.39	

Source: author's elaboration – AIDA database and Annual Reports for foreign sales measure.

Tab. 31 - Mean difference test of IR hedgers vs non-IR hedgers (no bias).

This table presents the results from the Mean difference test and the Wilcoxon rank sum test. The tests are performed on a range of independent variables between IR derivatives users versus non-IR derivative users no bias, where ***, ** and * indicate the significance at 1%, 5% and 10% respectively.

Variable	Hedgers		Non-Hedgers		diff	T-Stat		Wilcoxon rank sum test			
	N	mean	N	Mean		T-stat	Sign.	H&NH	Z-stat	Sign	
Zsc	151	0.51	346	0.77	0.26	***	3.06	0.00	H<NH	4.16	0.00
<u>LEVERAGE</u>											
DEBTEQUITY	151	11.27	346	11.43	0.16		0.06	0.95	H=NH	1.47	0.14
DEBTCAPITAL	151	3.58	346	3.15	-0.44		-0.37	0.71	H=NH	-0.50	0.61
LTDEBTCAPITAL	151	0.98	346	0.59	-0.39	*	-1.79	0.07	H>NH	-6.49	0.00
LTDEBTEQUITY	151	3.19	346	2.17	-1.02		-1.61	0.11	H=NH	-4.92	0.00
LIABASSETS	151	0.48	346	0.47	-0.01		-0.36	0.72	H=NH	-0.39	0.70
GEARINGRAT	153	3.48	354	3.90	0.42		0.52	0.60	H=NH	0.05	0.96
Bv	151	0.70	346	0.71	0.01		0.57	0.57	H=NH	1.47	0.14
MKTv	151	0.61	348	0.57	-0.05		-1.42	0.16	H=NH	-1.63	0.10
<u>LIQUIDITY</u>											
CRAT	151	1.82	346	2.18	0.35		1.62	0.11	H=NH	1.72	0.09
QRAT	151	1.65	346	1.92	0.27		1.31	0.19	H=NH	1.68	0.09
LIQUIDITYRATIOX	151	1.65	346	1.92	0.27		1.31	0.19	H=NH	1.68	0.09
SHAREHOLDERSLIQUIDITYRATIOX	141	10.95	271	33.98	23.03		1.56	0.12	H=NH	2.85	0.00
SOLVENCYRATIOASSETBASED	151	0.00	346	0.00	0.00		-0.10	0.92	H=NH	-1.95	0.05
<u>PROFITABILITY</u>											
Roc	153	0.24	354	1.79	1.55	*	1.75	0.08	H<NH	2.47	0.01
ROE	153	3.79	354	-0.82	-4.61	**	-2.03	0.04	H>NH	-1.66	0.10
PROFITMARGIN	151	0.20	334	-0.23	-0.43	**	-2.24	0.03	H>NH	-3.89	0.00
RETURNONSHAREHOLDERSFUNDS	151	0.38	335	0.11	-0.27		-0.64	0.52	H=NH	-0.91	0.36
RETURNONTOTALASSETS	153	1.07	354	-0.20	-1.27		-1.06	0.29	H=NH	1.30	0.20
EBITMARGIN	151	-0.18	345	-0.24	-0.06		-0.83	0.41	H=NH	1.34	0.18
EBITDAMARGIN	151	-0.08	345	-0.13	-0.06		-0.79	0.43	H=NH	0.63	0.53
<u>IC</u>											
EBITINP	151	0.32	341	-3.84	-4.16		-0.58	0.56	H=NH	1.94	0.05
EBITDAINP	151	2.35	341	8.73	6.37		0.88	0.38	H=NH	3.58	0.00
INTERESTCOVERX	151	0.32	341	-3.84	-4.16		-0.58	0.56	H=NH	1.94	0.05
ASSETCOVERX	141	31.22	271	181.99	150.77	***	2.70	0.01	H<NH	5.75	0.00
<u>GROWTH OPPORTUNITY</u>											
MKTTBRAT	151	0.79	346	0.79	0.00		0.11	0.91	H=NH	2.09	0.04
<u>DEBT MATURITY</u>											
STBORROW	151	0.61	346	0.80	0.20	***	9.11	0.00	H<NH	8.18	0.00
LTBORROW	151	0.39	346	0.20	-0.20	***	-9.11	0.00	H>NH	-8.18	0.00

<u>FIRM SIZE</u>											
LNMKTCAP	131	4.67	202	3.72	-0.96	***	-5.83	0.00	H>NH	-5.04	0.00
LNTOTSALES	151	10.30	345	9.68	-0.62	***	-6.28	0.00	H>NH	-5.76	0.00
LNTOTASSETS	151	12.19	346	10.68	-1.51	***	-	0.00	H>NH	-	0.00
							11.08			10.14	
<u>FOREIGN EXCHANGE</u>											
FOREIGNSALES	53	0.24	39	0.25	0.01		0.14	0.89	H=NH	1.71	0.09

Source: author's elaboration – AIDA database and Annual Reports for foreign sales measure.

The next two tables show the differences in means between FX hedgers and IR hedgers. Those tables affirm what have been affirmed by the previous two tables (table 30 and 31). The main differences between FX hedgers with and without bias is that in table 32 the foreign sales variable is statistically significant and is higher for FX hedgers, that strengthens what the literature stated. The table 33 presents the mean difference test run for IR hedgers and shows that z-score is statistically significant and higher for hedgers meanwhile in the table 32 it was higher for non-hedger and that is consistent with what is stated in the literature.

Tab. 32 - Mean difference test of FX hedgers vs non-FX hedgers (bias).

This table presents the results from the Mean difference test and the Wilcoxon rank sum test. The tests are performed on a range of independent variables between FX derivatives users versus non-FX derivative users, where ***, ** and * indicate the significance at 1%, 5% and 10% respectively.

Variable	Hedgers		Non-Hedgers		T-Stat			Wilcoxon rank sum test			
	N	mean	N	mean	diff	T-stat	Sign.	H&NH	Z-stat	Sign	
Zsc	64	0.51	453	0.71	0.20	*	1.69	0.09	H<NH	2.82	0.00
<u>LEVERAGE</u>											
DEBT-EQUITY	64	12.21	453	11.75	-0.45		-	0.90	H=NH	-	0.26
DEBT-CAPITAL	64	2.89	453	3.27	0.38		0.13	0.81	H=NH	1.12	0.74
LT-DEBT-CAPITAL	64	0.79	453	0.69	-0.10		0.24	0.74	H=NH	0.33	0.02
LT-DEBT-EQUITY	64	2.73	453	2.44	-0.29		-	0.74	H=NH	-	0.03
LIAB-ASSETS	64	0.47	453	0.47	0.00		0.34	0.96	H=NH	2.12	0.83
GEAR-INGRAT	65	2.33	463	1.48	-0.85		0.04	0.14	H=NH	0.22	0.74
Bv	64	0.74	453	0.71	-0.04		1.16	0.24	H=NH	-	0.26
MKTv	64	0.58	455	0.58	0.00		0.03	0.97	H=NH	1.13	0.94
										0.08	
<u>LIQUIDITY</u>											
CRAT	64	1.69	453	2.10	0.40		1.37	0.17	H=NH	-	0.92
QRAT	64	1.49	453	1.86	0.37		1.31	0.19	H=NH	0.11	0.82
LIQUIDITY-RATIOX	64	1.49	453	1.86	0.37		1.31	0.19	H=NH	0.23	0.82

SHAREHOLDERSLIQUIDITYRATIOX	59	23.69	372	25.25	1.56		0.08	0.94	H=NH	1.00	0.32
SOLVENCYRATIOASSETBASED	64	0.00	453	0.00	0.00		1.00	0.32	H=NH	0.78	0.44
<u>PROFITABILITY</u>											
Roc	65	-3.19	463	1.71	4.90	***	4.03	0.00	H<NH	4.72	0.00
RoE	65	3.51	463	0.12	-3.38		-	0.27	H=NH	-	0.27
PROFITMARGIN	64	-0.06	441	-0.11	-0.06		1.10	0.83	H=NH	1.10	0.31
RETURNONSHAREHOLDERSFUNDS	64	1.06	442	0.06	-1.00	*	0.21	0.07	H>NH	1.01	0.98
RETURNONTOTALASSETS	65	-1.13	463	0.22	1.35		1.79	0.41	H=NH	0.03	0.00
EBITMARGIN	64	-0.42	452	-0.20	0.22	**	2.03	0.04	H<NH	1.42	0.16
EBITDAMARGIN	64	-0.29	452	-0.09	0.20	**	2.15	0.03	H<NH	5.17	0.00
<u>IC</u>											
EBITINP	64	-3.03	448	-2.55	0.48		0.05	0.96	H=NH	3.32	0.00
EBITDAINP	64	0.02	448	7.50	7.48		0.77	0.44	H=NH	4.55	0.00
INTERESTCOVERX	64	-3.03	448	-2.55	0.48		0.05	0.96	H=NH	3.32	0.00
ASSETCOVERX	59	70.37	372	134.92	64.56		0.87	0.39	H=NH	1.42	0.16
<u>GROWTH OPPORTUNITY</u>											
MKTTBRAT	64	0.82	453	0.79	-0.03		-	0.37	H=NH	-	0.55
							0.90			0.60	
<u>DEBT MATURITY</u>											
STBORROW	64	0.65	453	0.76	0.11	***	3.39	0.00	H<NH	2.70	0.01
LTBORROW	64	0.35	453	0.24	-0.11	***	-	0.00	H>NH	-	0.01
							3.39			2.70	
<u>FIRM SIZE</u>											
LNMKTCAP	57	4.94	293	3.94	-1.01	***	-	0.00	H>NH	-	0.00
							4.69			4.64	
LNTOTSALES	64	10.08	452	9.86	-0.21		-	0.13	H=NH	-	0.46
							1.52			0.74	
LNTOTASSETS	64	12.10	453	11.01	-1.09	***	-	0.00	H>NH	-	0.00
							5.44			5.59	
<u>FOREIGN EXCHANGE</u>											
FOREIGNSALES	23	0.44	75	0.19	-0.25	***	-	0.01	H>NH	-	0.01
							2.59			2.55	

Source: author's elaboration – AIDA database and Annual Reports for foreign sales measure.

Tab. 33- Mean difference test of IR hedgers vs non-IR hedgers (bias).

This table presents the results from the Mean difference test and the Wilcoxon rank sum test. The tests are performed on a range of independent variables between IR derivatives users versus non-IR derivative users, where ***, ** and * indicate the significance at 1%, 5% and 10% respectively.

Variable	Hedgers		Non-Hedgers		diff	T-Stat		Wilcoxon rank sum test			
	N	mean	N	Mean		T-stat	Sign.	H&NH	Z-stat	Sign	
Zsc	151	0.51	366	0.76	0.26	***	3.05	0.00	H>NH	4.08	0.00
<u>LEVERAGE</u>											
DEBT-EQUITY	151	11.27	366	12.03	0.76		0.29	0.77	H=NH	1.74	0.08
DEBT-CAPITAL	151	3.58	366	3.07	-0.51		-0.44	0.66	H=NH	-	0.69
										0.40	

LTDEBTCAPITAL	151	0.98	366	0.59	-0.39	*	-1.82	0.07	H<NH	-	0.00
										6.44	
LTDEBTEQUITY	151	3.19	366	2.18	-1.01		-1.61	0.11	H=NH	-	0.00
										4.73	
LIABASSETS	151	0.48	366	0.47	-0.01		-0.30	0.77	H=NH	-	0.00
										4.73	
GEARINGRAT	153	3.48	375	3.84	0.36		0.45	0.65	H=NH	0.13	0.89
Bv	151	0.70	366	0.72	0.02		0.87	0.39	H=NH	1.74	0.81
MKTV	171	0.61	348	0.57	-0.04		-1.27	0.20	H=NH	1.74	0.08
<u>LIQUIDITY</u>											
CRAT	151	1.82	366	2.14	0.32		1.50	0.14	H=NH	1.65	0.10
QRAT	151	1.65	366	1.88	0.23		1.15	0.25	H=NH	1.44	0.15
LIQUIDITYRATIOX	151	1.65	366	1.88	0.23		1.15	0.25	H=NH	1.44	0.15
SHAREHOLDERSLIQUIDITYRATIOX	141	10.95	290	31.88	20.94		1.46	0.14	H=NH	2.76	0.01
SOLVENCYRATIOASSETBASED	151	0.00	366	0.00	0.00		-0.35	0.72	H=NH	-	0.03
										2.19	
<u>PROFITABILITY</u>											
Roc	153	0.24	375	1.46	1.22		1.37	0.17	H=NH	2.09	0.04
ROE	153	3.79	375	-0.78	-4.57	**	-2.05	0.04	H>NH	-	0.09
										1.67	
PROFITMARGIN	151	0.20	354	-0.24	-0.43	**	-2.33	0.02	H>NH	-	0.00
										4.26	
RETURNONSHAREHOLDERSFUNDS	151	0.38	355	0.11	-0.27		-0.67	0.50	H=NH	-	0.17
										1.37	
RETURNONTOTALASSETS	153	1.07	375	-0.36	-1.42		-1.21	0.23	H=NH	0.96	0.34
EBITMARGIN	151	-0.18	365	-0.25	-0.07		-0.09	0.36	H=NH	1.06	0.29
EBITDAMARGIN	151	-0.08	365	-0.14	-0.06		-0.87	0.39	H=NH	0.28	0.78
<u>IC</u>											
EBITINP	151	0.32	361	-3.84	-4.16		-0.59	0.55	H=NH	1.63	0.10
EBITDAINP	151	2.35	361	8.33	5.98		0.85	0.40	H=NH	3.25	0.00
INTERESTCOVERX	151	0.32	361	-3.84	-4.16		-0.59	0.55	H=NH	1.63	0.10
ASSETCOVERX	141	31.22	290	172.21	140.99	***	2.61	0.01	H<NH	5.86	0.00
<u>GROWTH OPPORTUNITY</u>											
MKTTBRAT	151	0.79	366	0.80	0.01		0.38	0.70	H=NH	2.36	0.02
<u>DEBT MATURITY</u>											
STBORROW	151	0.61	366	0.80	0.20	***	9.06	0.00	H<NH	8.16	0.00
LTBORROW	151	0.39	366	0.20	-0.20	***	-9.06	0.00	H>NH	-	0.00
										8.16	
<u>FIRM SIZE</u>											
LNMKTCAP	131	4.67	219	3.76	-0.92	***	-5.70	0.00	H>NH	-	0.00
										4.96	
LNTOTSALES	151	10.30	365	9.72	-0.58	***	-5.94	0.00	H>NH	-	0.00
										5.43	
LNTOTASSETS	151	12.19	366	10.72	-1.47	***	-	0.00	H>NH	-	0.00
							11.03			9.97	
<u>FOREIGN EXCHANGE</u>											
FOREIGNSALES	53	0.24	45	0.26	0.02		0.27	0.79	H=NH	2.01	0.04

Source: author's elaboration – AIDA database and Annual Reports for foreign sales measure.

Summary Mean difference test and Wilcoxon rank sum test

What can be concluded is that the most important factor that determine if an Italian non-financial listed SME goes hedging is its size. Because in all the mean difference tests is the most significant measure. Furthermore the debt maturity is another element that could influence the likelihood of a SME to enters into a derivative contract. The debt maturity proxies shows that firms facing long term borrowing are more likely to use derivatives as hedging instruments.

5.3.1: Univariate logit regression: Italian non-financial listed SMEs

In the next table are presented the results from the univariate logit tests run with all the independent variables. By doing this is given an estimated idea of the effects of every individual explanatory variable in the decision of hedging, so can be chosen with more confidence the most significant proxies to run multivariate logit regression and construct the best model to explain the determinants of hedging. The same test have been run to check the effect of every variable on Hedgers, FX Hedgers and IR Hedgers with and without bias.

The *leverage measure* for hedgers is long term debt capital ratio because it is significant and it has a positive coefficient. This variable is also the leverage measure for IR derivative users because significant and with a positive coefficient. About the FX derivative users, gearing ratio represents the leverage measure because it is the only significant proxy but has to be taken into account that it has a negative coefficient. In the previous section where have been discussed the mean difference test, the table 29 showed that Hedgers and IR hedgers no bias had this variable as significant variable and it was right with the literature.

Liquidity variables are the same for Hedgers and FX hedgers such as: current ratio, quick ratio and liquidity ratio. Current ratio is one with the highest chi-square and all of these variables have a negative coefficient as literature states. However IR derivative users have not significant liquidity ratios. The mean difference test showed that only Hedgers had significant liquidity variables.

Profitability variables for Users are mainly three: ROC, ROE and Profit Margin, but the latter two are significant and have a positive coefficient. Also IR Hedgers have ROE and Profit Margin as significant variables with a positive relationship with the probability to hedge. At the same time for FX Hedgers have four significant profitability variable: ROC, EBITDA Margin, EBIT Margin and Return on Shareholders Funds. But the first three variables have a negative coefficient.

Hedgers and IR Hedgers haven't *Interest Coverage* significant variables. At the same time EBITDA Interest Payments is the FX Users significant variable and has a negative coefficient as expected from the literature.

About the *firm growth* in anyone of the groups the market to book ratio is significant but for the users and the FX derivative users it has a positive coefficient as the literature states.

Debt maturity variables for all the dependent variables are the long term borrow and short borrow are the most significant variable with a positive and negative coefficients.

The natural log of total assets and the natural log of total sales are the variables that can be used to capture the effect of the *firm size*, because they are statistically significant with a positive coefficient.

As a *overseas operation* variable has been used the foreign sales. This variable is statistically significant with a positive coefficient only for FX derivative users.

To measure the *risk of default* have been used the variable z-score because it is the only variable available in this category. Z-score is statistically significant in all groups with a negative coefficient.

Tab. 34 - Univariate Logit of hedgers.

This table presents the results from univariate logit regression using a binary variable equal to 1 if firms use derivatives and 0 if otherwise. The table presents the number of observations, coefficients, robust standard errors, z-statistics, p-values and Wald chi-square statistics. ***, ** and * indicate the significance at 1%, 5% and 10% respectively.

	Variables	N	Coeff		Robust std.errors	Z-stat	p- value	chi2
LEVERAGE	zsc	517	-0.324	***	0.108	-3.00	0.00	8.99
	debtequity	517	0.002		0.004	0.44	0.66	0.19
	debtcapital	517	0.002		0.008	0.20	0.84	0.04
	ltdebtcapital	517	-0.065	*	0.039	1.66	0.10	2.76
	ltdebtequity	517	0.021		0.136	1.52	0.13	2.32
	liabassets	517	0.198		0.374	0.53	0.60	0.28
	gearingrat	528	-0.008		0.013	-0.64	0.52	0.41
	bv	517	0.040		0.373	0.11	0.92	0.01
LIQUIDITY	mktv	519	0.367		0.259	1.41	0.16	2.00
	crat	517	-0.093	**	0.046	-2.04	0.04	4.17
	qrat	517	-0.086	*	0.047	-1.83	0.07	3.35
	liquidityratiox shareholdersliq	517	-0.086	*	0.047	-1.83	0.07	3.35
	uidityratiox solvencyratioa ssetbased	431	-0.002		0.003	-0.84	0.40	0.70
		517	-18.600		35.891	-0.52	0.60	0.27
PROFITABILITY	roc	528	-0.024	**	0.010	-2.42	0.02	5.84
	roe	528	0.008	**	0.004	2.16	0.03	4.68
	profitmargin	505	0.108	**	0.054	2.00	0.05	3.98
	returnonshareh oldersfunds	506	0.013		0.023	0.57	0.57	0.32
	returnontotalas sets	528	0.005		0.006	0.86	0.39	0.73
	ebitmargin	516	0.077		0.098	0.79	0.43	0.62
	ebitdamargin	516	0.086		0.111	0.77	0.44	0.60
IC	ebitinp	512	0.001		0.001	0.83	0.41	0.68
	ebitdainp	512	-0.001		0.001	-1.22	0.22	1.48
	interestcoverx	512	0.001		0.001	0.83	0.41	0.68
	assetcoverx	431	-0.002		0.001	-1.12	0.26	1.27
GROWTH OP	mktbrat	517	0.209		0.363	0.58	0.57	0.33
DEBT MATURITY	stborrow	517	-3.183	***	0.428	-7.44	0.00	55.40
	ltborrow	517	3.183	***	0.428	7.44	0.00	55.40
FIRM SIZE	lnmktcap	350	0.431	***	0.083	5.22	0.00	27.29
	Intotsales	516	0.653	***	0.103	6.33	0.00	40.03
	Intotassets	517	0.773	***	0.098	7.91	0.00	62.54
FOREIGN EXPOSURE	foreignsales	98	-0.025		0.450	-0.06	0.96	0.00

Source: author's elaboration – AIDA database and Annual Reports for foreign sales measure.

Tab. 35 - Univariate Logit of IR (bias).

This table presents the results from univariate logit regression using a binary variable equal to 1 if firms hedge with IR derivatives and 0 if otherwise. The table presents the number of observations, coefficients, robust standard errors, z-statistics, p-values and Wald chi-square statistics. ***, ** and * indicate the significance at 1%, 5% and 10% respectively.

	Variables	N	Coeff		Robust std.errors	Z-stat	p- value	chi2
LEVERAGE	zsc	517	-0.348	***	-0.110	-3.16	0.00	9.96
	debtequity	517	-0.001		0.004	-0.27	0.79	0.07
	debtcapital	517	0.003		0.008	0.43	0.67	0.19
	ltdebtcapital	517	0.070	*	0.039	1.81	0.07	3.28
	ltdebtequity	517	0.022		0.014	1.60	0.11	2.56
	liabassets	517	0.123		0.384	0.32	0.75	0.10
	gearingrat	528	-0.006		0.013	-0.43	0.67	0.19
	bv	517	-0.350		0.380	-0.92	0.36	0.85
LIQUIDITY	mktv	519	0.437	*	0.263	1.66	0.10	2.75
	crat	517	-0.076		0.047	-1.62	0.11	2.62
	qrat	517	-0.059		0.046	-1.27	0.20	1.62
	liquidityratiox shareholdersliq	517	-0.059		0.046	-1.27	0.20	1.62
	uidityratiox	431	-0.002		0.002	-0.82	0.41	0.68
	solvencyratioa ssetbased	517	14.632		36.432	0.40	0.69	0.16
PROFITABILITY	roc	528	-0.014		0.010	-1.47	0.14	2.16
	roe	528	0.009	**	0.004	2.33	0.02	5.44
	profitmargin	505	0.131	**	0.060	2.16	0.03	4.66
	returnonshareh oldersfunds	506	0.016		0.025	0.66	0.51	0.43
	returnontotalas sets	528	0.010		0.006	1.56	0.12	2.43
	ebitmargin	516	0.120		0.101	1.18	0.24	1.40
	ebitdamargin	516	0.130		0.118	1.10	0.27	1.21
IC	ebitinp	512	0.001		0.001	0.99	0.32	0.98
	ebitdainp	512	-0.001		0.001	-1.20	0.23	1.44
	interestcoverx	512	0.001		0.001	0.99	0.32	0.98
	assetcoverx	431	-0.002		0.002	-0.99	0.32	0.98
GROWTH OP	mktbrat	517	-0.161		0.367	-0.44	0.66	0.19
DEBT MATURITY	stborrow	517	-3.435	***	0.440	-7.81	0.00	60.96
	ltborrow	517	3.435	***	0.440	7.81	0.00	60.96
FIRM SIZE	lnmktcap	350	0.431	***	0.083	5.17	0.00	26.71
	Intotsales	516	0.618	***	0.104	5.94	0.00	35.31
	Intotassets	517	0.789	***	0.098	8.01	0.00	64.23
FOREIGN EXPOSURE	foreignsales	98	-0.132		0.548	-0.24	0.81	0.06

Source: author's elaboration – AIDA database and Annual Reports for foreign sales measure.

Table 36 - Univariate Logit of FX (bias).

This table presents the results from univariate logit regression using a binary variable equal to 1 if firms hedge with FX derivatives and 0 if otherwise. The table presents the number of observations, coefficients, robust standard errors, z-statistics, p-values and Wald chi-square statistics. ***, ** and * indicate the significance at 1%, 5% and 10% respectively.

	Variables	N	Coeff		Robust std.errors	Z-stat	p- value	chi2
LEVERAGE	zsc	517	-0.265	*	0.151	-1.75	0.08	3.07
	debtequity	517	0.001		0.005	0.13	0.90	0.02
	debtcapital	517	-0.003		0.014	-0.20	0.84	0.04
	ltdebtcapital	517	0.019		0.055	0.34	0.74	0.11
	ltdebtequity	517	0.006		0.015	0.44	0.66	0.19
	liabassets	517	0.025		0.483	0.05	0.96	0.00
	gearingrat	528	-0.075	*	0.039	-1.91	0.06	3.63
	bv	517	0.702		0.590	1.19	0.23	1.42
LIQUIDITY	mktv	519	-0.014		0.286	-0.05	0.96	0.00
	crat	517	-0.114	**	0.056	-2.03	0.04	4.11
	qrat	517	-0.116	**	0.059	-1.96	0.05	3.85
	liquidityratiox shareholdersliq	517	-0.116	**	0.059	-1.96	0.05	3.85
	uidityratiox solvencyratioa ssetbased	431	0.000		0.002	-0.07	0.94	0.00
	517	-65.880			58.810	-1.12	0.26	1.25
PROFITABILITY	roc	528	-0.055	***	0.014	-3.81	0.00	14.54
	roe	528	0.007		0.005	1.38	0.17	1.91
	profitmargin	505	0.015		0.076	0.20	0.84	0.04
	returnonshareh oldersfunds	506	0.073	**	0.034	2.17	0.03	4.73
	returnontotalas sets	528	-0.009		0.008	-1.07	0.28	1.15
	ebitmargin	516	-0.261	***	0.101	-2.58	0.01	6.68
	ebitdamargin	516	-0.307	***	0.113	-2.71	0.01	7.37
	IC	ebitinp	512	0.000		0.001	-0.12	0.91
ebitdainp		512	-0.001	*	0.001	-1.67	0.09	2.80
interestcoverx		512	0.000		0.001	-0.12	0.91	0.01
assetcoverx		431	0.000		0.000	-0.96	0.34	0.93
GROWTH OP	mktbrat	517	0.602		0.588	1.02	0.31	1.05
DEBT MATURITY	stborrow	517	-1.709	***	0.563	-3.04	0.00	9.22
	ltborrow	517	1.709	***	0.563	3.04	0.00	9.22
FIRM SIZE	lnmktcap	350	0.419	***	0.100	4.19	0.00	17.53
	Intotsales	516	0.205	*	0.113	1.81	0.07	3.28
	Intotassets	517	0.425	***	0.080	5.34	0.00	28.48
FOREIGN EXPOSURE	foreignsales	98	1.882	*	1.039	1.81	0.07	3.28

Source: author's elaboration – AIDA database and Annual Reports for foreign sales measure.

In the table below have been summarized in order by significance, all the significant independent variables for each dependent binary variable. To build up the multivariate regression for each proxy have been taken into account the independent variables that the dependent variables have in common and at the same time whose who have the high number of observations.²⁷

²⁷ The data sample consists of 528 firm-year observations.

Tab. 37 - Summary independent variables for multivariate model.

HEDGERS	No. Obs.	IR	No. Obs.	FX	No. Obs.
Z-Score	517	Z-Score	517	Z-Score	517
Leverage					
LT Debt Capital	517	LT Debt Capital Mktv	517 519	Gearing ratio	528
<hr/>					
Liquidity					
Cratio	517			Cratio	517
Qratio	517			Qratio	517
Liquidity ratio	517			Liquidity ratio	517
<hr/>					
Profitability					
ROC	528	ROE	528	ROC	528
ROE	528	Profit Margin	505	EBITDA Margin	516
Profit margin	505			EBIT Margin	516
				Return on Shareholders'Funds	506
<hr/>					
Interest Coverage					
				EBTDA Int. Payiments	512
<hr/>					
Growth Opportunities					
<hr/>					
Debt Maturity					
Short Term Borrow	517	Short Term Borrow	517	Short Term Borrow	517
Long Term Borrow	517	Long Term Borrow	517	Long Term Borrow	517
<hr/>					
Firm Size					
Ln Total Sales	516	Ln Total Assets	517	Ln Total Assets	517
Ln Total Assets	517	Ln Total Sales	516	Ln Total Sales	516
Ln Market	350	Ln Market	350	Ln Market	350
Capitalization		Capitalization		Capitalization	
<hr/>					
Foreign Exposure					
				Foreign Sales	98

Source: author's elaboration.

5.3.2: Multivariate logit regression: Italian non-financial listed SMEs

To run the Multivariate logit regression have been used the following independent variables:

Table 38 - Summary independent variables and relative literature.

Independent Variables	Literature
Z-SCORE	Altman (1968)
<u>Leverage</u>	
LT Debt Capital	Stulz (1996) Leland (1998)
Gearing ratio	
<u>Liquidity</u>	
CRatio	Geczy et al. (1999) Bartram et al. (2009)
Liquidity Ratio	
<u>Profitability</u>	
ROC	Glaum (2002) Bartram et al. (2009)
ROE	
<u>Interest Coverage</u>	
EBITDA Interest Payments	Froot et al. (1993)
<u>Growth Opportunities</u>	
Market To Book Ratio	Myers (1977) Bressembinder (1991) Froot et al. (1993)
<u>Debt Maturity</u>	
Long Term Borrow	Stulz (1996) Leland (1998)
Short Term Borrow	
<u>Firm Size</u>	
Ln Total Sales	Graham and Rodgers (2002) Judge (2006)
Ln Total Assets	Campello et al. (2011)
<u>Foreign Exposure</u>	
Foreign Sales	Smith and Stulz (1985) Allayannis and Ofek (2001)

Source: author's elaboration.

The Univariate test explained the relationship between hedging and different firms characteristics. The problem is that previous tests did not take into account the interaction between different independent variables. For this motivation have been run a logit regression between the probability of hedging and several

explanatory variables. The results in model 1-7 suggest that firm size is the most significant variable to determine the probability for a firm to hedge. The variable shows that there is a positive relationship between firm size and the probability to hedge, therefore can be expected that bigger firms are more likely to hedge.

Foreign sales has been used as a proxy to measure the foreign exposure, but in all the seven models it is statistically insignificant. Indeed, also in the mean difference test and in the univariate logit regression this variable had not a significant coefficient.

The variables that have been used as measures of *leverage and debt maturity* are long term debt capital, gearing ratio, short and long term borrow. They show that exist a positive relationship between them and the probability to hedge, that it is consistent with what Stulz (1996) and Leland (1998) demonstrated on how companies that hedge are able to reduce their likelihood of bankruptcy and therefore are able to increase their level of debt. The results suggest that long term borrow and leverage measures have a very high elasticity and odds values. What said right now have been predicted also in the mean difference test where all of these variables were significant and hedgers had an higher mean than the non-hedgers.

As *liquidity ratio* proxy has been used the current ratio but is not statistically significant in all the seven models. Infact looking back to the previous test, in particular to the mean difference tests, is shown that it is significant but non-hedgers presents an higher mean respect the hedgers, which suggests that more liquid is a firm more likely it uses hedging substitutes than derivatives instruments.

The *Interest Coverage* ratio used is the EBITDA Interest Payments. It is significant and has a negative coefficient as the theory of Froot et al. (1993) states. With their research showed that hedging reduces cash flow volatility leading to better rates for financing, therefore those companies with higher rates of volatilities are more likely to use derivatives in order to reduce the financial risk and get an easier and better conditions access for funding.

Profitability proxies employed to measure the relationship with the probability of hedging are return on capital (ROC) and return on equity (ROE) and both of them are not significant.

What argued above suggests that the decision of using derivatives as hedging instruments is closely related to factors determining the firm size and the financial distress situation measured by debt maturity proxies and leverage proxies.

The table 40 shows the relationship between the probability that a firm hedges with IR derivatives and proxies for incentives to hedge. The natural log of total assets is the most significant variable, at the same time debt maturity (DM) variables are important factors in determining whether to hedge with IR derivatives. Long term debt borrow is the most important financial distress measure when comparing the marginal effect across models, which gives strong support to the notion that firm's with more long term debt exposure are more likely to hedge. According to Bessembinder (1991) and Myers (1977), the significantly positive effects of leverage on the likelihood of hedging is consistent with the notion that asymmetric information can lead to underinvestment when leverage is high, resulting in increased agency costs which creates incentives for firms to hedge.

Table 41 suggests that FX exposure is an important factor in determining whether firms hedge FX risks. This supports the argument that firms with more volatile income resulting from changes in the exchange rate are more likely to hedge with FX derivatives, which is supported by the findings in the multivariate logit regression, where three out of seven models show a positive and statistical relationship between hedging and foreign sales. As demonstrated for hedgers and IR hedgers, also for FX hedgers the firm size proxy used suggests the existence of a positive relationship between firm size and the probability that a firm hedges and that supports scale economies hypothesis. The liquidity measure used has been the current ratio and in six out of seven model have a significant and negative coefficient as the literature states. This shows that Italian non-financial listed SMEs are less likely to hedge against foreign currency exposure by derivative instruments when the company uses alternative instruments.

With the multivariate analysis have been tried to identify a model with all the most significant variables. Hence, have been started creating the model with the most significant variables and then based on trial and error method adding other variables have been tried to find those that are meaningful to create the model with the largest number of explanatory variables which reflects the best possible decision of hedging. At the end have been obtained a model composed of two independent variables statistically significant: long term debt capital and atural log of total assets – Model 1.

As might be expected when this model has been applied to specific cases as the probability of using foreign exchange derivatives or interest rate derivatives

have been found that some variables are no longer significant. For FX Hedgers the long term debt capital is not statistically significant whilst for Hedgers and IR Hedgers all these variables are significant.

Looking into the summary statistics of each table is possible to demonstrate why model 5 has been chosen as the best model. Taking into account the summary table related to the probability of hedging (Use) model 1 correctly predicted the 77.97% of the derivatives users and the 73.68% of the no derivatives users. Thus the 23.71 % of the sample are misclassified cases. But the same model at the same time when predicts the probability of hedging by IR its correctly predicted the 81.13% would use derivatives and the 79.55% would not use those instruments. So the 19.59% of the sample are misclassified cases. For the probability of hedging instruments by FX the 98.96% of the sample are misclassified cases so the 4.35% would use derivatives and 95.95% would not use derivatives. IR Hedgers are those with the higher chi square (46.86%) meanwhile the FX Hedgers have the lower chi square (13.47%), that could be explained by the fact that the 87.93% of the Italian non-financial listed SMEs used IR derivatives.

Is interesting focusing on the numbers of users and non-users displayed in table 40 and 41. The table 28 shows the probability of hedging by IR derivative and the data show that over 53 observation as users 43 are classified as users IR derivatives and at the same time there are 10 misclassified non derivatives users. At the same time is interesting to see that data about the FX hedgers in table 41 states that over 23 observation as users only 1 is classified as user FX instruments and the others 22 observations are classified as non-users. In all the seven model the sensitivity is very higher for IR derivative users compared with the Hedgers and FX hedgers tables. But at the same time the specificity is higher in table 16 (FX hedgers). Therefore the misclassification presented by FX Hedgers is not clearly clarified by the data present in the IR table. So could be assumed that could be that the Italian sample from presents misclassification about the use of foreign exchange derivatives as hedging instruments.

Tab. 39 - Logit Regression on the probability of hedging (Use).

This table presents logit regression estimates of the relation between the probability that a firm hedge as proxies for incentives to hedge (Panel A). The dependent variable equals 1 if a firm provides qualitative information of any derivative use in the annual report, an 0 if otherwise. The model presents log of odds coefficients (Coef.), marginal effects (ME), odds ratios and the respective p-values in parenthesis. The estimated coefficients give the change in the logit function given a change in the independent variable. The marginal effect (elasticities) measures the actual change (percentage change) in the probability of hedging for 1% increase in the independent variable. The higher the elasticity' value more important is the variable in the model. The odds ratio gives the likelihood of Y = 1 when X is increased by one unit. The p-values are calculated using the robust (heteroscedastic) standard errors. ***, ** and * indicate the significance at 1%, 5% and 10% respectively.

Indep. Variables	MOD.1			MOD.2			MOD.3			MOD.4			MOD.5			MOD.6			MOD.7				
	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds		
LT DEBT CAPITAL	2.354 (0.010) ***	0.282 (0.000) ***	10.528 (0.010) ***																				
GEARING RATIO				0.622 (0.010) ***	0.110 (0.000) ***	1.862 (0.010) ***																	
ROC							- 0.030 (0.342)	- 0.007 (0.343)	- 0.970 (0.342)														
ROE										- 0.006 (0.696)	- 0.001 (0.697)	- 0.994 (0.696)											
EBITDA INT PAY													- 0.571 (0.025) **	- 0.014 (0.033) **	- 0.945 (0.025) **								
ST BORROW																- 3.610 (0.008) ***	- 0.808 (0.006) ***	- 0.027 (0.008) ***					
LT BORROW																					3.610 (0.008) ***	0.808 (0.006) ***	36.970 (0.008) ***
MKTTBRAT	- 3.017 (0.244)	- 0.362 (0.303)	- 0.049 (0.244)	- 2.503 (0.330)	- 0.446 (0.344)	- 0.082 (0.330)	- 2.439 (0.304)	- 0.566 (0.303)	- 0.087 (0.304)	- 2.283 (0.343)	- 0.530 (0.342)	- 0.102 (0.343)	- 0.291 (0.610)	- 0.309 (0.610)	- 0.275 (0.610)	- 1.421 (0.564)	- 0.318 (0.566)	- 0.241 (0.564)	- 1.421 (0.564)	- 0.318 (0.566)	- 0.241 (0.564)		
FOREIGN SALES	0.143 (0.837)	0.017 (0.838)	1.153 (0.837)	0.067 (0.919)	0.012 (0.919)	1.069 (0.919)	0.054 (0.922)	0.012 (0.922)	1.056 (0.922)	0.002 (0.997)	0.005 (0.997)	1.002 (0.997)	0.010 (0.855)	0.025 (0.855)	0.902 (0.855)	0.224 (0.736)	0.050 (0.736)	1.251 (0.736)	0.224 (0.736)	0.050 (0.736)	1.251 (0.736)		
LN ASSETS	1.105 (0.020) **	0.132 (0.115)	3.018 (0.020) ***	1.703 (0.000) ***	0.303 (0.000) ***	5.489 (0.000) ***	1.724 (0.000) ***	0.400 (0.000) ***	5.604 (0.000) ***	1.612 (0.000) ***	0.374 (0.000) ***	5.014 (0.000) ***	1.344 (0.003) ***	0.321 (0.003) ***	3.833 (0.003) ***	0.946 (0.061) *	0.212 (0.062) *	2.574 (0.061) *	0.946 (0.061) *	0.212 (0.062) *	2.574 (0.061) *		
CRATIO	0.243 (0.170)	0.029 (0.205)	1.275 (0.170)	0.329 (0.100)	0.059 (0.078)	1.390 (0.100)	0.132 (0.461)	0.031 (0.459)	1.141 (0.461)	0.128 (0.463)	0.030 (0.461)	1.136 (0.463)	0.306 (0.228)	0.073 (0.221)	1.358 (0.228)	- 0.014 (0.945)	- 0.003 (0.946)	- 0.986 (0.945)	- 0.014 (0.945)	- 0.003 (0.946)	- 0.986 (0.945)		

Z-SCORE	0.149 (0.660)	0.018 (0.679)	1.161 (0.660)	0.270 (0.428)	0.048 (0.435)	1.310 (0.428)	0.538 (0.133)	0.125 (0.133)	1.713 (0.133)	0.450 (0.230)	0.104 (0.229)	1.568 (0.230)	0.754 (0.051)	0.180 (0.057)	2.125 (0.051)	0.318 (0.343)	0.071 (0.345)	1.374 (0.343)	0.318 (0.343)	0.071 (0.345)	1.374 (0.343)
_cons	- 10.657 (0.065)	- 0.000 (0.065)	- 18.655 (0.003)	- 7.93-09 (0.003)	- 17.401 (0.002)	- 0.000 (0.002)	- 16.200 (0.003)	- 0.000 (0.003)	- 14.147 (0.006)	- 0.000 (0.006)	- 6.580 (0.296)	- 0.001 (0.296)	- 10.190 (0.079)	- 0.000 (0.079)	- 0.000 (0.079)	- 0.000 (0.079)	- 0.000 (0.079)	- 0.000 (0.079)	- 0.000 (0.079)	- 0.000 (0.079)	- 0.000 (0.079)

Source: author's elaboration – AIDA database and Annual Reports for foreign sales measure.

Summary Statistic for Logit Regression.

Statistics	MOD.1	MOD.2	MOD.3	MOD.4	MOD.5	MOD.6	MOD.7
N.	97	97	97	97	97	97	97
No. of Users	59	59	59	59	59	59	59
Classified as Users	46	51	45	46	50	46	46
Classified as Non-Users	13	8	14	13	9	913	13
Sensitivity	77.97%	86.44%	76.27%	77.97%	84.75%	77.97%	77.97%
No. of Non-Users	38	38	38	38	38	38	38
Classified as users	10	14	18	19	16	12	12
Classified as Non-Users	28	24	20	19	22	26	26
Specificity	73.68%	63.16%	52.63%	50.00%	57.89%	68.42%	68.42%
Correctly Specified	76.29%	77.32%	67.01%	67.01%	74.23%	74.23%	74.23%
Chi-Square	33.62%	32.32%	22.48%	21.71%	31.19%	29.78%	29.78%
Probability	0.0000	0.0000	0.0010	0.0014	0.0000	0.0000	0.0000
Pseudo R-Square	0.2589	0.2488	0.1731	0.1671	0.2401	0.2293	0.2293
Log pseudo likelihood	-48.131512	-48.783157	-53.703583	-54.089008	-49.351322	-50.054822	-50.054822

Source: author's elaboration – AIDA database and Annual Reports for foreign sales measure.

Tab. 40 - Logit Regression on the probability of hedging (IR).

This table presents logit regression estimates of the relation between the probability that a firm hedge with IR derivatives as proxies for incentives to hedge. The dependent variable equals 1 if a firm provides qualitative information of any derivative use in the annual report, an 0 if otherwise. The model presents log of odds coefficients (Coef.), marginal effects (ME), odds ratios and the respective p-values in parenthesis. The estimated coefficients give the change in the logit function given a change in the independent variable. The marginal effect (elasticities) measures the actual change (percentage change) in the probability of hedging for 1% increase in the independent variable. The higher the elasticity' value more important is the variable in the model. The odds ratio gives the likelihood of Y = 1 when X is increased by one unit. The p-values are calculated using the robust (heteroscedastic) standard errors. ***, ** and * indicate the significance at 1%, 5% and 10% respectively.

Indep. Variables	MOD.1			MOD.2			MOD.3			MOD.4			MOD.5			MOD.6			MOD.7			
	Coeff.	ME	Odds	Coeff.	ME	Odds	Coeff.	ME	Odds	Coeff.	ME	Odds	Coeff.	ME	Odds	Coeff.	ME	Odds	Coeff.	ME	Odds	
LT DEBT CAPITAL	2.694 (0.005) ***	0.348 (0.000) ***	14.792 (0.005) ***																			
GEARING RATIO				0.479 (0.054) *	0.104 (0.020) **	1.614 (0.054) *																
ROC							- 0.022 (0.506)	- 0.005 (0.506)	0.977 (0.506)													
ROE										0.006 (0.687)	0.001 (0.687)	1.006 (0.687)										
EBITDA INT PAY													0.035 (0.122)	0.008 (0.127)	0.964 (0.122)							
ST BORROW																4.287 (0.003) ***	1.029 (0.002) ***	0.013 (0.003) ***				
LT BORROW																			4.287 (0.003) ***	1.029 (0.002) ***	72.762 (0.003) ***	
MKTTBRAT	1.679 (0.503)	0.217 (0.533)	0.186 (0.503)	1.546 (0.533)	0.337 (0.539)	0.212 (0.533)	1.594 (0.490)	0.392 (0.491)	0.202 (0.490)	1.854 (0.437)	0.456 (0.437)	0.156 (0.437)	0.815 (0.736)	0.202 (0.736)	0.442 (0.736)	0.419 (0.867)	0.100 (0.868)	0.657 (0.867)	0.419 (0.867)	0.100 (0.868)	0.657 (0.867)	
FOREIGN SALES	0.092 (0.879)	0.011 (0.879)	0.912 (0.879)	0.127 (0.822)	0.027 (0.822)	0.880 (0.822)	0.128 (0.805)	0.031 (0.805)	0.879 (0.805)	0.153 (0.771)	0.037 (0.771)	0.857 (0.771)	0.235 (0.653)	0.058 (0.654)	0.790 (0.653)	0.019 (0.974)	0.004 (0.974)	1.019 (0.974)	0.019 (0.974)	0.004 (0.974)	1.019 (0.974)	
LN ASSETS	1.738 (0.001) ***	0.224 (0.056) **	5.689 (0.001) ***	2.218 (0.000) ***	0.484 (0.000) ***	9.197 (0.000) ***	2.269 (0.000) ***	0.558 (0.000) ***	9.674 (0.000) ***	2.097 (0.000) ***	0.516 (0.000) ***	8.148 (0.000) ***	1.981 (0.000) ***	0.491 (0.000) ***	7.251 (0.000) ***	1.499 (0.006) ***	0.360 (0.006) ***	4.477 (0.006) ***	1.499 (0.006) ***	0.360 (0.006) ***	4.477 (0.006) ***	
CRATIO	0.294 (0.134)	0.038 (0.171)	1.343 (0.134)	0.347 (0.107)	0.075 (0.086) *	1.416 (0.107)	0.173 (0.378)	0.042 (0.376)	1.189 (0.378)	0.179 (0.347)	0.044 (0.345)	1.196 (0.347)	0.262 (0.272)	0.065 (0.269)	1.300 (0.272)	0.030 (0.899)	0.007 (0.899)	0.969 (0.899)	0.030 (0.899)	0.007 (0.899)	0.969 (0.899)	
Z-SCORE	0.337	0.043	1.401	0.398	0.086	1.488	0.654	0.161	1.924	0.418 (0.292)	0.102 (0.292)	1.519 (0.292)	0.749	0.185	2.115	0.529 (0.135)	0.127 (0.138)	1.697 (0.135)	0.529 (0.135)	0.127 (0.138)	1.697 (0.135)	

	(0.354)	(0.416)	(0.354)	(0.262)	(0.273)	(0.262)	(0.096)	(0.096)	(0.096)		(0.056)	(0.058)	(0.056)			
	-			-			*	*	*		*	*	*			
_cons	19.561	3.2e-09	25.479	8.6e-12	24.723	1.8e-11	22.444	1.8e-10	22.097	2.5e-10	13.586	1.3e-06	17.874	1.7e-08		
	(0.002)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.038)	(0.038)	(0.004)	(0.004)		
	***	***	***	***	***	***	***	***	***	***	**	**	***	***		

Source: author's elaboration – AIDA database and Annual Reports for foreign sales measure.

Summary Statistic for Logit Regression.

Statistics	MOD.1	MOD.2	MOD.3	MOD.4	MOD.5	MOD.6	MOD.7
N.	97	97	97	97	97	97	97
No. of Users	53	53	53	53	53	53	53
Classified as Users	43	44	43	43	45	43	43
Classified as Non-Users	10	9	10	10	8	10	10
Sensitivity	81.13%	83.82%	81.13%	81.13%	84.91%	81.13%	81.13%
No. of Non-Users	44	44	44	44	44	44	44
Classified as users	9	8	13	12	13	11	11
Classified as Non-Users	35	36	31	32	31	33	33
Specificity	79.55%	81.82%	70.45%	72.73%	70.45%	75.00%	75%
Correctly Specified	80.41%	82.47%	76.29%	77.32%	78.35%	78.35%	78.35%
Chi-Square	46.87%	40.06%	33.82%	33.54%	37.78%	43.82%	43.82%
Probability	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R-Square	0.3507	0.2998	0.2531	0.2510	0.2827	0.3279	0.3279
Log pseudo likelihood	-43.381332	-46.787286	-49.907269	-50.048889	-47.927789	-44.904983	-44.904983

Source: author's elaboration – AIDA database and Annual Reports for foreign sales measure.

Tab. 41 - Logit Regression on the probability of hedging (FX).

This table presents logit regression estimates of the relation between the probability that a firm hedge with FX exposure as proxies for incentives to hedge. The dependent variable equals 1 if a firm provides qualitative information of any derivative use in the annual report, an 0 if otherwise. The model presents log of odds coefficients (Coef.), marginal effects (ME), odds ratios and the respective p-values in parenthesis. The estimated coefficients give the change in the logit function given a change in the independent variable. The marginal effect (elasticities) measures the actual change (percentage change) in the probability of hedging for 1% increase in the independent variable. The higher the elasticity' value more important is the variable in the model. The odds ratio gives the likelihood of Y = 1 when X is increased by one unit. The p-values are calculated using the robust (heteroscedastic) standard errors. ***, ** and * indicate the significance at 1%, 5% and 10% respectively.

Indep. Variables	MOD.1			MOD.2			MOD.3			MOD.4			MOD.5			MOD.6			MOD.7			
	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	
LT DEBT CAPITAL	0.074 (0.556)	0.011 (0.553)	0.928 (0.556)																			
GEARING RATIO				0.981 (0.698)	0.002 (0.696)	0.981 (0.698)																
ROC							- 0.079 (0.054) *	- 0.011 (0.048) **	0.924 (0.054) *													
ROE										- 0.026 (0.194)	- 0.003 (0.171)	0.974 (0.194)										
EBITDA INT PAY													- 0.076 (0.038) **	- 0.009 (0.007) ***	0.926 (0.038) **							
ST BORROW																- 3.884 (0.008) ***	- 0.555 (0.009) ***	0.020 (0.008) ***				
LT BORROW																			3.884 (0.008) ***	0.555 (0.009) ***	48.644 (0.008) ***	
MKTTBRAT	1.115 (0.733)	0.170 (0.732)	3.051 (0.733)	2.315 (0.794)	0.128 (0.793)	2.315 (0.794)	0.897 (0.778)	0.129 (0.778)	2.454 (0.778)	2.090 (0.555)	0.301 (0.548)	8.089 (0.555)	0.944 (0.772)	0.113 (0.774)	2.571 (0.772)	0.293 (0.932)	0.041 (0.932)	1.341 (0.932)	0.293 (0.932)	0.041 (0.932)	1.341 (0.932)	
FOREIGN SALES	1.734 (0.127)	0.264 (0.137)	5.666 (0.127)	6.085 (0.112)	0.277 (0.123)	6.085 (0.112)	1.915 (0.083) *	0.275 (0.090) *	6.791 (0.083) *	1.871 (0.102)	0.270 (0.110)	6.499 (0.102)	1.941 (0.114)	0.234 (0.151)	6.971 (0.114)	2.595 (0.034) **	0.371 (0.044) **	13.406 (0.034) ***	2.595 (0.034) ***	0.371 (0.044) **	13.406 (0.034) **	
LN ASSETS	0.740 (0.114)	0.113 (0.107)	2.097 (0.114)	2.018 (0.131)	0.107 (0.125)	2.018 (0.131)	1.152 (0.037) **	0.165 (0.031) **	3.164 (0.037) **	0.995 (0.064) *	0.143 (0.051) *	2.706 (0.064) *	0.832 (0.106)	0.100 (0.086) *	2.298 (0.106)	- 0.213 (0.702)	- 0.030 (0.701)	0.808 (0.702)	- 0.213 (0.702)	- 0.030 (0.701)	0.808 (0.702)	
CRATIO	- 0.690	- 0.105	- 0.501	- 0.503	- 0.105	- 0.503	- 0.692	- 0.099	- 0.500	- 0.781	- 0.112	- 0.457	- 0.586	- 0.070	- 0.556	- 0.878	- 0.125	- 0.415	- 0.878	- 0.125	- 0.415	

	(0.085)	(0.035)	(0.085)	(0.088)	(0.037)	(0.088)	(0.084)	(0.035)	(0.084)	(0.080)	(0.023)	(0.080)	(0.111)	(0.072)	(0.111)	(0.039)	(0.009)	(0.039)	(0.039)	(0.009)	(0.039)
	*	**	*	*	**	*	*	**	*	**	*	*	(0.111)	*	(0.111)	**	***	**	**	***	**
Z-SCORE	0.702	0.107	2.018	2.023	0.108	2.023	1.230	0.176	3.422	1.269	0.183	3.558	1.638	0.197	5.149	0.674	0.096	1.962	0.674	0.096	1.962
	(0.127)	(0.101)	(0.127)	(0.127)	(0.101)	(0.127)	(0.023)	(0.011)	(0.023)	(0.056)	(0.027)	(0.056)	(0.017)	(0.003)	(0.017)	(0.146)	(0.129)	(0.146)	(0.146)	(0.129)	(0.146)
	-						**	**	**	*	**	*	**	***	**						
_cons	10.271		0.000	0.000		0.000	15.246		2.4e-07	14.311		6.1e-07	11.772		7.7e-06	3.807		45.015	0.077		0.925
	(0.074)		(0.074)	(0.087)		(0.087)	(0.022)		(0.022)	(0.041)		(0.041)	(0.056)		(0.056)	(0.586)		(0.586)	(0.990)		(0.990)
	*		*	*		*	**		**	**		**	*		*						

Source: author's elaboration – AIDA database and Annual Reports for foreign sales measure.

Summary Statistic for Logit Regression.

Statistics	MOD.1	MOD.2	MOD.3	MOD.4	MOD.5	MOD.6	MOD.7
N.	97	97	97	97	97	07	97
No. of Users	23	23	23	23	23	23	23
Classified as Users	1	2	4	1	3	6	6
Classified as Non-Users	22	21	19	22	20	17	17
Sensitivity	4.35%	8.70%	17.39%	4.35%	13.04%	26.09%	26.09%
No. of Non-Users	74	74	74	74	74	74	74
Classified as users	3	3	4	3	4	5	5
Classified as Non-Users	71	71	70	71	70	69	69
Specificity	95.95%	95.95%	94.59%	95.95%	94.59%	93.24%	93.24%
Correctly Specified	74.23%	75.26%	76.29%	74.23%	75.26%	77.32%	77.32%
Chi-Square	13.47%	13.47%	17.30%	14.97%	20.25%	20.99%	20.99%
Probability	0.0362	0.0395	0.0083	0.0205	0.0020	0.0018	0.0018
Pseudo R-Square	0.1268	0.1245	0.1628	0.1408	0.1953	0.1975	0.1975
Log pseudo likelihood	-46.394885	-46.51417	-44.482041	-45.647001	-42.754443	-42.634016	-42.634016

Source: author's elaboration – AIDA database and Annual Reports for foreign sales measure.

Summary Multivariate Logit Regression

Table 42 shows the estimation results for the extent to which firms hedge their risk exposure with derivatives instruments as users (USE), interest rate (IR) and foreign exchange (FX) hedgers. It shows the seven different models specifications that have been obtained from different combinations of explanatory variables. All seven models estimated the three different dependent variables, the hedgers, the interest rate hedgers and the foreign exchange hedgers, and include one at a time measures such as interest coverage ratios, leverage ratio, profitability ratios, debt maturity ratios, growth opportunity ratio, financial price risk ratio and overseas operation ratio, firm size ratios, hedging substitutes ratios and likelihood of default ratio.

Previous tables showed that when the seven model have been run testing the IR hedgers they get an higher chi-square compared to the others. So it is believed that IR hedgers better capture the decision to hedge. Data suggest that estimates can be quite similar for Hedgers and IR hedgers because they have mainly the same significant variables. That could be explained because hedgers, as dependent variable, includes all those firms that used all types of derivatives and those who do not, further has to be taken into account that the Italian sample is characterized by the fact that 87.93% of the derivative users disclosed in their annual reports that they used IR derivatives. Meanwhile all the three dependent variables have in common the fact the most important proxy of financial distress is debt maturity as long term debt borrow, that has the highest coefficient. Furthermore it suggest that the Italian non-financial listed SMEs are more likely to use derivatives instruments on long term basis. That could be explained by high costs that they have to support entering into a derivative contract.

Tab. 42 - Empirical results: summary table about the corporate demand for financial derivatives

Indep. Variables	MOD.1			MOD.2			MOD.3			MOD.4			MOD.5			MOD.6			MOD.7			
	USE	IR	FX	USE	IR	FX	USE	IR	FX	USE	IR	FX	USE	IR	FX	USE	IR	FX	USE	IR	FX	
LT DEBT CAPITAL	2.354 (0.010) ***	2.694 (0.005) ***	- 0.074 (0.556)																			
GEARING RATIO				0.622 (0.010) ***	0.479 (0.054) *	0.981 (0.698)																
ROC							- 0.030 (0.342)	- 0.022 (0.506)	- 0.079 (0.054) *													
ROE										- 0.006 (0.696)	- 0.006 (0.687)	- 0.026 (0.194)										
EBITDA INT PAY													- 0.571 (0.025) **	- 0.035 (0.122)	- 0.076 (0.038) **							
ST BORROW																- 3.610 (0.008) ***	- 4.287 (0.003) ***	- 3.884 (0.008) ***				
LT BORROW																				3.610 (0.008) ***	4.287 (0.003) ***	3.884 (0.008) ***
MKTTBRAT	- 3.017 (0.244)	- 1.679 (0.503)	- 1.115 (0.733)	- 2.503 (0.330)	- 1.546 (0.533)	- 2.315 (0.794)	- 2.439 (0.304)	- 1.594 (0.490)	- 0.897 (0.778)	- 2.283 (0.343)	- 1.854 (0.437)	- 2.090 (0.555)	- 0.291 (0.610)	- 0.815 (0.736)	- 0.944 (0.772)	- 1.421 (0.564)	- 0.419 (0.867)	- 0.293 (0.932)	- 1.421 (0.564)	- 0.419 (0.867)	- 0.293 (0.932)	
FOREIGN SALES	0.143 (0.837)	0.092 (0.879)	1.734 (0.127)	0.067 (0.919)	0.127 (0.822)	6.085 (0.112)	0.054 (0.922)	0.128 (0.805)	1.915 (0.083) *	0.002 (0.997)	0.153 (0.771)	1.871 (0.102)	0.010 (0.855)	0.235 (0.653)	1.941 (0.114)	0.224 (0.736)	0.019 (0.974)	2.595 (0.034) **	0.224 (0.736)	0.019 (0.974)	2.595 (0.034) **	
LN ASSETS	1.105 (0.020) **	1.738 (0.001) ***	0.740 (0.114)	1.703 (0.000) ***	2.218 (0.000) ***	2.018 (0.131)	1.724 (0.000) ***	2.269 (0.000) ***	1.152 (0.037) **	1.612 (0.000) ***	2.097 (0.000) ***	0.995 (0.064) *	1.344 (0.003) ***	1.981 (0.000) ***	0.832 (0.106)	0.946 (0.061) *	1.499 (0.006) ***	0.213 (0.702)	0.946 (0.061) *	1.499 (0.006) ***	0.213 (0.702)	
CRATIO	0.243 (0.170)	0.294 (0.134)	0.690 (0.085) *	0.329 (0.100)	0.347 (0.107)	0.503 (0.088) *	0.132 (0.461)	0.173 (0.378)	0.692 (0.084) *	0.128 (0.463)	0.179 (0.347)	0.781 (0.080) *	0.306 (0.228)	0.262 (0.272)	0.586 (0.111)	0.014 (0.945)	0.030 (0.899)	0.878 (0.039) **	0.014 (0.945)	0.030 (0.899)	0.878 (0.039) **	
Z-SCORE	0.149 (0.660)	0.337 (0.354)	0.702 (0.127)	0.270 (0.428)	0.398 (0.262)	2.023 (0.127)	0.538 (0.133)	0.654 (0.096) *	1.230 (0.023) **	0.450 (0.230)	0.418 (0.292)	1.269 (0.056) *	0.754 (0.051) *	0.749 (0.056) *	1.638 (0.017) **	0.318 (0.343)	0.529 (0.135)	0.674 (0.146)	0.318 (0.343)	0.529 (0.135)	0.674 (0.146)	
_cons	- 10.657	- 19.561	- 10.271	- 18.655	- 25.479	0.000	- 17.401	- 24.723	- 15.246	- 16.200	- 22.444	- 14.311	- 14.147	- 22.097	- 11.772	- 6.580	- 13.586	- 3.807	- 10.190	- 17.874	- 0.077	

	(0.065)	(0.002)	(0.074)	(0.003)	(0.000)	(0.087)	(0.002)	(0.000)	(0.022)	(0.003)	(0.000)	(0.041)	(0.006)	(0.000)	(0.056)	(0.296)	(0.038)	(0.586)	(0.079)	(0.004)	(0.990)
	*	***	*	***	***	*	***	***	**	***	***	**	***	***	*		**		*	***	

Source: author's elaboration – AIDA database and Annual Reports for foreign sales measure.

5.4: United Kingdom vs Italian non-financial listed SMEs

This analysis attempted to track the utilization of derivatives instruments by UK and Italian non-financial listed Small and Medium Enterprises (SMEs) during the time period 2005-2012. The UK sample is composed by 1328 firm-year observations meanwhile the Italian has 528 firm-year observations.

In figure 1 is shown that the use of derivatives was most common among medium firms – almost 90 percent, followed by small and micro companies. Indeed, was expected this positive relationship between size and derivative usage because the derivative markets show significant economies of scale. Those results are consistent with the findings of Bodnar et al. (1995) and Berkman et al. (1997). But has to be taken into account that Warner's in 1977 with his research demonstrate that between direct costs of bankruptcy and firm size there is a negative relationship.

By industry sector²⁸, the use of derivatives by Italian SMEs was most common among manufacturing companies (36.21%), followed by professional, scientific and technical activities (17.24%) and industrial and commercial firms (13.22%). About the UK sample it is characterized by 22.57% of manufacturing companies that used derivatives instruments, the 21.18% of the hedger were information and commercial firms meanwhile the 19.10% were professional, scientific and technical activities. Therefore as could be expected in both samples manufacturing firms indicated a higher usage of derivatives, and this could be explained by the fact that manufacturing companies are more exposed to foreign exchange risks. UK small and medium enterprises are on average more exposed to foreign exchange risk than Italian, because in the European Union they trade with their national currency that is sterling and not Euro.

Another important fact that has to be taken into account matching the UK and Italian samples is what have been reported in the tables referring to the hedging activities and types of derivatives used by the UK and Italian non-financial listed SMEs. Indeed, data show that the 87.93% of the Italian derivative users disclosed in their annual reports that they used interest rate derivatives and the most common type has been interest rate swap (IRS). Meanwhile, the 55.21% of United Kingdom firms disclosed in their annual reports that they hedged by IR derivatives and 51.74% hedged by FX derivatives. Therefore there is a substantial difference in hedging type between the Italian and the UK small and

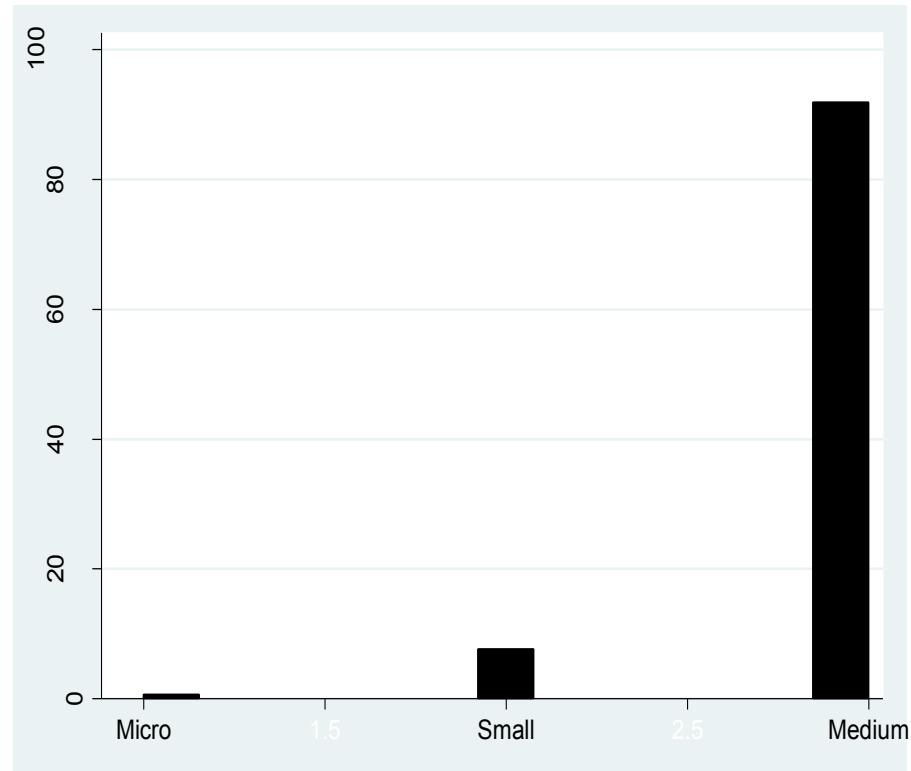
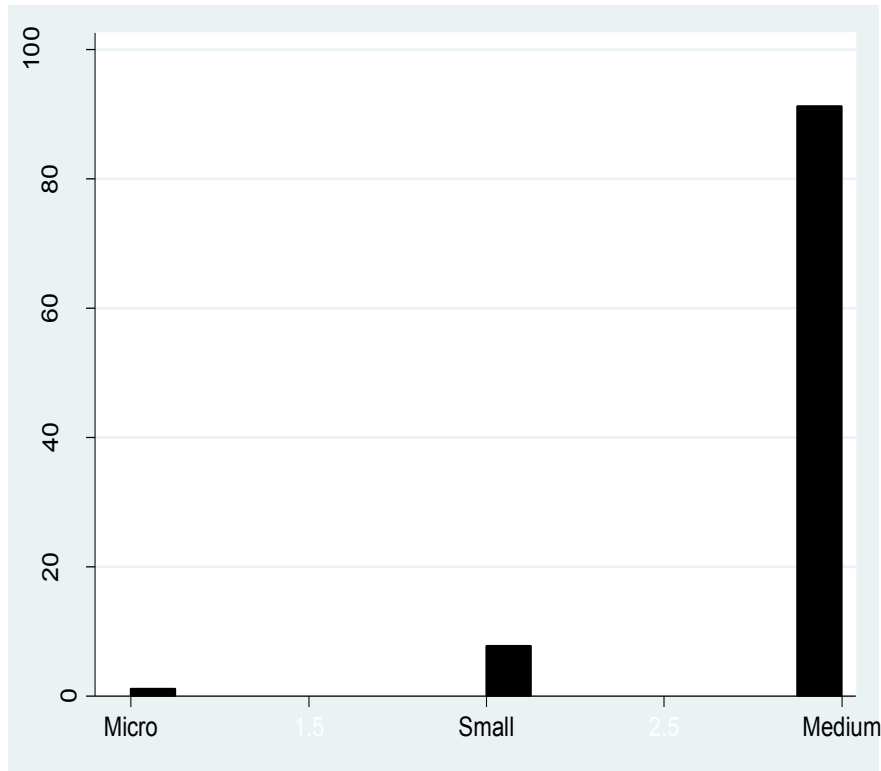
²⁸ See Annex E: Standard Industrial Classification of Economic Activities SIC 2007

medium enterprises, furthermore the univariate and the multivariate results strengthened that assumptions.

The summary multivariate logit regression tables shows that firm size is statistically significant with a positive relationship in both of the samples, thus larger Italian and UK small and medium enterprises are more likely to hedge. But, in almost all UK models the foreign sales and the liquidity measures are statistical significant variables, the first with a positive coefficient and the second with a negative one. Those explanatory variables in the Italian sample are never significant, except in few exceptional models. Also the market to book ratio is statistically significant only in the UK sample but with a negative coefficient. About the financial distress measures, the results suggest that the two best proxies in both samples are leverage and debt maturity. But the Italian multivariate logit regression used as leverage variables the long term debt and the gearing ratio which have a statistical positive coefficients for two dependent variables (Hedgers and IR Hedgers), meanwhile the UK model used the market value leverage who had a positive and statistical significant coefficient when the dependent variables were Hedgers and IR Hedgers and a statistical high negative coefficient when FX Hedgers are tested. The other explanatory proxies such as interest coverage ratios and profitability ratios in both samples had very low coefficient.

Fig.1 - Derivative usage by SMEs in United Kingdom and Italy

Micro, Small and Medium indicates the percentage of firms that disclosed in their annual reports that used derivatives according to firm size, where a turnover value equal or less than € 2 million (£ 2 million) was considered micro, more than € 2 million (£ 2 million) but equal or less than € 10million (£ 9million) was considered small and more than € 10 (£ 9 million) equal or less than € 50 (£ 43 million) million was considered medium.



Source: author's elaboration –Annual Reports data, STATA..

CONCLUSIONS

This research employs two unique datasets to examine why and how United Kingdom and Italian non-financial listed Small and Medium Enterprises (SMEs) used financial derivative instruments such as currency derivatives, interest rate derivatives and commodity derivatives, during the time period 2005-2012.

From the European Definition of SMEs using Bureaux Van Dijk databases – FAME (UK) AIDA (Italy) – have built up the two samples and collected all the necessary variables to perform the calculation needed for this research. Meanwhile, hedging data have been handily collected from the annual reports published on the websites of each firm, and for the Italian sample have been handily collected data about the overseas operations.

The univariate and multivariate logit tests help to understand which are the main factors that could lead an UK and an Italian non-financial listed small and medium enterprise to hedge with derivatives. The firm size proxies that have been used are statistically significant in all of the models in both samples, and it could be explained as: the high costs related to the use of derivatives are unaffordable for small businesses and they play a key role in decisions to adopt a risk management strategy that includes the use of these instruments. The findings are in line with the results obtained by Froot et al. (1993), Nance et al. (1993) and Judge (2006b).

The UK sample shows that foreign sale is a significant variable in almost all the models as foreign risk and overseas operation measure. Furthermore, it has a higher level of significance being 1% in all those models having FX hedgers as dependent variable. This is consistent with Berkman et Bradbourgy (1996) stated in their research. Meanwhile, in the Italian sample foreign sale variable is not significant in almost all of the models, that could be explained because only the 37% of the firms in the sample disclosed in their annual reports the use of FX derivatives, furthermore Italian companies trade in the European market with their national currency that is Euro.

The interest rate exposure is relevant in both samples but it is higher in the Italian. The proxies used to test this phenomenon are leverage and debt maturity. For the Italian sample the debt maturity and long term debt over capital are the best variables that explain the relationship between financial distress and the use of interest rate derivatives by Italian SMEs. Instead, market value leverage is the

best variable with debt maturity in the UK sample that best explain this relationship. The meaningfulness of these variables can be justified by the fact that SMEs have an high long term debt exposure therefore are more likely to face interest risks exposure. And an higher interest exposure lead to higher borrow costs, which in turn affect the company leverage and higher is its leverage exposure higher is its probability to incur into a financial distress situation. Therefore, bigger SMEs are more likely to hedge against this type of risk. Here is confirmed what stated by Smith and Stulz (1985) about the financial distress, with what Campello, Lin Ma and Zou (2011), Bartram et al. (2009) and Graham and Roger (2002) argued about leverage ratio.

The Froot, Scharfstein and Stein (1993) theory about the growth opportunities and the likelihood to hedge has been tested using the market to book ratio. This variable in the Italian sample was not significant in all the model, meanwhile in the UK sample it was statistically significant with a negative coefficient instead of positive.

Some analogy can be found comparing the results with those obtained in previous studies about European countries. Particularly, the firm size is a key variable because the benefits derived from economies of scale are a huge incentive for the adoption of derivatives by SMEs.

In contrast to the analysis carried out in the United States, in the Italian sample the market to book ratio is not significant in all the models, meanwhile in the UK sample it is statistically significant with a negative coefficient. Further, compared to other European research in the Italian sample the exchange rate proxies and the substitute of hedging variables used have no significant coefficients in all of the models tested.

While in both samples, the variables used to measure interest rate such as leverage and debt maturity are statistically significant with a high coefficient.

The most discriminating variable in the decision to use derivatives in the UK and Italian samples is the firm size, because is the only factor that in all the models is statistically significant with the higher marginal effect: larger is the firms higher is the probability that it is going to hedge by derivative instruments.

The unique aspect of this research is that it investigates this important issue of Italian and United Kingdom non-financial listed Small and Medium Enterprises. However it should be noted that a further research is required in this area,

especially estimating and managing interest rate and foreign exchange exposure and their determinants of UK and Italian firms.

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Annex A: Univariate logit regression results - UK sample

Tab. 43 - Univariate Logit of IR (no bias)

This table presents the results from univariate logit regression using a binary variable equal to 1 if firms hedge with IR derivatives and 0 if otherwise. The table presents the number of observations, coefficients, robust standard errors, z-statistics, p-values and Wald chi-square statistics. ***, ** and * indicate the significance at 1%, 5% and 10% respectively.

	Variables	N	Coeff		Robust std.errors	Z-stat	P- value	chi2
	Zsc	797	-0.222	***	0.060	-3.68	0.00	13.52
	Divyield	394	-0.037		0.045	-0.82	0.41	0.67
LEVERAGE	debtequity	627	0.001	*	0.001	1.84	0.07	3.40
	debtcapital	627	-0.032		0.110	-0.29	0.77	0.08
	ltdebtcapital	702	0.589	**	0.288	2.05	0.04	4.19
	ltdebtequity	702	0.402	***	0.114	3.52	0.00	12.41
	liabassets	988	0.139		0.274	0.51	0.61	0.26
	gearingrat	1020	0.003	***	0.001	3.90	0.00	15.19
	Bv	627	0.532	**	0.232	2.29	0.02	5.25
	Mktv	503	3.301	***	0.465	7.10	0.00	50.37
LIQUIDITY	Crat	1197	-0.067		0.070	-0.96	0.34	0.92
	Qrat	721	-0.243	**	0.120	-2.03	0.04	4.13
	liquidityratiox	1197	-0.344	***	0.116	-2.97	0.00	8.80
	shareholdersliqui	997	-0.019		0.013	-1.49	0.14	2.23
	dityratiox	11877	-0.001		0.003	-0.52	0.60	0.28
PROFITABILITY	solvencyratioass							
	etbased							
	Roc	1189	0.001		0.001	1.22	0.22	1.49
	Roe	1145	0.119	*	0.064	1.86	0.06	3.47
	profitmargin	1107	0.012	***	0.005	2.52	0.01	6.34
	returnonsharehol	1131	0.002		0.001	1.17	0.24	1.37
	dersfunds							
	returnontotalass	1196	0.007	***	0.003	2.70	0.01	7.28
ets								
IC	ebitmargin	1168	0.012	***	0.005	2.60	0.01	6.77
	ebitdamargin	1166	0.012	***	0.004	3.19	0.00	10.19
	grossmargin	1011	-0.002		0.004	-0.41	0.68	0.17
	Ebitinp	944	0.000		0.000	1.50	0.14	2.24
	ebitdainp	944	0.000		0.000	-0.41	0.68	0.17
GROWTH OP.	interestcoverx	925	-0.002		0.002	-1.21	0.23	1.46
	assetcoverx	690	-0.011	**	0.005	-2.27	0.02	5.15
	berryratio	1008	0.115		0.120	0.96	0.34	0.92
DEBT MATURITY	capexpsales	293	3.916		2.153	1.35	0.18	1.83
	mktbrat	934	0.270		0.266	1.02	0.31	1.03
FIRM SIZE	stborrow	627	-2.226	***	0.418	-5.33	0.00	28.40
	ltborrow	627	2.226	***	0.418	5.33	0.00	28.40
	lnmktcap	934	0.316	***	0.067	4.74	0.00	22.46
FOREIGN EXPOSURE	Intotsales	1130	0.557	***	0.081	6.88	0.00	47.40
	Intotassets	1146	0.695	***	0.070	9.94	0.00	98.71
	foreignsales	1130	-0.583	**	0.271	-2.15	0.03	4.62

Source: author's elaboration – FAME database.

Tab. 44 - Univariate Logit of FX (no bias).

This table presents the results from univariate logit regression using a binary variable equal to 1 if firms hedge with FX derivatives and 0 if otherwise. The table presents the number of observations, coefficients, robust standard errors, z-statistics, p-values and Wald chi-square statistics. ***, ** and * indicate the significance at 1%, 5% and 10% respectively.

	Variables	N	Coeff		Robust std.errors	Z-stat	P- value	chi2
	Zsc	797	0.586	***	0.098	5.93	0.00	35.15
	Divyield	394	0.052		0.052	-0.99	0.32	0.98
LEVERAGE	debtquity	627	0.000		0.001	-0.40	0.69	0.16
	debtcapital	627	-0.085		0.065	-1.32	0.19	1.75
	ltdebtcapital	702	-0.805	***	0.271	-2.97	0.00	8.83
	ltdebtquity	702	-0.183		0.158	-1.16	0.25	1.33
	liabassets	988	-2.542	***	0.462	-5.50	0.00	30.24
	gearingrat	1020	-0.012	***	0.004	-3.49	0.00	12.15
	Bv	627	-2.067	***	0.656	-3.15	0.00	9.91
	Mktv	503	-2.677	***	0.614	-4.36	0.00	19.03
LIQUIDITY	Crat	1197	0.105	***	0.029	3.59	0.00	12.89
	Qrat	721	0.247	***	0.067	3.67	0.00	13.48
	liquidityratiox shareholdersliqui	1197	0.141	***	0.040	3.49	0.00	12.17
	dityratiox	997	0.001		0.001	1.33	0.18	1.76
	solvencyratioass etbased	1187	0.024	***	0.004	5.77	0.00	33.28
PROFITABILITY	Roc	1189	0.004	***	0.001	3.45	0.00	11.92
	Roe	1145	0.137		0.093	1.48	0.14	2.19
	profitmargin	1107	0.014	***	0.003	3.86	0.00	14.93
	returnonsharehol dersfunds	1131	0.008	***	0.002	3.81	0.00	14.50
	returnontotalass ets	1196	0.025	***	0.006	4.21	0.00	17.73
	ebitmargi	1168	0.005	***	0.002	3.15	0.00	9.92
	ebitdamargi	1166	0.004	***	0.001	2.75	0.01	7.55
	grossmargin	1011	-0.003		0.004	-0.88	0.38	0.77
IC	Ebitinp	944	0.002	***	0.000	4.03	0.00	16.28
	ebitdainp	944	0.001	***	0.000	3.90	0.00	15.17
	interestcoverx	925	0.004	***	0.001	4.13	0.00	17.07
	assetcoverx	690	0.001		0.001	1.49	0.14	2.23
	berryratio	1008	0.111	*	0.061	1.82	0.07	3.32
GROWTH OP.	capexpsales	293	0.888		0.832	1.07	0.29	1.14
	mktbrat	934	-2.314	***	0.442	-5.24	0.00	27.42
DEBT MATURITY	stborrow	627	0.359		0.437	0.82	0.41	0.67
	ltborrow	627	-0.359		0.437	-0.82	0.41	0.67
FIRM SIZE	lnmktcap	934	0.231	***	0.065	3.57	0.00	12.75
	lntotsales	1130	0.884	***	0.107	8.25	0.00	68.14
	lntotassets	1146	0.237	***	0.053	4.50	0.00	20.24
FOREIGN EXPOSURE	foreignsales	1130	1.514	***	0.242	6.27	0.00	39.28

Source: author's elaboration – FAME database.

						0.768 (0.000) ***	0.104 (0.000) ***	2.157 (0.000) ***	0.849 (0.000) ***	0.102 (0.000) ***	2.337 (0.000) ***				0.783 (0.000) ***	0.106 (0.000) ***	2.188 (0.000) ***	0.783 (0.000) ***	0.106 (0.000) ***	2.188 (0.000) ***	
				-																	
LN ASSETS	0.660 (0.000) ***	0.088 (0.000) ***	1.935 (0.000) ***	0.577 (0.000) ***	0.040 (0.042) **	1.781 (0.000) ***						0.733 (0.000) ***	0.089 (0.000) ***	2.082 (0.000) ***							
	-	-		-	-							-	-		-	-		-	-		
Q-RATIO	0.253 (0.066) *	0.033 (0.062) *	0.776 (0.066) *	0.328 (0.043) **	0.040 (0.042) **	0.719 (0.043) **	0.153 (0.440) *	0.020 (0.434) **	0.858 (0.440) **	0.319 (0.044) **	0.038 (0.037) **	0.726 (0.044) **	0.302 (0.031) **	0.036 (0.028) **	0.739 (0.031) **	0.277 (0.181) **	0.037 (0.173) **	0.757 (0.181) **	0.277 (0.181) **	0.037 (0.173) **	0.757 (0.181) **
SOLVENCY RATIO																					
Z-SCORE	0.204 (0.281)	0.027 (0.275)	1.226 (0.281)	0.274 (0.204)	0.033 (0.194)	1.35 (0.204)	0.070 (0.709)	0.009 (0.710)	0.932 (0.709)	0.476 (0.004) ***	0.057 (0.003) ***	0.621 (0.004) ***	0.210 (0.464)	0.025 (0.465)	1.233 (0.464)	0.047 (0.798)	0.006 (0.799)	0.953 (0.798)	0.047 (0.798)	0.006 (0.799)	0.953 (0.798)
	-			-			-	-		-	-		-	-		-	-		-	-	
_cons	7.577 (0.000) ***		0.001 (0.000) ***	5.749 (0.001) ***		0.003 (0.001) ***	8.113 (0.000) ***		0.000 (0.000) ***	7.971 (0.000) ***		0.000 (0.000) ***	8.432 (0.000) ***		0.000 (0.000) ***	6.818 (0.001) ***		0.001 (0.001) ***		8.414 (0.000) ***	0.000 (0.000) ***

Source: author's elaboration – FAME database.

Summary Statistic for Logit Regression.

Statistics	MOD.1	MOD.2	MOD.3	MOD.4	MOD.5	MOD.6	MOD.7
N.	398	330	310	430	444	310	310
No. of Users	77	70	65	75	78	63	63
Classified as Users	35	47	40	30	32	40	40
Classified as Non-Users	42	23	23	45	46	23	23
Sensitivity	45.45%	67.14%	63.49%	40.00%	41.03%	63.49%	63.49%
No. of Non-Users	321	260	247	355	366	247	247
Classified as users	61	68	56	57	55	63	63
Classified as Non-Users	260	192	191	298	311	184	184
Specificity	81.00%	73.85%	77.33%	83.94%	84.97%	74.49%	74.49%
Correctly Specified	74.12%	72.42%	74.52%	76.28%	77.25%	72.26%	72.26%
Chi-Square	44.53%	49.49%	41.40%	42.67%	51.32%	38.62%	38.62%
Probability	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R-Square	0.1139	0.1451	0.1323	0.1072	0.1244	0.1234	0.1234
Log pseudo likelihood	-173.23633	-145.78173	-135.80085	-177.6772	-180.69657	-137.19141	-137.19141

Source: author's elaboration – FAME database.

Tab. 46 - Logit Regression on the probability of hedging (FX no bias).

This table presents logit regression estimates of the relation between the probability that a firm hedge with FX derivatives as proxies for incentives to hedge. The dependent variable equals 1 if a firm provides qualitative information of any derivative use in the annual report, an 0 if otherwise. The model presents log of odds coefficients (Coef.), marginal effects (ME), odds ratios and the respective p-values in parenthesis. The estimated coefficients give the change in the logit function given a change in the independent variable. The marginal effect (elasticities) measures the actual change (percentage change) in the probability of hedging for 1% increase in the independent variable. The higher the elasticity' value more important is the variable in the model. The odds ratio gives the likelihood of Y = 1 when X is increased by one unit. The p-values are calculated using the robust (heteroscedastic) standard errors. ***, ** and * indicate the significance at 1%, 5% and 10% respectively.

Indep. Variables	MOD.1			MOD.2			MOD.3			MOD.4			MOD.5		
	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds
EBIT INT PAYMENT	-	-													
	0.000	0.000	0.999												
	(0.783)	(0.782)	(0.783)												
ASSETCOV ERX				0.001	0.000	1.001									
				(0.149)	(0.151)	(0.149)									
MKTV							-	-							
							4.261	0.402	0.014						
							(0.000)	(0.000)	(0.000)						
							***	***	***						
PROFIT MARGIN										-	-				
										0.022	0.002	0.977			
										(0.008)	(0.007)	(0.008)			
										***	***	***			
ROA													-	-	
													0.072	0.009	0.930
													(0.000)	(0.000)	(0.000)
													***	***	***
ST BORROW LT BORROW															
MKTTBRAT	-	-		-	-										
	1.937	0.254	0.144	0.362	0.039	0.695	0.002	0.000	1.002	3.666	0.386	0.025	2.642	0.331	0.071
	(0.020)	(0.016)	(0.020)	(0.698)	(0.697)	(0.698)	(0.998)	(0.998)	(0.998)	(0.000)	(0.000)	(0.000)	(0.002)	(0.001)	(0.002)
	**	**	**							***	***	***	***	***	***
FOREIGN SALES	0.558	0.073	1.747	0.702	0.077	2.019	0.967	0.091	2.630	0.414	0.043	1.512	0.601	0.075	1.823
	(0.134)	(0.138)	(0.134)	(0.121)	(0.125)	(0.121)	(0.059)	(0.064)	(0.059)	(0.267)	(0.270)	(0.267)	(0.094)	(0.095)	(0.094)
							*	*	*				*	*	*
LN SALES							0.954	0.090	2.597	1.117	0.117	3.055			
							(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)			
							***	***	***	***	***	***			
LN ASSETS	0.301	0.039	1.352	0.296	0.032	1.345							0.732	0.091	2.080
	(0.024)	(0.018)	(0.024)	(0.073)	(0.060)	(0.073)							(0.000)	(0.000)	(0.000)

	**	**	**	*	*	*							***	***	***
	-	-		-	-								-	-	
Q-RATIO	0.054	0.007	0.947	0.030	0.003	0.969	0.036	0.003	1.037	0.147	0.015	0.862	0.167	0.020	0.845
	(0.655)	(0.655)	(0.655)	(0.856)	(0.856)	(0.856)	(0.872)	(0.872)	(0.872)	(0.325)	(0.319)	(0.325)	(0.162)	(0.159)	(0.162)
SOLVENCY RATIO															
	0.893	0.117	2.442	0.773	0.085	2.166	0.491	0.046	1.635	1.009	0.106	2.743	1.795	0.225	6.023
Z-SCORE	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.014)	(0.011)	(0.014)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	***	***	***	***	***	***	**	**	**	***	***	***	***	***	***
	-			-			-			-			-		
_cons	4.914		0.007	5.825		0.002	10.739		0.000	12.336		4.4e-06	9.899		0.000
	(0.002)		(0.002)	(0.002)		(0.002)	(0.000)		(0.000)	(0.000)		(0.000)	(0.000)		(0.000)
	***		***	***		***	***		***	***		***	***		***

Source: author's elaboration – FAME database.

Summary Statistic for Logit Regression.

Statistics	MOD.1	MOD.2	MOD.3	MOD.4	MOD.5
N.	401	308	298	441	455
No. of Users	80	48	51	86	89
Classified as Users	43	20	28	57	54
Classified as Non-Users	37	28	23	29	35
Sensitivity	53.75%	41.67%	54.90%	66.28%	60.67%
No. of Non-Users	321	260	247	355	366
Classified as users	72	27	39	69	66
Classified as Non-Users	249	233	208	286	300
Specificity	77.57%	89.62%	84.21%	80.56%	81.97%
Correctly Specified	72.82%	82.14%	79.19%	77.78%	77.80%
Chi-Square	45.80%	23.13%	55.37%	92.37%	71.92%
Probability	0.0000	0.0008	0.0000	0.0000	0.0000
Pseudo R-Square	0.1143	0.0868	0.2030	0.2122	0.1599
Log pseudo likelihood	-177.48354	-121.71149	-108.70473	-171.41046	-188.92298

Source: author's elaboration – FAME database.

Annex C: Univariate logit regression results – Italian sample

Tab. 47 - Univariate Logit of IR (no bias).

This table presents the results from univariate logit regression using a binary variable equal to 1 if firms hedge with IR derivatives and 0 if otherwise. The table presents the number of observations, coefficients, robust standard errors, z-statistics, p-values and Wald chi-square statistics. ***, ** and * indicate the significance at 1%, 5% and 10% respectively.

	Variables	N	Coeff		Robust std.errors	Z-stat	P- value	chi2
	zsc	497	-0.352		0.117	-3.15	0.00	9.91
LEVERAGE	debtequity	497	0.000		0.004	-0.06	0.10	0.00
	debtcapital	497	0.003		0.008	0.36	0.72	0.13
	ltdebtcapital	497	0.070		0.039	1.77	0.08	3.14
	ltdebtequity	497	0.022		0.014	1.59	0.11	2.53
	liabassets	497	0.151		0.384	0.39	0.70	0.15
	gearingrat	507	-0.006		0.013	-0.49	0.62	0.24
	bv	497	-0.231		0.380	-0.61	0.54	0.37
	mktv	499	0.422		0.264	1.60	0.11	2.56
LIQUIDITY	crat	497	-0.082	*	0.047	-1.75	0.08	3.07
	qrat	497	-0.068		0.047	-1.45	0.15	2.11
	liquidityratiox	497	-0.068		0.047	-1.45	0.15	2.11
	shareholdersliq	412	-0.002		0.002	-0.08	0.41	0.69
	uidityratiox							
	solvencyratioa	497	4.324		36.346	0.12	0.91	0.01
	ssetbased							
PROFITABILITY	roc	507	-0.019	*	0.010	-1.84	0.07	3.40
	roe	507	0.009		0.004	2.31	0.21	5.36
	profitmargin	485	0.124	**	0.059	2.11	0.04	4.46
	returnonshareh	486	0.015		0.024	0.63	0.53	0.40
	oldersfunds							
	returnontotalas	507	0.009		0.006	1.36	0.17	1.85
	sets							
	ebitmargin	496	0.108		0.100	1.08	0.28	1.17
	ebitdamargin	496	0.117		0.116	1.01	0.31	1.02
IC	ebitinp	492	0.001		0.001	0.94	0.35	0.88
	ebitdainp	492	-0.001		0.001	-1.21	0.23	1.46
	interestcoverx	492	0.001		0.001	0.94	0.35	0.88
	assetcoverx	412	-0.002		0.002	-1.03	0.30	1.06
GROWTH OP	mktbrat	497	-0.047		0.367	-0.13	0.90	0.02
DEBT MATURITY	stborrow	497	-3.511	***	0.453	-7.75	0.00	60.13
	ltborrow	497	3.511	***	0.453	7.75	0.00	60.13
FIRM SIZE	lnmktcap	333	0.450	***	0.086	5.21	0.00	27.10
	lntotales	496	0.664	***	0.107	6.19	0.00	38.32
	lntotassets	497	0.791	***	0.100	7.94	0.00	62.98
FOREIGN EXPOSURE	foreignsales	92	-0.071		0.484	-0.15	0.88	0.02

Source: author's elaboration – AIDA database and Annual Reports for foreign sales measure.

Table 48 - Univariate Logit of FX (no bias).

This table presents the results from univariate logit regression using a binary variable equal to 1 if firms hedge with FX derivatives and 0 if otherwise. The table presents the number of observations, coefficients, robust standard errors, z-statistics, p-values and Wald chi-square statistics. ***, ** and * indicate the significance at 1%, 5% and 10% respectively.

	Variables	N	Coeff		Robust std.errors	Z-stat	p- value	chi2
LEVERAGE	zsc	410	-0.303	**	0.143	-2.12	0.03	4.50
	debtequity	410	0.001		0.006	0.23	0.82	0.05
	debtcapital	410	-0.002		0.015	-0.14	0.89	0.02
	ltdebtcapital	410	0.044		0.056	0.80	0.42	0.64
	ltdebtequity	410	0.015		0.018	0.85	0.40	0.07
	liabassets	410	0.083		0.475	0.18	0.86	0.03
	gearingrat	419	-0.075	*	0.040	-1.88	0.06	3.54
	bv	410	0.583		0.555	1.05	0.29	1.10
	mktv	412	0.100		0.279	9.36	0.72	0.13
LIQUIDITY	crat	410	-0.135	**	0.062	-2.18	0.03	4.76
	qrat	410	-0.135	**	0.064	-2.09	0.04	4.36
	liquidityratiox	410	-0.135	**	0.064	-2.09	0.04	4.36
	shareholdersliq							
	uidityratiox	330	0.000		0.001	-0.37	0.71	0.14
	solvencyratioa	410	-56.320		52.277	-1.08	0.28	1.16
	ssetbased							
PROFITABILITY	roc	419	-0.052	***	0.014	-3.67	0.00	13.48
	roe	419	0.008	*	0.005	1.67	0.10	2.78
	profitmargin	398	0.042		0.072	0.58	0.56	0.34
	returnonshareh							
	oldersfunds	399	0.063	**	0.031	2.03	0.04	4.11
	returnontotalas	419	-0.005		0.007	-0.68	0.49	0.47
	sets							
	ebitmargin	409	-0.194	*	0.101	-1.92	0.06	3.68
	ebitdamargin	409	-0.233	**	0.114	-2.04	0.04	4.16
IC	ebitinp	405	0.000		0.001	0.16	0.87	0.03
	ebitdainp	405	-0.001		0.001	-1.55	0.12	2.39
	interestcoverx	405	0.000		0.001	0.16	0.87	0.03
	assetcoverx	330	-0.001		0.000	-1.22	0.22	1.48
GROWTH OP	mktbrat	410	0.527		0.525	1.00	0.32	1.01
DEBT MATURITY	stborrow	410	-2.549	***	0.574	-4.44	0.00	19.70
	ltborrow	410	2.549	***	0.574	4.44	0.00	19.70
FIRM SIZE	lnmktcap	259	0.667	***	0.138	4.84	0.00	23.38
	Intotsales	409	0.389	***	0.124	3.14	0.00	9.89
	Intotassets	410	0.728	***	0.121	6.02	0.00	36.25
FOREIGN EXPOSURE	foreignsales	62	0.954		0.652	1.46	0.14	2.14

Source: author's elaboration – AIDA database and Annual Reports for foreign sales measure.

Annex D: Multivariate logit results - Italian sample

Tab. 49 - Logit Regression on the probability of hedging (IR no bias).

This table presents logit regression estimates of the relation between the probability that a firm hedge with IR derivatives as proxies for incentives to hedge. The dependent variable equals 1 if a firm provides qualitative information of any derivative use in the annual report, an 0 if otherwise. The model presents log of odds coefficients (Coef.), marginal effects (ME), odds ratios and the respective p-values in parenthesis. The estimated coefficients give the change in the logit function given a change in the independent variable. The marginal effect (elasticities) measures the actual change (percentage change) in the probability of hedging for 1% increase in the independent variable. The higher the elasticity' value more important is the variable in the model. The odds ratio gives the likelihood of Y = 1 when X is increased by one unit. The p-values are calculated using the robust (heteroscedastic) standard errors. ***, ** and * indicate the significance at 1%, 5% and 10% respectively.

Indep. Variables	MOD.1			MOD.2			MOD.3			MOD.4			MOD.5			MOD.6			MOD.7			
	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	
LT DEBT CAPITAL	2.554 (0.007) ***	0.285 (0.000) ***	12.862 (0.007) ***																			
GEARING RATIO				0.537 (0.033) **	0.103 (0.004) ***	1.711 (0.033) **																
ROC							-0.024 (0.468)	-0.005 (0.468)	0.975 (0.468)													
ROE										0.002 (0.873)	0.000 (0.873)	1.002 (0.873)										
EBITDA INT PAY													0.043 (0.078) *	0.010 (0.088) *	0.957 (0.078) *							
ST BORROW																4.074 (0.004) ***	0.931 (0.003) ***	0.017 (0.004) ***				
LT BORROW																			4.074 (0.004) ***	0.931 (0.003) ***	58.793 (0.004) ***	
MKTTBRAT	-0.022 (0.405)	-0.0237 (0.456)	0.119 (0.405)	1.913 (0.447)	0.369 (0.459)	0.147 (0.447)	1.931 (0.411)	0.459 (0.411)	0.144 (0.411)	2.076 (0.390)	0.494 (0.390)	0.125 (0.390)	1.073 (0.664)	0.260 (0.664)	0.341 (0.664)	0.713 (0.776)	0.163 (0.777)	0.490 (0.776)	0.713 (0.776)	0.163 (0.777)	0.490 (0.776)	
FOREIGN SALES	0.022 (0.972)	0.002 (0.972)	0.978 (0.972)	0.048 (0.936)	0.009 (0.936)	0.952 (0.936)	0.068 (0.899)	0.016 (0.899)	0.934 (0.899)	0.104 (0.847)	0.024 (0.847)	0.901 (0.847)	0.184 (0.733)	0.044 (0.733)	0.831 (0.733)	0.074 (0.904)	0.016 (0.904)	1.077 (0.904)	0.074 (0.904)	0.016 (0.904)	1.077 (0.904)	
LN ASSETS	1.605 (0.002) ***	0.179 (0.087) *	4.981 (0.002) ***	2.049 (0.000) ***	0.395 (0.000) ***	7.761 (0.000) ***	2.141 (0.000) ***	0.509 (0.000) ***	8.514 (0.000) ***	1.998 (0.000) ***	0.475 (0.000) ***	7.378 (0.000) ***	1.754 (0.001) ***	0.425 (0.001) ***	5.782 (0.001) ***	1.396 (0.011) **	0.319 (0.011) **	4.041 (0.011) **	1.396 (0.011) **	0.319 (0.011) **	4.041 (0.011) **	

CRATIO	0.304 (0.124)	0.034 (0.177)	1.356 (0.124)	0.373 (0.085) *	0.072 (0.062) *	1.453 (0.085) *	0.193 (0.333)	0.045 (0.329)	1.213 (0.333)	0.194 (0.316)	0.046 (0.255)	1.214 (0.316)	0.315 (0.219)	0.076 (0.213)	1.371 (0.219)	0.014 (0.954)	0.003 (0.954)	1.014 (0.954)	0.014 (0.954)	0.003 (0.954)	1.014 (0.954)
Z-SCORE	0.309 (0.389)	0.034 (0.454)	1.362 (0.389)	0.331 (0.351)	0.064 (0.366)	1.392 (0.351)	0.630 (0.098) *	0.150 (0.099) *	1.878 (0.098) *	0.449 (0.255)	0.106 (0.255)	1.567 (0.255)	0.750 (0.052) *	0.181 (0.057) *	2.118 (0.052) *	0.484 (0.167)	0.110 (0.172)	1.623 (0.167)	0.484 (0.167)	0.110 (0.172)	1.623 (0.167)
_cons	17.555 (0.007) ***	2.3e-08 (0.007) ***	23.261 (0.000) ***	7.9e-11 (0.000) ***	22.915 (0.000) ***	1.1e-10 (0.000) ***	21.075 (0.000) ***	7.0e-10 (0.000) ***	19.238 (0.001) ***	4.4e-09 (0.001) ***	12.297 (0.065) *	4.5e-06 (0.065) *	16.371 (0.010) ***	7.7e-08 (0.010) ***							

Source: author's elaboration – AIDA database and Annual Reports for foreign sales measure.

Summary Statistic for Logit Regression.

Statistics	MOD.1	MOD.2	MOD.3	MOD.4	MOD.5	MOD.6	MOD.7
N.	91	91	91	91	91	91	91
No. of Users	53	53	53	53	53	53	53
Classified as Users	43	44	43	43	46	43	43
Classified as Non-Users	10	9	10	10	7	10	10
Sensitivity	81.13%	83.02%	81.13%	81.13%	86.79%	81.13%	81.13%
No. of Non-Users	38	38	38	38	38	38	38
Classified as users	8	9	13	13	14	10	10
Classified as Non-Users	30	29	25	25	24	28	28
Specificity	78.95%	76.32%	65.79%	65.79%	63.16%	73.68%	73.68%
Correctly Specified	80.22%	80.22%	74.73%	74.73%	76.92%	78.02%	78.02%
Chi-Square	41.14%	36.17%	28.92%	28.41%	34.20%	38.04%	38.04%
Probability	0.0000	0.0000	0.0001	0.0001	0.0000	0.0000	0.0000
Pseudo R-Square	0.3327	0.2925	0.2339	0.2298	0.2765	0.3076	0.3076
Log pseudo likelihood	-41.264965	-43.749998	-47.373148	-47.627049	-44.735995	-42.816868	-42.816868

Source: author's elaboration – AIDA database and Annual Reports for foreign sales measure.

Tab. 50 - Logit Regression on the probability of hedging (FX no bias).

This table presents logit regression estimates of the relation between the probability that a firm hedge with FX exposure as proxies for incentives to hedge. The dependent variable equals 1 if a firm provides qualitative information of any derivative use in the annual report, an 0 if otherwise. The model presents log of odds coefficients (Coef.), marginal effects (ME), odds ratios and the respective p-values in parenthesis. The estimated coefficients give the change in the logit function given a change in the independent variable. The marginal effect (elasticities) measures the actual change (percentage change) in the probability of hedging for 1% increase in the independent variable. The higher the elasticity' value more important is the variable in the model. The odds ratio gives the likelihood of Y = 1 when X is increased by one unit. The p-values are calculated using the robust (heteroscedastic) standard errors. ***, ** and * indicate the significance at 1%, 5% and 10% respectively.

Indep. Variables	MOD.1			MOD.2			MOD.3			MOD.4			MOD.5			MOD.6			MOD.7			
	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	Coef.	ME	Odds	
LT DEBT CAPITAL	3.311 (0.001) ***	0.773 (0.002) ***	27.427 (0.001) ***																			
GEARING RATIO				1.553 (0.001) ***	0.326 (0.001) ***	4.726 (0.001) ***																
ROC							- 0.068 (0.123)	- 0.015 (0.111)	- 0.933 (0.123)													
ROE										- 0.030 (0.244)	- 0.006 (0.234)	- 0.970 (0.244)										
EBITDA INT PAY													- 0.075 (0.045) **	- 0.014 (0.005) ***	- 0.927 (0.045) **							
ST BORROW																- 5.271 (0.003) ***	- 1.200 (0.004) ***	- 0.005 (0.003) ***				
LT BORROW																				5.271 (0.003) ***	1.200 (0.004) ***	194.706 (0.003) ***
MKTTBRAT	1.214 (0.824)	0.283 (0.825)	0.296 (0.824)	1.929 (0.742)	0.406 (0.741)	0.145 (0.742)	1.288 (0.770)	0.288 (0.769)	3.628 (0.770)	1.361 (0.771)	0.307 (0.770)	3.903 (0.771)	0.645 (0.891)	0.121 (0.891)	0.524 (0.891)	1.559 (0.772)	0.355 (0.771)	4.755 (0.772)	1.559 (0.772)	0.355 (0.771)	4.755 (0.772)	
FOREIGN SALES	1.825 (0.260)	0.426 (0.268)	6.203 (0.260)	2.916 (0.113)	0.613 (0.113)	18.477 (0.006) ***	0.989 (0.307)	0.221 (0.310)	2.689 (0.307)	1.107 (0.381)	0.249 (0.385)	3.025 (0.381)	1.157 (0.417)	0.217 (0.428)	3.180 (0.417)	2.151 (0.177)	0.489 (0.188)	8.596 (0.177)	2.151 (0.177)	0.489 (0.188)	8.596 (0.177)	
LN ASSETS	0.034 (0.959)	0.008 (0.959)	1.035 (0.959)	2.069 (0.006) ***	0.435 (0.004) ***	7.919 (0.006) ***	1.305 (0.019) **	0.292 (0.016) **	3.688 (0.019) **	1.349 (0.030) **	0.304 (0.024) **	3.855 (0.030) **	1.078 (0.055) *	0.202 (0.048) **	2.940 (0.055) *	0.055 (0.925) *	0.012 (0.965) *	1.057 (0.925) *	0.055 (0.925) *	0.012 (0.925) *	1.057 (0.925) *	
CRATIO	- 0.421	- 0.098	- 0.655	- 0.614	- 0.129	- 1.849	- 0.537	- 0.120	- 0.584	- 0.618	- 0.139	- 0.538	- 0.069	- 0.013	- 0.932	- 1.032	- 0.235	- 0.355	- 1.032	- 0.235	- 0.355	

	(0.466)	(0.461)	(0.466)	(0.204)	(0.195)	(0.204)	(0.308)	(0.296)	(0.308)	(0.265)	(0.251)	(0.265)	(0.903)	(0.903)	(0.903)	(0.089)	(0.080)	(0.089)	(0.089)	(0.080)	(0.089)
Z-SCORE	0.258	0.060	1.295	0.848	0.178	2.336	0.934	0.209	2.545	1.236	0.279	3.444	1.379	0.258	3.972	0.593	0.135	1.810	0.593	0.135	1.810
	(0.677)	(0.676)	(0.677)	(0.183)	(0.172)	(0.183)	(0.098)	(0.087)	(0.098)	(0.134)	(0.121)	(0.134)	(0.074)	(0.039)	(0.074)	(0.279)	(0.281)	(0.279)	(0.279)	(0.281)	(0.279)
	-			-			-	*	*	-			-	**	*				-		
_cons	1.162		0.312	28.647		3.6e-13	16.407		7.4e-08	17.018		4.0e-08	12.874		2.5e-06	1.866		6.468	3.404		0.033
	(0.876)		(0.876)	(0.002)		(0.002)	(0.023)		(0.023)	(0.038)		(0.038)	(0.058)		(0.058)	(0.796)		(0.796)	(0.600)		(0.600)
				***		***	**		**	**		**	*		*						

Source: author's elaboration – AIDA database and Annual Reports for foreign sales measure.

Summary Statistic for Logit Regression.

Statistics	MOD.1	MOD.2	MOD.3	MOD.4	MOD.5	MOD.6	MOD.7
N.	61	61	61	61	61	61	61
No. of Users	23	23	23	23	23	23	23
Classified as Users	13	14	11	10	11	10	10
Classified as Non-Users	10	9	12	13	12	13	13
Sensitivity	56.52%	60.87%	47.83%	43.38%	47.83%	43.38%	43.38%
No. of Non-Users	38	38	38	38	38	38	38
Classified as users	4	5	6	6	8	6	6
Classified as Non-Users	34	33	32	32	30	32	32
Specificity	89.47%	86.84%	84.21%	84.21%	78.95%	84.21%	84.21%
Correctly Specified	77.05%	77.05%	70.49%	68.85%	67.21%	68.85%	68.85%
Chi-Square	23.93%	26.48%	11.53%	10.37%	16.78%	20.01%	20.01%
Probability	0.0005	0.0002	0.0734	0.1101	0.0101	0.0028	0.0028
Pseudo R-Square	0.2960	0.3276	0.1426	0.1282	0.2076	0.2475	0.2475
Log pseudo likelihood	-28.454006	-27.179225	-34.654963	-35.236036	-32.029625	-30.413871	-30.41387

Source: author's elaboration – AIDA database and Annual Reports for foreign sales measure.

Annex E: Standard Industrial Classification of Economic Activities SIC 2007

Tab.51 – SIC 2007.

Standard Industrial Classification of Economic Activities (SIC) is used to classify business establishments and other standard units by the type of economic activity in which they are engaged. The new version of these codes (SIC 2007) was adopted by the UK as from 1st January 2008.

SIC 2007	Description
SECTION	Agriculture, Forestry and Fishing
A	
01110	Growing of cereals (except rice), leguminous crops and oil seeds
01120	Growing of rice
01130	Growing of vegetables and melons, roots and tubers
01140	Growing of sugar cane
01150	Growing of tobacco
01160	Growing of fibre crops
01190	Growing of other non-perennial crops
01210	Growing of grapes
01220	Growing of tropical and subtropical fruits
01230	Growing of citrus fruits
01240	Growing of pome fruits and stone fruits
01250	Growing of other tree and bush fruits and nuts
01260	Growing of oleaginous fruits
01270	Growing of beverage crops
01280	Growing of spices, aromatic, drug and pharmaceutical crops
01290	Growing of other perennial crops
01300	Plant propagation
01410	Raising of dairy cattle
01420	Raising of other cattle and buffaloes
01430	Raising of horses and other equines
01440	Raising of camels and camelids
01450	Raising of sheep and goats
01460	Raising of swine/pigs
01470	Raising of poultry
01490	Raising of other animals
01500	Mixed farming
01610	Support activities for crop production
01621	Farm animal boarding and care
01629	Support activities for animal production (other than farm animal boarding and care) n.e.c.
01630	Post-harvest crop activities
01640	Seed processing for propagation
01700	Hunting, trapping and related service activities
02100	Silviculture and other forestry activities

02200	Logging
02300	Gathering of wild growing non-wood products
02400	Support services to forestry
03110	Marine fishing
03120	Freshwater fishing
03210	Marine aquaculture
03220	Freshwater aquaculture
SECTION B	Mining and Quarrying
05101	Deep coal mines
05102	Open cast coal working
05200	Mining of lignite
06100	Extraction of crude petroleum
06200	Extraction of natural gas
07100	Mining of iron ores
07210	Mining of uranium and thorium ores
07290	Mining of other non-ferrous metal ores
08110	Quarrying of ornamental and building stone, limestone, gypsum, chalk and slate
08120	Operation of gravel and sand pits; mining of clays and kaolin
08910	Mining of chemical and fertilizer minerals
08920	Extraction of peat
08930	Extraction of salt
08990	Other mining and quarrying n.e.c.
09100	Support activities for petroleum and natural gas mining
09900	Support activities for other mining and quarrying
SECTION C	Manufacturing
10110	Processing and preserving of meat
10120	Processing and preserving of poultry meat
10130	Production of meat and poultry meat products
10200	Processing and preserving of fish, crustaceans and molluscs
10310	Processing and preserving of potatoes
10320	Manufacture of fruit and vegetable juice
10390	Other processing and preserving of fruit and vegetables
10410	Manufacture of oils and fats
10420	Manufacture of margarine and similar edible fats
10511	Liquid milk and cream production
10512	Butter and cheese production
10519	Manufacture of other milk products
10520	Manufacture of ice cream
10611	Grain milling

10612	Manufacture of breakfast cereals and cereals-based food
10620	Manufacture of starches and starch products
10710	Manufacture of bread; manufacture of fresh pastry goods and cakes
10720	Manufacture of rusks and biscuits; manufacture of preserved pastry goods and cakes
10730	Manufacture of macaroni, noodles, couscous and similar farinaceous products
10810	Manufacture of sugar
10821	Manufacture of cocoa and chocolate confectionery
10822	Manufacture of sugar confectionery
10831	Tea processing
10832	Production of coffee and coffee substitutes
10840	Manufacture of condiments and seasonings
10850	Manufacture of prepared meals and dishes
10860	Manufacture of homogenized food preparations and dietetic food
10890	Manufacture of other food products n.e.c.
10910	Manufacture of prepared feeds for farm animals
10920	Manufacture of prepared pet foods
11010	Distilling, rectifying and blending of spirits
11020	Manufacture of wine from grape
11030	Manufacture of cider and other fruit wines
11040	Manufacture of other non-distilled fermented beverages
11050	Manufacture of beer
11060	Manufacture of malt
11070	Manufacture of soft drinks; production of mineral waters and other bottled waters
12000	Manufacture of tobacco products
13100	Preparation and spinning of textile fibres
13200	Weaving of textiles
13300	Finishing of textiles
13910	Manufacture of knitted and crocheted fabrics
13921	Manufacture of soft furnishings
13922	manufacture of canvas goods, sacks, etc.
13923	manufacture of household textiles
13931	Manufacture of woven or tufted carpets and rugs
13939	Manufacture of other carpets and rugs
13940	Manufacture of cordage, rope, twine and netting
13950	Manufacture of non-wovens and articles made from non-wovens, except apparel
13960	Manufacture of other technical and industrial textiles
13990	Manufacture of other textiles n.e.c.
14110	Manufacture of leather clothes
14120	Manufacture of workwear
14131	Manufacture of other men's outerwear

14132	Manufacture of other women's outerwear
14141	Manufacture of men's underwear
14142	Manufacture of women's underwear
14190	Manufacture of other wearing apparel and accessories n.e.c.
14200	Manufacture of articles of fur
14310	Manufacture of knitted and crocheted hosiery
14390	Manufacture of other knitted and crocheted apparel
15110	Tanning and dressing of leather; dressing and dyeing of fur
15120	Manufacture of luggage, handbags and the like, saddlery and harness
15200	Manufacture of footwear
16100	Sawmilling and planing of wood
16210	Manufacture of veneer sheets and wood-based panels
16220	Manufacture of assembled parquet floors
16230	Manufacture of other builders' carpentry and joinery
16240	Manufacture of wooden containers
16290	Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials
17110	Manufacture of pulp
17120	Manufacture of paper and paperboard
17211	Manufacture of corrugated paper and paperboard, sacks and bags
17219	Manufacture of other paper and paperboard containers
17220	Manufacture of household and sanitary goods and of toilet requisites
17230	Manufacture of paper stationery
17240	Manufacture of wallpaper
17290	Manufacture of other articles of paper and paperboard n.e.c.
18110	Printing of newspapers
18121	Manufacture of printed labels
18129	Printing n.e.c.
18130	Pre-press and pre-media services
18140	Binding and related services
18201	Reproduction of sound recording
18202	Reproduction of video recording
18203	Reproduction of computer media
19100	Manufacture of coke oven products
19201	Mineral oil refining
19209	Other treatment of petroleum products (excluding petrochemicals manufacture)
20110	Manufacture of industrial gases
20120	Manufacture of dyes and pigments
20130	Manufacture of other inorganic basic chemicals
20140	Manufacture of other organic basic chemicals
20150	Manufacture of fertilizers and nitrogen compounds

20160	Manufacture of plastics in primary forms
20170	Manufacture of synthetic rubber in primary forms
20200	Manufacture of pesticides and other agrochemical products
20301	Manufacture of paints, varnishes and similar coatings, mastics and sealants
20302	Manufacture of printing ink
20411	Manufacture of soap and detergents
20412	Manufacture of cleaning and polishing preparations
20420	Manufacture of perfumes and toilet preparations
20510	Manufacture of explosives
20520	Manufacture of glues
20530	Manufacture of essential oils
20590	Manufacture of other chemical products n.e.c.
20600	Manufacture of man-made fibres
21100	Manufacture of basic pharmaceutical products
21200	Manufacture of pharmaceutical preparations
22110	Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres
22190	Manufacture of other rubber products
22210	Manufacture of plastic plates, sheets, tubes and profiles
22220	Manufacture of plastic packing goods
22230	Manufacture of builders ware of plastic
22290	Manufacture of other plastic products
23110	Manufacture of flat glass
23120	Shaping and processing of flat glass
23130	Manufacture of hollow glass
23140	Manufacture of glass fibres
23190	Manufacture and processing of other glass, including technical glassware
23200	Manufacture of refractory products
23310	Manufacture of ceramic tiles and flags
23320	Manufacture of bricks, tiles and construction products, in baked clay
23410	Manufacture of ceramic household and ornamental articles
23420	Manufacture of ceramic sanitary fixtures
23430	Manufacture of ceramic insulators and insulating fittings
23440	Manufacture of other technical ceramic products
23490	Manufacture of other ceramic products n.e.c.
23510	Manufacture of cement
23520	Manufacture of lime and plaster
23610	Manufacture of concrete products for construction purposes
23620	Manufacture of plaster products for construction purposes
23630	Manufacture of ready-mixed concrete
23640	Manufacture of mortars

23650	Manufacture of fibre cement
23690	Manufacture of other articles of concrete, plaster and cement
23700	Cutting, shaping and finishing of stone
23910	Production of abrasive products
23990	Manufacture of other non-metallic mineral products n.e.c.
24100	Manufacture of basic iron and steel and of ferro-alloys
24200	Manufacture of tubes, pipes, hollow profiles and related fittings, of steel
24310	Cold drawing of bars
24320	Cold rolling of narrow strip
24330	Cold forming or folding
24340	Cold drawing of wire
24410	Precious metals production
24420	Aluminium production
24430	Lead, zinc and tin production
24440	Copper production
24450	Other non-ferrous metal production
24460	Processing of nuclear fuel
24510	Casting of iron
24520	Casting of steel
24530	Casting of light metals
24540	Casting of other non-ferrous metals
25110	Manufacture of metal structures and parts of structures
25120	Manufacture of doors and windows of metal
25210	Manufacture of central heating radiators and boilers
25290	Manufacture of other tanks, reservoirs and containers of metal
25300	Manufacture of steam generators, except central heating hot water boilers
25400	Manufacture of weapons and ammunition
25500	Forging, pressing, stamping and roll-forming of metal; powder metallurgy
25610	Treatment and coating of metals
25620	Machining
25710	Manufacture of cutlery
25720	Manufacture of locks and hinges
25730	Manufacture of tools
25910	Manufacture of steel drums and similar containers
25920	Manufacture of light metal packaging
25930	Manufacture of wire products, chain and springs
25940	Manufacture of fasteners and screw machine products
25990	Manufacture of other fabricated metal products n.e.c.
26110	Manufacture of electronic components
26120	Manufacture of loaded electronic boards

26200	Manufacture of computers and peripheral equipment
26301	Manufacture of telegraph and telephone apparatus and equipment
26309	Manufacture of communication equipment other than telegraph, and telephone apparatus and equipment
26400	Manufacture of consumer electronics
26511	Manufacture of electronic measuring, testing etc. equipment, not for industrial process control
26512	Manufacture of electronic industrial process control equipment
26513	Manufacture of non-electronic measuring, testing etc. equipment, not for industrial process control
26514	Manufacture of non-electronic industrial process control equipment
26520	Manufacture of watches and clocks
26600	Manufacture of irradiation, electromedical and electrotherapeutic equipment
26701	Manufacture of optical precision instruments
26702	Manufacture of photographic and cinematographic equipment
26800	Manufacture of magnetic and optical media
27110	Manufacture of electric motors, generators and transformers
27120	Manufacture of electricity distribution and control apparatus
27200	Manufacture of batteries and accumulators
27310	Manufacture of fibre optic cables
27320	Manufacture of other electronic and electric wires and cables
27330	Manufacture of wiring devices
27400	Manufacture of electric lighting equipment
27510	Manufacture of electric domestic appliances
27520	Manufacture of non-electric domestic appliances
27900	Manufacture of other electrical equipment
28110	Manufacture of engines and turbines, except aircraft, vehicle and cycle engines
28120	Manufacture of fluid power equipment
28131	Manufacture of pumps
28132	Manufacture of compressors
28140	Manufacture of taps and valves
28150	Manufacture of bearings, gears, gearing and driving elements
28210	Manufacture of ovens, furnaces and furnace burners
28220	Manufacture of lifting and handling equipment
28230	Manufacture of office machinery and equipment (except computers and peripheral equipment)
28240	Manufacture of power-driven hand tools
28250	Manufacture of non-domestic cooling and ventilation equipment
28290	Manufacture of other general-purpose machinery n.e.c.
28301	Manufacture of agricultural tractors
28302	Manufacture of agricultural and forestry machinery other than tractors
28410	Manufacture of metal forming machinery
28490	Manufacture of other machine tools

28910	Manufacture of machinery for metallurgy
28921	Manufacture of machinery for mining
28922	Manufacture of earthmoving equipment
28923	Manufacture of equipment for concrete crushing and screening and roadworks
28930	Manufacture of machinery for food, beverage and tobacco processing
28940	Manufacture of machinery for textile, apparel and leather production
28950	Manufacture of machinery for paper and paperboard production
28960	Manufacture of plastics and rubber machinery
28990	Manufacture of other special-purpose machinery n.e.c.
29100	Manufacture of motor vehicles
29201	Manufacture of bodies (coachwork) for motor vehicles (except caravans)
29202	Manufacture of trailers and semi-trailers
29203	Manufacture of caravans
29310	Manufacture of electrical and electronic equipment for motor vehicles and their engines
29320	Manufacture of other parts and accessories for motor vehicles
30110	Building of ships and floating structures
30120	Building of pleasure and sporting boats
30200	Manufacture of railway locomotives and rolling stock
30300	Manufacture of air and spacecraft and related machinery
30400	Manufacture of military fighting vehicles
30910	Manufacture of motorcycles
30920	Manufacture of bicycles and invalid carriages
30990	Manufacture of other transport equipment n.e.c.
31010	Manufacture of office and shop furniture
31020	Manufacture of kitchen furniture
31030	Manufacture of mattresses
31090	Manufacture of other furniture
32110	Striking of coins
32120	Manufacture of jewellery and related articles
32130	Manufacture of imitation jewellery and related articles
32200	Manufacture of musical instruments
32300	Manufacture of sports goods
32401	Manufacture of professional and arcade games and toys
32409	Manufacture of other games and toys, n.e.c.
32500	Manufacture of medical and dental instruments and supplies
32910	Manufacture of brooms and brushes
32990	Other manufacturing n.e.c.
33110	Repair of fabricated metal products
33120	Repair of machinery
33130	Repair of electronic and optical equipment

33140	Repair of electrical equipment
33150	Repair and maintenance of ships and boats
33160	Repair and maintenance of aircraft and spacecraft
33170	Repair and maintenance of other transport equipment n.e.c.
33190	Repair of other equipment
33200	Installation of industrial machinery and equipment
SECTION	Electricity, gas, steam and air conditioning supply
D	
35110	Production of electricity
35120	Transmission of electricity
35130	Distribution of electricity
35140	Trade of electricity
35210	Manufacture of gas
35220	Distribution of gaseous fuels through mains
35230	Trade of gas through mains
35300	Steam and air conditioning supply
SECTION	Water supply, sewerage, waste management and remediation activities
E	
36000	Water collection, treatment and supply
37000	Sewerage
38110	Collection of non-hazardous waste
38120	Collection of hazardous waste
38210	Treatment and disposal of non-hazardous waste
38220	Treatment and disposal of hazardous waste
38310	Dismantling of wrecks
38320	Recovery of sorted materials
39000	Remediation activities and other waste management services
SECTION	Construction
F	
41100	Development of building projects
41201	Construction of commercial buildings
41202	Construction of domestic buildings
42110	Construction of roads and motorways
42120	Construction of railways and underground railways
42130	Construction of bridges and tunnels
42210	Construction of utility projects for fluids
42220	Construction of utility projects for electricity and telecommunications
42910	Construction of water projects
42990	Construction of other civil engineering projects n.e.c.
43110	Demolition
43120	Site preparation

43130	Test drilling and boring
43210	Electrical installation
43220	Plumbing, heat and air-conditioning installation
43290	Other construction installation
43310	Plastering
43320	Joinery installation
43330	Floor and wall covering
43341	Painting
43342	Glazing
43390	Other building completion and finishing
43910	Roofing activities
43991	Scaffold erection
43999	Other specialised construction activities n.e.c.
SECTION	Wholesale and retail trade; repair of motor vehicles and motorcycles
G	
45111	Sale of new cars and light motor vehicles
45112	Sale of used cars and light motor vehicles
45190	Sale of other motor vehicles
45200	Maintenance and repair of motor vehicles
45310	Wholesale trade of motor vehicle parts and accessories
45320	Retail trade of motor vehicle parts and accessories
45400	Sale, maintenance and repair of motorcycles and related parts and accessories
46110	Agents selling agricultural raw materials, livestock, textile raw materials and semi-finished goods
46120	Agents involved in the sale of fuels, ores, metals and industrial chemicals
46130	Agents involved in the sale of timber and building materials
46140	Agents involved in the sale of machinery, industrial equipment, ships and aircraft
46150	Agents involved in the sale of furniture, household goods, hardware and ironmongery
46160	Agents involved in the sale of textiles, clothing, fur, footwear and leather goods
46170	Agents involved in the sale of food, beverages and tobacco
46180	Agents specialised in the sale of other particular products
46190	Agents involved in the sale of a variety of goods
46210	Wholesale of grain, unmanufactured tobacco, seeds and animal feeds
46220	Wholesale of flowers and plants
46230	Wholesale of live animals
46240	Wholesale of hides, skins and leather
46310	Wholesale of fruit and vegetables
46320	Wholesale of meat and meat products
46330	Wholesale of dairy products, eggs and edible oils and fats
46341	Wholesale of fruit and vegetable juices, mineral water and soft drinks
46342	Wholesale of wine, beer, spirits and other alcoholic beverages

46350	Wholesale of tobacco products
46360	Wholesale of sugar and chocolate and sugar confectionery
46370	Wholesale of coffee, tea, cocoa and spices
46380	Wholesale of other food, including fish, crustaceans and molluscs
46390	Non-specialised wholesale of food, beverages and tobacco
46410	Wholesale of textiles
46420	Wholesale of clothing and footwear
46431	Wholesale of audio tapes, records, CDs and video tapes and the equipment on which these are played
46439	Wholesale of radio, television goods & electrical household appliances (other than records, tapes, CD's & video tapes and the equipment used for playing them)
46440	Wholesale of china and glassware and cleaning materials
46450	Wholesale of perfume and cosmetics
46460	Wholesale of pharmaceutical goods
46470	Wholesale of furniture, carpets and lighting equipment
46480	Wholesale of watches and jewellery
46491	Wholesale of musical instruments
46499	Wholesale of household goods (other than musical instruments) n.e.c
46510	Wholesale of computers, computer peripheral equipment and software
46520	Wholesale of electronic and telecommunications equipment and parts
46610	Wholesale of agricultural machinery, equipment and supplies
46620	Wholesale of machine tools
46630	Wholesale of mining, construction and civil engineering machinery
46640	Wholesale of machinery for the textile industry and of sewing and knitting machines
46650	Wholesale of office furniture
46660	Wholesale of other office machinery and equipment
46690	Wholesale of other machinery and equipment
46711	Wholesale of petroleum and petroleum products
46719	Wholesale of other fuels and related products
46720	Wholesale of metals and metal ores
46730	Wholesale of wood, construction materials and sanitary equipment
46740	Wholesale of hardware, plumbing and heating equipment and supplies
46750	Wholesale of chemical products
46760	Wholesale of other intermediate products
46770	Wholesale of waste and scrap
46900	Non-specialised wholesale trade
47110	Retail sale in non-specialised stores with food, beverages or tobacco predominating
47190	Other retail sale in non-specialised stores
47210	Retail sale of fruit and vegetables in specialised stores
47220	Retail sale of meat and meat products in specialised stores
47230	Retail sale of fish, crustaceans and molluscs in specialised stores

47240	Retail sale of bread, cakes, flour confectionery and sugar confectionery in specialised stores
47250	Retail sale of beverages in specialised stores
47260	Retail sale of tobacco products in specialised stores
47290	Other retail sale of food in specialised stores
47300	Retail sale of automotive fuel in specialised stores
47410	Retail sale of computers, peripheral units and software in specialised stores
47421	Retail sale of mobile telephones
47429	Retail sale of telecommunications equipment other than mobile telephones
47430	Retail sale of audio and video equipment in specialised stores
47510	Retail sale of textiles in specialised stores
47520	Retail sale of hardware, paints and glass in specialised stores
47530	Retail sale of carpets, rugs, wall and floor coverings in specialised stores
47540	Retail sale of electrical household appliances in specialised stores
47591	Retail sale of musical instruments and scores
47599	Retail of furniture, lighting, and similar (not musical instruments or scores) in specialised store
47610	Retail sale of books in specialised stores
47620	Retail sale of newspapers and stationery in specialised stores
47630	Retail sale of music and video recordings in specialised stores
47640	Retail sale of sports goods, fishing gear, camping goods, boats and bicycles
47650	Retail sale of games and toys in specialised stores
47710	Retail sale of clothing in specialised stores
47721	Retail sale of footwear in specialised stores
47722	Retail sale of leather goods in specialised stores
47730	Dispensing chemist in specialised stores
47741	Retail sale of hearing aids
47749	Retail sale of medical and orthopaedic goods in specialised stores (not incl. hearing aids) n.e.c.
47750	Retail sale of cosmetic and toilet articles in specialised stores
47760	Retail sale of flowers, plants, seeds, fertilizers, pet animals and pet food in specialised stores
47770	Retail sale of watches and jewellery in specialised stores
47781	Retail sale in commercial art galleries
47782	Retail sale by opticians
47789	Other retail sale of new goods in specialised stores (not commercial art galleries and opticians)
47791	Retail sale of antiques including antique books in stores
47799	Retail sale of other second-hand goods in stores (not incl. antiques)
47810	Retail sale via stalls and markets of food, beverages and tobacco products
47820	Retail sale via stalls and markets of textiles, clothing and footwear
47890	Retail sale via stalls and markets of other goods
47910	Retail sale via mail order houses or via Internet
47990	Other retail sale not in stores, stalls or markets

SECTION	Transportation and storage
H	
49100	Passenger rail transport, interurban
49200	Freight rail transport
49311	Urban and suburban passenger railway transportation by underground, metro and similar systems
49319	Other urban, suburban or metropolitan passenger land transport (not underground, metro or similar)
49320	Taxi operation
49390	Other passenger land transport
49410	Freight transport by road
49420	Removal services
49500	Transport via pipeline
50100	Sea and coastal passenger water transport
50200	Sea and coastal freight water transport
50300	Inland passenger water transport
50400	Inland freight water transport
51101	Scheduled passenger air transport
51102	Non-scheduled passenger air transport
51210	Freight air transport
51220	Space transport
52101	Operation of warehousing and storage facilities for water transport activities
52102	Operation of warehousing and storage facilities for air transport activities
52103	Operation of warehousing and storage facilities for land transport activities
52211	Operation of rail freight terminals
52212	Operation of rail passenger facilities at railway stations
52213	Operation of bus and coach passenger facilities at bus and coach stations
52219	Other service activities incidental to land transportation, n.e.c.
52220	Service activities incidental to water transportation
52230	Service activities incidental to air transportation
52241	Cargo handling for water transport activities
52242	Cargo handling for air transport activities
52243	Cargo handling for land transport activities
52290	Other transportation support activities
53100	Postal activities under universal service obligation
53201	Licensed carriers
53202	Unlicensed carriers
SECTION I	Accommodation and food service activities
55100	Hotels and similar accommodation
55201	Holiday centres and villages
55202	Youth hostels

55209	Other holiday and other collective accommodation
55300	Recreational vehicle parks, trailer parks and camping grounds
55900	Other accommodation
56101	Licensed restaurants
56102	Unlicensed restaurants and cafes
56103	Take-away food shops and mobile food stands
56210	Event catering activities
56290	Other food services
56301	Licensed clubs
56302	Public houses and bars
SECTION	Information and communication
J	
58110	Book publishing
58120	Publishing of directories and mailing lists
58130	Publishing of newspapers
58141	Publishing of learned journals
58142	Publishing of consumer and business journals and periodicals
58190	Other publishing activities
58210	Publishing of computer games
58290	Other software publishing
59111	Motion picture production activities
59112	Video production activities
59113	Television programme production activities
59120	Motion picture, video and television programme post-production activities
59131	Motion picture distribution activities
59132	Video distribution activities
59133	Television programme distribution activities
59140	Motion picture projection activities
59200	Sound recording and music publishing activities
60100	Radio broadcasting
60200	Television programming and broadcasting activities
61100	Wired telecommunications activities
61200	Wireless telecommunications activities
61300	Satellite telecommunications activities
61900	Other telecommunications activities
62011	Ready-made interactive leisure and entertainment software development
62012	Business and domestic software development
62020	Information technology consultancy activities
62030	Computer facilities management activities
62090	Other information technology service activities
63110	Data processing, hosting and related activities

63120	Web portals
63910	News agency activities
63990	Other information service activities n.e.c.
SECTION	Financial and insurance activities
K	
64110	Central banking
64191	Banks
64192	Building societies
64201	Activities of agricultural holding companies
64202	Activities of production holding companies
64203	Activities of construction holding companies
64204	Activities of distribution holding companies
64205	Activities of financial services holding companies
64209	Activities of other holding companies n.e.c.
64301	Activities of investment trusts
64302	Activities of unit trusts
64303	Activities of venture and development capital companies
64304	Activities of open-ended investment companies
64305	Activities of property unit trusts
64306	Activities of real estate investment trusts
64910	Financial leasing
64921	Credit granting by non-deposit taking finance houses and other specialist consumer credit grantors
64922	Activities of mortgage finance companies
64929	Other credit granting n.e.c.
64991	Security dealing on own account
64992	Factoring
64999	Financial intermediation not elsewhere classified
65110	Life insurance
65120	Non-life insurance
65201	Life reinsurance
65202	Non-life reinsurance
65300	Pension funding
66110	Administration of financial markets
66120	Security and commodity contracts dealing activities
66190	Activities auxiliary to financial intermediation n.e.c.
66210	Risk and damage evaluation
66220	Activities of insurance agents and brokers
66290	Other activities auxiliary to insurance and pension funding
66300	Fund management activities
SECTION	Real estate activities

L

- 68100** Buying and selling of own real estate
- 68201** Renting and operating of Housing Association real estate
- 68202** Letting and operating of conference and exhibition centres
- 68209** Other letting and operating of own or leased real estate
- 68310** Real estate agencies
- 68320** Management of real estate on a fee or contract basis

SECTION Professional, scientific and technical activities**M**

- 69101** Barristers at law
- 69102** Solicitors
- 69109** Activities of patent and copyright agents; other legal activities n.e.c.
- 69201** Accounting and auditing activities
- 69202** Bookkeeping activities
- 69203** Tax consultancy
- 70100** Activities of head offices
- 70210** Public relations and communications activities
- 70221** Financial management
- 70229** Management consultancy activities other than financial management
- 71111** Architectural activities
- 71112** Urban planning and landscape architectural activities
- 71121** Engineering design activities for industrial process and production
- 71122** Engineering related scientific and technical consulting activities
- 71129** Other engineering activities
- 71200** Technical testing and analysis
- 72110** Research and experimental development on biotechnology
- 72190** Other research and experimental development on natural sciences and engineering
- 72200** Research and experimental development on social sciences and humanities
- 73110** Advertising agencies
- 73120** Media representation services
- 73200** Market research and public opinion polling
- 74100** specialised design activities
- 74201** Portrait photographic activities
- 74202** Other specialist photography
- 74203** Film processing
- 74209** Photographic activities not elsewhere classified
- 74300** Translation and interpretation activities
- 74901** Environmental consulting activities
- 74902** Quantity surveying activities
- 74909** Other professional, scientific and technical activities n.e.c.
- 74990** Non-trading company non trading

75000	Veterinary activities
SECTION	Administrative and support service activities
N	
77110	Renting and leasing of cars and light motor vehicles
77120	Renting and leasing of trucks and other heavy vehicles
77210	Renting and leasing of recreational and sports goods
77220	Renting of video tapes and disks
77291	Renting and leasing of media entertainment equipment
77299	Renting and leasing of other personal and household goods
77310	Renting and leasing of agricultural machinery and equipment
77320	Renting and leasing of construction and civil engineering machinery and equipment
77330	Renting and leasing of office machinery and equipment (including computers)
77341	Renting and leasing of passenger water transport equipment
77342	Renting and leasing of freight water transport equipment
77351	Renting and leasing of air passenger transport equipment
77352	Renting and leasing of freight air transport equipment
77390	Renting and leasing of other machinery, equipment and tangible goods n.e.c.
77400	Leasing of intellectual property and similar products, except copyright works
78101	Motion picture, television and other theatrical casting activities
78109	Other activities of employment placement agencies
78200	Temporary employment agency activities
78300	Human resources provision and management of human resources functions
79110	Travel agency activities
79120	Tour operator activities
79901	Activities of tourist guides
79909	Other reservation service activities n.e.c.
80100	Private security activities
80200	Security systems service activities
80300	Investigation activities
81100	Combined facilities support activities
81210	General cleaning of buildings
81221	Window cleaning services
81222	Specialised cleaning services
81223	Furnace and chimney cleaning services
81229	Other building and industrial cleaning activities
81291	Disinfecting and exterminating services
81299	Other cleaning services
81300	Landscape service activities
82110	Combined office administrative service activities
82190	Photocopying, document preparation and other specialised office support activities
82200	Activities of call centres

82301	Activities of exhibition and fair organisers
82302	Activities of conference organisers
82911	Activities of collection agencies
82912	Activities of credit bureaus
82920	Packaging activities
82990	Other business support service activities n.e.c.
SECTION	Public administration and defence; compulsory social security
O	
84110	General public administration activities
84120	Regulation of health care, education, cultural and other social services, not incl. social security
84130	Regulation of and contribution to more efficient operation of businesses
84210	Foreign affairs
84220	Defence activities
84230	Justice and judicial activities
84240	Public order and safety activities
84250	Fire service activities
84300	Compulsory social security activities
SECTION	Education
P	
85100	Pre-primary education
85200	Primary education
85310	General secondary education
85320	Technical and vocational secondary education
85410	Post-secondary non-tertiary education
85421	First-degree level higher education
85422	Post-graduate level higher education
85510	Sports and recreation education
85520	Cultural education
85530	Driving school activities
85590	Other education n.e.c.
85600	Educational support services
SECTION	Human health and social work activities
Q	
86101	Hospital activities
86102	Medical nursing home activities
86210	General medical practice activities
86220	Specialists medical practice activities
86230	Dental practice activities
86900	Other human health activities
87100	Residential nursing care facilities
87200	Residential care activities for learning difficulties, mental health and substance abuse

87300	Residential care activities for the elderly and disabled
87900	Other residential care activities n.e.c.
88100	Social work activities without accommodation for the elderly and disabled
88910	Child day-care activities
88990	Other social work activities without accommodation n.e.c.
SECTION	Arts, entertainment and recreation
R	
90010	Performing arts
90020	Support activities to performing arts
90030	Artistic creation
90040	Operation of arts facilities
91011	Library activities
91012	Archives activities
91020	Museums activities
91030	Operation of historical sites and buildings and similar visitor attractions
91040	Botanical and zoological gardens and nature reserves activities
92000	Gambling and betting activities
93110	Operation of sports facilities
93120	Activities of sport clubs
93130	Fitness facilities
93191	Activities of racehorse owners
93199	Other sports activities
93210	Activities of amusement parks and theme parks
93290	Other amusement and recreation activities n.e.c.
SECTION	Other service activities
S	
94110	Activities of business and employers membership organisations
94120	Activities of professional membership organisations
94200	Activities of trade unions
94910	Activities of religious organisations
94920	Activities of political organisations
94990	Activities of other membership organisations n.e.c.
95110	Repair of computers and peripheral equipment
95120	Repair of communication equipment
95210	Repair of consumer electronics
95220	Repair of household appliances and home and garden equipment
95230	Repair of footwear and leather goods
95240	Repair of furniture and home furnishings
95250	Repair of watches, clocks and jewellery
95290	Repair of personal and household goods n.e.c.
96010	Washing and (dry-)cleaning of textile and fur products

96020	Hairdressing and other beauty treatment
96030	Funeral and related activities
96040	Physical well-being activities
96090	Other service activities n.e.c.
SECTION T	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use
97000	Activities of households as employers of domestic personnel
98000	Residents property management
98100	Undifferentiated goods-producing activities of private households for own use
98200	Undifferentiated service-producing activities of private households for own use
SECTION U	Activities of extraterritorial organisations and bodies
99000	Activities of extraterritorial organisations and bodies
99999	Dormant Company

Source: ompany House