DETERMINANTS OF EXCHANGE RATE RISK HEDGING

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ABSTRACT: The present paper analyses the reasons publicly traded Spanish firms use derivatives to hedge against exchange-rate risk. Our research focuses on the reasons that can be justified based on the theory of optimal hedging. Information from 49 publicly traded Spanish companies has been used for the analysis. Results similar to those found in other markets have been obtained using multivariate logit regression models. In addition to being a pioneering study in the context of the Spanish market, hypotheses are considered which have not been previously applied in other markets.

1.- INTRODUCTION

The continuous movement in foreign exchange rates means that firms that operate internationally have exposure to exchange rate risk. Poor management of this exposure can have a significant influence on the value of the company and on its very survival. In light of this, many firms implement an active policy of risk management through a variety of hedging strategies. Although Modiglianni and Miller (1958) showed that the value of a company and financial decisions were not related in the absence of imperfect conditions, more recently a variety of studies have shown that hedging can increase the value of the firm, if imperfections exist in capital markets. For this reason, a variety of theories have been developed regarding optimal hedging which attempt to explain the reasons firms may be interested in hedging. The hedging decision may be the result of managers' aversion to risk as Stulz (1984) explains. Nevertheless, other reasons may drive firms to hedging such as tax structure, or the transaction costs associated to bankruptcy (Smith and Stulz, 1985), In addition, in so far as hedging reduces the likelihood of bankruptcy, the firm may increase its level of debt (Stulz, 1996 and Leland,1998). Furthermore, it is possible to mitigate problems of underinvestment , due to the fact that hedging reduces cash flow volatility leading to better rates for financing (Froot, Scharfstein and Stein, 1993). Finally, DeMarzo and Duffie (1995) indicate that hedging is optimal – even if shareholders can hedge for themselves – when the managers have insider information about the firms' future cash flows which is not available to the shareholders. For this reason, some firms choose to hedge by using derivatives or other internal means such as foreign currency debt, leads & lags, netting or "own currency".

The exposure to foreign exchange-rate risk can be classified into three types: transaction risk, translation risk, and economic risk. Transaction risk, which is the focus of the present study, derives from the effects that changes in foreign exchange-rates may have on a firm's deferred receivables/ payables in foreign currency. Translation risk is an accounting risk and refers to the reduction in profit or even loss which may result from the preparation financial statements in multinational corporations. Finally, economic risk comprises the possible consequences that changes in the foreign exchange rate may have on transactions which are planned or are going to be carried out in the local of international context. This economic risk is more difficult to evaluate and manifests itself directly (lower income or greater cost) or indirectly (fall in competitiveness).

The present study aims to analyse the reasons why Spanish firms take the hedging decision against transaction exchange-rate risk by means of derivatives, as well as the variables that affect hedging volume, in the context of optimal hedging theories. The contribution to existing literature of this paper lies in that it is a new study of the Spanish market and that its analytical and empirical development incorporates a greater number of factors than those analysed in previous international studies.

The paper proceeds by first carrying out a review of earlier empirical studies and literature related to the hedging decision in the face of foreign exchange-rate risk. Afterward, the main determinants of the currency hedging with derivatives are presented in a theoretical context. Finally, we describe the statistical model used to contrast hypotheses, our results are analysed, and the main conclusions are presented.

2.- RELATED LITERATURE

Several studies have attempted to determine if firms behave according to the principles established in the theories of optimal hedging. One of the main difficulties has been obtaining the necessary information. Prior to the decade of the 1990's, this type of information was considered to be an important component of the firm's competitive strategy, and, thus, it was considered almost confidential. The growing demands on firms for disclosure of information, partly due to changes in accounting and business regulations made it possible in developed markets for this type of information to become a part of the financial reports of large firms. Although we focused on firms that are publicly traded on the Spanish stock exchange for this reason, we must still point out the difficulty of obtaining precise information regarding the Spanish market.

The interest in studying the reasons firms hedge has led to numerous publications ranging from the most generic for the non-financial business sector to those focusing on a specific sector or type of risk. Among the first group it is worth noting the research by Nance, Smith and Smithson (1993), which is

based on the Fortune 500 companies and tries to analyse the reasons which lead firms to use derivatives. These authors found that the firms with the most convex tax functions, with the largest size, and with greatest potential for growth are the ones which choose to hedge in greatest measure. Dolde (1993), using a questionnaire sent to the largest North American companies, found that hedging firms have a greater degree of leverage than those that do not hedge.

The work that stands out in the financial field are the studies by Sinkey and Carter (1997) and Gunther and Siems (1995) for the banking sector. Notable research regarding insurance activity has been carried out by Colquitt and Hoyt (1997), Cummins et al. (1997a, 1997b), Hardwick and Adams (1999), De Ceuster et al. (2003) and Otero and Fernández (2005).

Researchers have also taken an interest in the reasons which impel the hedging of different types of financial risk (foreign exchange rate, interest rate and commodities). They have found that different factors may explain hedging depending on type of risk and the market in question. Regarding the specific case of foreign exchange-rate risk, the study by Geczy el al (1997) is one of the main references. These authors point out that firms with a combination of growth opportunities but little access to internal or external financing are more likely to use derivatives as a way of reducing underinvestment costs. They also point out that the use of derivatives is positively related to firm size and level of exposure. Mian (1996) studied the hedging activities of a sample of 3022 firms and found reasons stemming from managers' aversion to risk, taxation factors and the existence of economies of scale. More recent studies have analysed the use of derivatives for certain types of currency hedging (Allayannis and Ofek, 2000; Graham and Rogers, 2000; Haushalter, 2000), which has led to a better understanding of the reasons for hedging. While most of these earlier studies have tried to analyse the factors associated with a firm's hedging likelihood, the studies by Allayannis and Ofek (2001) Graham and Rogers (2000) and Hagelin (2003) also analyse the factors related to the level of hedging. Thus, the study by Allayannis and Ofek (2001) found that firm size, R & D expense, and the level of exposure (measured through the firms volume of sales and international trade) are relevant determinants in the hedging decision, however, once the firm has decided to hedge, exposure factors are the only determinants of hedging volume. These authors also analyse the decision to issue debt as an alternative way of currency hedging. They found a high degree of positive correlation between the level of exposure to foreign exchange-rate risk and the use of this strategy. They found a similar correlation for the use of derivatives. Graham and Rogers (2000) found that firms hedge in response to the high costs stemming from bankruptcy situations and to deal with the problem of under investment (agency cost). They also conclude that hedging increases the value of a company, increasing borrowing capacity and deductions for interest expense, such that they estimate that the tax benefits of hedging add between 2.2% and 3,5% to the value of the firm. Finally, Hagelin (2003) in line with the aforementioned studies, analyses why firms use derivatives for currency hedging, both for transaction and translation, for a total of 101 companies that are listed on the Stockholm Stock Exchange. The results are consistent with the idea that companies hedge transaction risk with currency derivatives in order to increase the value of the company, thus reducing the indirect costs of bankruptcy and alleviating the problem of underinvestment, as well as for reasons of exposure to risk. Nevertheless, this study does not find any evidence to support that any of these variables are related to traslation risk, which indicates that this may be due to greater reticence on the part of shareholders regarding hedging if it is not justified by managers based on real information.

After a review of the most relevant literature we can conclude that economies of scale seem to be present in most of the studies, as well as the creation of value linked to reduction in agency or bankruptcy costs. The degree of exposure to risk also tends to be a determining factor. Other lesser relevant reasons include managers' aversion to risk and taxation.

Table 1.- Main Studies analysing transaction exchange rate risk hedging with derivatives

Autor	Variables affecting the decision to hedge with derivatives.
Mian (1996)	• Risk aversion (+) • Taxation (+). • Size (+).
Geczy et al (1997)	• Growth opportunities (+). • Access to financing (+). • Size (+). • Degree of exposure (+)
Graham y Rogers (2000)	• Leverage (+). • Agency costs (+).
Allayannis y Ofek (2001)	• Size (+). • R & D expenses. (+) • Degree of exposure (+).
Hagelin (2003)	• Bankruptcy costs (+). • Underinvestment (+)

3.- FACTORS EXPLAINING CURRENCY HEDGING FROM THE FINANCIAL THEORY

There is a consensus in the financial world that imperfections in financial markets are responsible for the existence of incentives to hedge with derivatives. According to financial theory and empirical evidence, the reasons which explain hedging with derivatives are related to the creation of value, information asymmetry, managers' risk aversion, economies of scale and the degree of risk taken on. Specifically, the creation of value associated to hedging with derivatives derives mainly from a reduction in agency and bankruptcy costs, as well as from making the most of tax advantages. Hedging also responds to other factors such as the protection of managers' wealth, the degree of risk taken on, and the cost of hedging. We would also add that the use of alternative strategies, such as foreign currency leverage, spot hedging, and other techniques may affect the decision to use derivatives.

Table 2.- Reasons for currency hedging with derivatives

Reason	Theory	Related variables
CREATION OF VALUE	Agency Cost	Underinvestment and information asymmetries • Market to book • R&D • Dividend per share • Managers' ownership
	Bankruptcy costs	• Leverage • Liquidity • Dividend • ROA
	Taxation	• Dummy
	Start-up costs	• Fixed start-up costs • Size • Use of derivatives
OTHER REASONS	Manager risk aversion	• % capital • Options
	Exposure to risk factors	• Revenue in Foreign Currency • Volume of international trade
	Alternative hedging instruments	• Use of foreign debt

3.1.- CREATION OF VALUE

Companies can create value through hedging if as a consequence they are able to start up new projects (alleviate problems of underinvestment) with a positive NPV, they make the best of tax advantages, or they reduce agency and bankruptcy costs.

3.1.1- Agency Costs

The main costs that we consider under this heading arise as a consequence of imperfections in the market, specifically as a result of information asymmetry. The access to external financing is more difficult and costly for companies that have greater asymmetry of information (Froot et al. 1993). For this reason, hedging, in so far as it means a greater guarantee for future cash flow, may be favourable for obtaining external financing at better rates. Thus, the firms most affected by information asymmetry have greater incentive for hedging[1]. In this way, hedging can contribute to value creation by making it possible to obtain financing at better rates. Firms with the greatest growth opportunities, those that operate in unregulated markets and smaller companies are more likely to have information asymmetry regarding the quality of new projects.

According to Froot el al. (1993), cash flow variability affects capacity to obtain external funding and the firm's level of investment. When a situation of information asymmetry exists, the cost of funding increases as more financing is sought. In light of this situation, the company may proceed to get more external financing and carrying out fewer investment projects, resulting in the creation of less value for the company. For this reason, if the firm hedges, it is not so dependent on external financing, therefore, obtaining it at better rates[2]. Companies with greater growth opportunities are subject to a greater problem of underinvestment.

In order to test theories related to the problem of underinvestment and information asymmetry, and, thus, consider growth opportunities, we use intangible assets to total assets, and market value to book value. Likewise, we use the percentage of shares held by institutional investors, as in the studies by Geczy et al. (1997), Graham and Rogers (2001) and Hagelin (2003). This is because an elevated ownership by institutions implies less likelihood of hedging because there is less information asymmetry as a result of the greater control to which the management of the firm is subject.

3.1.2- Bankruptcy costs

Smith and Stulz (1985) showed that hedging can increase the value of the company by lowering the likelihood of bankruptcy and its associated costs, thus the likelihood of hedging increases wih the likelihood of bankruptcy. Nance et al.(1993) established the hypothesis that the likelihood of bankruptcy increases along with leverage defined as (book value of Debt/ book value of Capital). Nevertheless, many of the studies do not confirm this hypothesis[3]. These authors also claim that hedging is not the only way to reduce the probability of bankruptcy. If the company has more liquid assets[4] available or pays a smaller dividend there may be lesser bankruptcy problems. Besides these indicators, Allayannis and Ofek (2001) also used the ROA as an indicator of the likelihood of bankruptcy, indicating that those firms with greater profitability on their assets have less likelihood of bankruptcy. Our study includes all of the variables mentioned, as can be seen in Table 3.

3.1.3.- Taxation

Smith and Stulz (1985) showed that hedging could reduce expected tax payments when firms were subject to a progressive tax system. Therefore, a greater convexity in the tax function should lead to a greater likelihood of hedging. In addition, there may also be an incentive to hedge when it is possible to cover for losses, that is, there is a tax credit that can be carried over to another fiscal year. Nevertheless, in the studies by Mian (1996), Géczy el al. (1997), Howton y Perfect (1998) y Allayannis y Ofek (2001),

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[1] Myers and Majluf, 1984 claim that companies with the greatest information asymmetry are more likely to hedge.

[2] As Bessimber (1991) indicates, an adequate hedging strategy over time allows creditors to demand a lower remuneration from the company.

[3] In our opinion, this may be due to the inclusion of companies from different sectors in the sample group, since the financial structure may be affected by the sector making the sample unrepresentative. For example, in the insurance sector indebtedness is representative (Otero and Fernandez, 2005) but that may not be applicable to other sectors included in the sample.

[4] We would like to point out that there are three studies supporting this hypothesis.

it is not found that the possibility of compensating for losses constitutes a significant incentive to determine the hedging decision. In Spain firms are not faced with a progressive system, hence we have decided, as in the study by Hagelin (2003), not to consider the taxation factor.

3.2.- OTHER REASONS BESIDES THE CREATION OF VALUE

There are other reasons that may affect the hedging decision such as the cost and resources needed to set up a hedging program, the aversion to risk on the part of a manager who may control an important part of the firm's assets or the existence or alternative hedging tools. Furthermore, the need to hedge may be influenced by the firm's degree of risk exposure.

3.2.1- High fixed cost to start up a derivatives program

Empirical research supports the claim that setting up and managing a derivatives program is subject to significant economies of scale, thus leading us to the hypothesis that larger firms are more likely to use derivatives for hedging (Nance et al., 1993; Sinkey and Carter, 1994; Cummins et al., 1997b). These economies of scale are associated to the high fixed costs of training employees (experience), the need for technical resources, and the development of a hedging strategy.

However, there are conflicting hypothesis regarding the effect of size on the hedging decision. Some authors (Warner, 1977; Altman, 1984) indicate that because the costs of an adverse financial situation are greater for a small company, these will resort more frequently to hedging to reduce the likelihood of bankruptcy (Colquitt and Hoyt, 1997). If this hypothesis turned out to be true, size would be negatively related to the use of derivatives. Moreover, it is more likely that larger firms are already diversified through their different areas of business, therefore, ceteris paribus, they resort to hedging less than smaller firms (Cummins et al., 1997a). As a proxy for the variable Size we use, as in the referenced studies, the logarithm of assets.

3.2.2.- Managers' risk aversion

When a manager takes on a high risk in a business, that manager may be interested in protecting the firm's profitability through hedging since possible losses or variations in value will affect the manager's assets directly. Aversion to risk may therefore be related to the percentage of stock held by managers. According to Smith and Stulz (1985), managers who have a large part of their assets invested in the company opt for hedging. As a proxy for managers' aversion to risk, like the referenced studies we use the percentage of stock held by managers.

3.2.3.- Exposure factors

There is no doubt that the degree of exposure to foreign exchange-rate risk can affect the hedging decision, given that those companies with a greater degree of exposure benefit more from using currency derivatives. Furthermore, those firms that do not have currency exposure yet used these products would be speculating and not hedging.

To analyse currency exposure, like Gezcy et al. (1997) and Hagelin (2003), we use the percentage of total company sales that sales in foreign currency represents, or the volume of purchases in foreign currency for those companies that only import.

3.2.4- Cost of using different kinds of derivatives

Costs also play as important role in the decision to use currency derivatives and in selecting between various derivative strategies, because if the costs are very high, the firm could decide not to use these products (Geczy, 1997). With respect to cost, it is important to differentiate between those associated to setting up and running a hedging program, which we already mentioned when we referred to economies of scale, and those costs which derive from choosing a certain derivative instrument. Nevertheless, in our study we have not considered this aspect as no breakdown by type of product was available.

3.2.5- Use of other hedging alternatives

The use of derivatives is not the only alternative available to a company for currency hedging. There are other options available such as foreign currency debt, choice of billing currency, spot hedging, or the creation of a fund to cover the risk. Foreign currency debt can act as a natural hedge, and in this way reduce the degree of currency exposure. Following Allayannis and Ofek (2001), a company with income in foreign currency can issue debt because in this way it creates a flow of payments in the foreign currency. Debt can only by used by exporters, because only they receive payments in foreign currency. These authors found a significant positive relation between the ratio (foreign sales/ total assets) and the decision to issue debt.

Table 3.- Variables and hypotheses considered in the study

	Variable	Prediction	Variable	Hypothesis
Agency Costs	Market to book	+	Market value of total assets / Book value of assets	Companies with high market to book values have greater growth opportunities and are subject to underinvestment problems. Through hedging the problem of underinvestment can be reduced and as a result those with greater growth opportunities are more likely to hedge.
	Intangible assets	+	Intangible / Total Assets	Firms with greater intangible assets have greater growth opportunities and are more subject to underinvestment problems. Through hedging the problem of underinvestment can be reduced and as a result those with greater growth opportunities are more likely to hedge.
	Institutional Ownership	-	Percentage of capital held by institutional investors.	Companies with greater participation by institutions are expected to have less information asymmetry and will resort less to using derivatives.
Bankruptcy C.	Leverage	+	Book value of debt / Book value of capital	Companies with greater leverage take on greater risk and, therefore, have a greater likelihood of incurring costs associated to bankruptcy and, hence, are also more likely to hedge.
	Liquidity	-	Current Assets/current liabilities	Companies with greater liquidity have a lower probability of bankruptcy and, therefore, it is an alternative way of hedging.
	Earnings per share	+	Earning per share/ price per share	Companies that have a greater dividend can have more liquidity and, thus, take on a lesser risk of bankruptcy.
	ROA	-	BAIT/ Total assets	The companies with greatest profitability have a lower risk and resort less to using derivatives.
Start Up C.	Size of the company	+/-	Log (total assets)	Smaller companies will be more affected by costs (more that proportional) of a bankruptcy situation, so they will have to hedge more. Nevertheless, hedging with derivatives has economies of scale and requires human resources which are only within the reach of larger companies.
	Use of derivatives	+	Dummy	The use of other derivatives for hedging makes it possible to attain economies of scale.
Aversion	Managers´ ownership	+	Percentage of capital held by managers	If they have a high level of ownership, they will try to hedge more, especially if they are not well diversified.
Exposure	Income in foreign currency	+	Foreign sales/ total sales	For greater exposure, we assume a higher degree of hedging.
Other alternatives	Foreign debt	-	Volume of foreign borrowing	Borrowing in foreign currency acts as an alternative hedging tool..

4. EMPIRICAL ANALYSIS

Our empirical analysis is based on a sample made up of 49 companies that are listed on the General Index of the Madrid Stock Exchange. At the time of selecting these companies we have considered only those with exposure to foreign exchange-rate risk at the end of year 2003. As an indicator of this exposure we have considered purchases or sales in foreign currency, or the existence of a debt in foreign currency. Other indicators such as before-tax profits in foreign currency or volume of business have not been considered as they were not available in the sources of information used. These sources were the SABI data-base, annual reports of publicly listed companies, and the mailing of a questionnaire to those firms whose annual report did not contain data regarding sales in foreign currency, volume of derivatives used or foreign debt.

Based on this data we have tried to explain the reasons and the extent to which companies carry out currency hedging. Moreover, we have analysed if foreign debt contributes to increase the firm's exchange-rate exposure or if, on the contrary, it is used as an internal form of hedging in substitution of or complementary to the use of derivatives. In order to do this, we have applied a two-stage methodology. Firstly, since we are trying to explain the reasons leading companies to adopt a hedging strategy, like Geczy (1997) of Hagelin (2003), we use a binomial logit model[5]. Secondly, using only those companies that carry out hedging activities, a truncated regression is estimated using the amount hedged as the dependent variable[6].

4.1.- ANALYSIS OF THE HEDGING DECISION

A) Univariate Analysis

As a preamble to the multivariate analysis, we proceed to analyse the difference between variables through a one-factor ANOVA model. From this analysis we conclude that there are significant differences (favouring companies that choose to hedge) between the variables referring to size of company (totalassets), as measured by total assets and volume of revenues (sizerevenue). There are also significant differences in a variable that is a proxy for opportunities for investment growth, defined as Book to market ratio (marketbook), which is considerably greater in companies that choose to hedge. These differences hold up for the institutional ownership variable, that is, for those firms which have a higher percentage of their capital held by institutional investors. This is used as a proxy of information asymmetry. Finally, the liquidity variable, which is used as a proxy for likelihood of bankruptcy, presents lower values in companies that choose to hedge.

On the other hand, the differences for the remaining variables were not significant. In this sense, the variables being used as proxies for a bankruptcy situation – such as leverage, return on asset (ROA) or profit per share – present differences in line with what is established in the theoretical framework, however, they are not significant. Nor does managers' aversion to risk seem to be relevant, since there are scarcely any differences between companies that hedge and those that do not in the percentage of capital held by management. Lastly, we should point out that variables referring to degree of exposure, as measured by the level of foreign debt and the volume of revenues in foreign currency, do not seem to be play a fundamental role in the hedging decision either, although it is true that the companies that do not use derivatives are the ones that present the highest average values of foreign debt and the ones that hedge have a higher average revenue in foreign currency.

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[5] This methodology has been used by Gezcy et al. (1997) and Hagelin (2003).

[6] See Allayannis and Ofek (2001).

Table 4.- Comparison of variables between users and non-users of currency derivatives

		N	Average	Standard deviation	Standard Error	F	Sig.
Totalassets	,00	23	5,6417	,65287	,13613	9,451	,004
	1,00	26	6,3227	,86640	,16991		
	Total	49	6,0031	,83917	,11988		
marketbook	,00	23	1,3691	1,18933	,24799	4,023	,051
	1,00	25	4,3552	7,04221	1,40844		
	Total	48	2,9244	5,31589	,76728		
intangasset	,00	23	,0513	,09127	,01903	1,689	,200
	1,00	26	,0858	,09382	,01840		
	Total	49	,0696	,09330	,01333		
instownersh	,00	22	13,0391	13,97810	2,98014	2,862	,098
	1,00	25	22,6216	23,08871	4,61774		
	Total	47	18,1362	19,76591	2,88315		
Leverage	,00	23	,5852	,20282	,04229	1,672	,202
	1,00	26	,6469	,12664	,02484		
	Total	49	,6180	,16785	,02398		
Liquidity	,00	23	1,4200	,59431	,12392	6,708	,013
	1,00	26	1,0838	,27514	,05396		
	Total	49	1,2416	,47963	,06852		
Inmliquid	,00	23	,1939	,17676	,03686	,959	,333
	1,00	26	,2535	,23953	,04698		
	Total	49	,2255	,21238	,03034		
profpershare	,00	23	1,0061	1,36350	,28431	1,062	,308
	1,00	25	,6244	1,20187	,24037		
	Total	48	,8073	1,28257	,18512		
ROA	,00	23	,0448	,04347	,00906	,024	,878
	1,00	26	,0477	,08096	,01588		
	Total	49	,0463	,06544	,00935		
SIZEREVENUES	,00	23	1038667	1648158	343664	4,340	,043
	1,00	26	4581268	7997030	1568346		
	Total	49	2918415	6143653	877664		
MANAGCAP	,00	23	2,9635	8,75951	1,82648	,008	,930
	1,00	23	2,6865	12,34913	2,57497		
	Total	46	2,8250	10,58714	1,56099		
Forsalperc	,00	23	,0986	,14416	,03006	1,313	,258
	1,00	20	,1575	,19208	,04295		
	Total	43	,1260	,16870	,02573		
Hedgeperc	,00	23	,0000	,00000	,00000	11,790	,001
	1,00	26	,1242	,17330	,03399		
	Total	49	,0659	,13988	,01998		

B) Multivariate analysis with a logit model

The majority of the empirical studies carried out, among which this study can be included, contrast the hypotheses laid out in a theoretical framework by means of conditional probability models. For this reason, to analyse the hedging decision we have chosen to apply a logit model so as to be able to compare our results with those in previous studies.

The use of derivatives (dependent variable) is measured through a dicotomic variable which is given a value of 1 for those companies which have used derivatives for hedging and 0 for those companies which have not done so. As independent variables we have considered those included in the univariate analysis. We have found a high degree of correlation with some of the variables that turn out to be significant in the analysis of variance. Thus, size has a negative correlation with the liquidity variable and a positive correlation with volume of revenue. Because of this, we have chosen to include the variable "totalassets" as a proxy of economies of scale and to exclude "size revenues". To compare the factors that determine the hedging decision and the preceding hypotheses, a binomial logit model has been applied and SPSS software has been used as the statistical application. Various methods were used to estimate the model (introducing all the variables as a block and step-by-step). The model finally chosen can be seen in Table 5. As can be seen, the significant variables refer to size, market value with respect to book value, and the percentage of institutional ownership. All of these variables presented significant differences in the ANOVA model except the liquidity variable.

Table 5.- Variables included in the logistic regression equation

		B	E.T.	Wald	Gl	Sig.	Exp(B)
Paso 1(a)	totalassets	1,377	,487	7,992	1	,005	3,963
	Constant	-8,194	2,925	7,846	1	,005	,000
Paso 2(b)	marketbook	1,303	,622	4,398	1	,036	3,682
	totalassets	1,378	,513	7,206	1	,007	3,968
	Constant	-10,608	3,437	9,527	1	,002	,000
Paso 3(c)	instownersh	,044	,023	3,687	1	,055	1,045
	marketbook	1,573	,696	5,114	1	,024	4,821
	totalassets	1,458	,562	6,735	1	,009	4,297
	Constant	-12,410	4,056	9,362	1	,002	,000

a Variable(s) introduced in step 1: totalassets.

As can be seen the model presents and adequate level of adjustment since the inclusion of the three variables reduces the log of likelihood to (35,65) and Nagelkerke's R^2 is 0,609. Moreover, the classification matrix demonstrates the adequacy of the model which classify 82,6 % of the cases correctly.

Table 6.- Omnibus tests on the model and statistical coefficients of global adjustment

Step	-2 likelihood log	Cox y Snell R^2	Nagelkerke R^2
1	52,912(a)	,209	,279
2	39,883(b)	,404	,539
3	35,657(b)	,456	,609

Table 7.- Classification Table.

Observed	Prediction		
	Derivatives Use		
	1	0	Correct Percentage
Derivatives use			
0	17	5	77,3
1	3	21	87,5
Overall percentage			82,6

Based on this analysis we can gather that it is the variables related to economies of scale and the creation of value that determine the decision to hedge with derivatives in our sample of companies. Specifically, there is a positive relation with the variable "totalassets", used as a proxy for size, that supports the economies of scale hypothesis for the hedging decision. The same occurs with the variable "marketbook", which attempts to represent the phenomenon of underinvestment. The results in this case are in line with preceding studies carried out in other markets. The same does not occur, however, with the variable "institutional ownership", which presents the opposite sign than is established in the theoretical framework, which in our opinion may mean that the presence of institutional investors (many of whom are familiar with the management of hedging with derivatives) may act as an element of pressure on the hedging decision. Finally, we should point out that despite the fact that it is not included in the logit model, we have found significant differences in the liquidity variable favouring companies that do not hedge, and, therefore, the likelihood of bankruptcy seems to act as a driving factor for the decision to hedge with derivatives.

4.2 ANALYSIS OF HEDGING VOLUME

Having analysed the decision to hedge, we attempted to study the variables which determine the degree of hedging. As a dependent variable we used, as in the study by Allayannis and Ofek (2001), the ratio of the notional value of the derivatives position, including OTC's, and the volume of revenue in foreign currency. In order to analyse this relation we used a truncated regression model which makes it possible to evaluate the effect of independent variables on the level of hedging in the sample of companies which decided to hedge with derivatives.

The results of this analysis showed that the only variable which was significant with respect to level of hedging, both in the block models and in the ones obtained step-by-step, is the average level of exposure by the percentage of revenue in foreign currency. This level presented an important level of adjustment seeing as the adjusted R^2 coefficient had a value of 0, 584. The result obtained is in line with those reported in other studies such as Allayannis and Ofek (2001) and Hagelin (2003). In addition, the relation existing between level of risk taken on and the level of hedging would seem to confirm that companies use derivatives to cover their foreign exchange-rate risk and not to speculate.

Table 8.- Linear Regression between the percentage revenue variable and level of hedging.

Model		Non-standard Coefficients		Standardised Coefficients	t	Sig.
		B	Error típ.	Beta		
1	(Constant)	,042	,045		,935	,367
	forsalperc	,717	,168	,764	4,271	,001

a Dependent Variable: hedgeperc

4.3.- THE EFFECT OF FOREIGN CURRENCY DEBT

With respect to foreign currency debt, we have attempted to determine if this debt is used as a hedging instrument or if, on the other hand, it represents an increase in currency exposure. We have also attempted to determine if differences exist between companies that use derivatives and those that do not. We have observed no significant differences in the use of debt between these two groups, although the average amount is greater in firms that do not hedge. This situation together with the high correlation between the level of foreign currency debt and the degree of currency exposure, lead us to conclude that companies use foreign currency debt as a hedging instrument. In the case of companies that do not use derivatives, debt acts as a substitute, while in those that do use derivatives, debt acts as a complimentary hedging instrument.

Table 9.- Correlation between the level of debt and currency exposure.

		fordebt	Forgsales
Fordebt	Pearson Correlation	1	,621(**)
	Sig. (bilateral)		,003
	N	25	20
Forgsales	Pearson Correlation	,621(**)	1
	Sig. (bilateral)	,003	
	N	20	20

** The correlation is significant at a level of 0,01 (bilateral).

5.- CONCLUSIONS

This paper analyses the reasons why Spanish non-financial companies use derivatives for currency hedging. The research focuses on the reasons stemming from theories of optimal hedging, differentiating between those based on the creation of value and those based on other reasons. From the results we can gather that those companies with greater growth opportunities are more likely to carry out currency hedging. We have also found significant differences in liquidity ratio, which is used as a proxy for likelihood of bankruptcy, in favour of companies that choose not to hedge. These results are consistent with the theoretical arguments which indicate that companies hedge in order to increase the firm's value by reducing the agency cost of bankruptcy. In addition, the influence of size confirms the hypothesis regarding economies of scale in the hedging decision. In general terms, the significant variables coincide with those in the studies by Froot et al. (1993), Geczy et al. (1997), Allayannis y Ofek (2001) y Hagelin (2003). Nevertheless, institutional ownership is significant but has the opposite sign than is proposed in the hypothesis, which we have interpreted to mean that greater control exerted by this type of informed shareholder favours the decision to hedge. Regarding the hedging volume, like Allayannis and Ofek (2001) we found that it is only related to the firm's exposure. This would seem to confirm that companies use derivatives for currency hedging and not for speculation. Regarding foreign currency debt, we found that companies use this as a complimentary hedging instrument. Thus, we conclude that the reasons which lead Spanish firms to hedge is in keeping with some of the theories analysed and coincide in great measure with the findings in studies carried out in other markets.

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