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Dynamic Derivative Use and Accounting Information

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Abstract

This paper is a study of the use of derivatives by Italian non-financial firms. We examine the use of derivatives in order to analyse existing theories of hedging behaviour and provide empirical evidence on a potential differentiation of determinants of derivative use during time. We find that the variable most determinant of derivative use is the foreign sales.

We show that evidence is mixed with respect to financial distress cost models, tax, and agency costs theories. Instead evidence supports the hypothesis that exposure and economies of scale are the most determinants of derivative use.

1. Introduction

While companies have been using derivatives for many years, little is known about the extent or pattern of their use: in fact firms have not been required (until recently in the US, at least) to publicly report their derivatives activity. Unfortunately, the use of derivatives by companies only appears to receive attention in response to special cases of huge derivative related losses such as Barings, Procter&Gamble or Metallgesellschaft. However, relatively little is known about the patterns of use or firms' attitudes and policies regarding derivative use.

Nevertheless, derivatives are powerful instruments. In fact they are able heavily to affect the financial structure of a firm and its risk exposure by modifying future cash flows. In particular, they are able to reduce cash flow variability if they are used for hedging purposes or to increase cash flow variability if used for speculation. Moreover, they are able to increase the asymmetries of information between firm insiders and outsiders by their ability to modify accounting results.

There have recently been several empirical studies on the use of derivatives by non-financial companies. Among these are: the two large-scale surveys conducted by the Wharton School: one in 1994 (Bodnar, Hayt, Marston and Smithson (1995)) and another in late 1995 ((Bodnar, Hayt, Marston (1996); the survey on Canadian firms (Downie, McMillan and Nosla (1996); the survey on Japanese firms (Yanagida and Inui (1995)); and the survey on German firm (Bodnar and Gebhardt (1998)). Almost all these works focus on the question of why firms use derivatives and they mainly use cross-section analysis.

This work is in line with previous literature. The aim of this paper is to studies the use of derivatives by Italian non-financial firms and fill this void in the academic literature. The peculiarity of this study, also, is that it's conducted utilising a panel data approach.

The database we use is characterised by accounting data (balance sheet and off-balance-sheet) on the Italian Stock markets. The time horizon considered is from 1993 till 1999. We consider 15 individual firm variables in line with the literature: Total asset, Research and Development, short term debt, long term debt, leverage, Sales, exchange rate loss carry forward, Foreign sales, Interest rate payments, Pre-tax foreign exchange income, foreign exchange losses, Foreign exchange net income, Income, tax payment.

2. Determinants of Derivative Use and accounting variables

Theoretical research provides several explanations for derivative use in non-financial firms, resulting from different types of capital market imperfections. In the basic Modigliani and Miller world in fact, hedging (and so derivative use) does not alter firm value. Financial economists have derived the demand for derivative by relaxing one or more of the MM assumptions and identified at least five market imperfections that make volatility costly: the corporate income tax (Mayers and Smith (1982) and Smith and Stulz (1985)), costs of financial distress (Mayers and Smith (1982), Smith and Stulz (1985) and Froot, Scharfstein and Stein (1993)), managerial risk aversion, agency costs, and information asymmetry (Smith and Stulz (1985) and DeMarzo and Duffie (1991)). Nevertheless, as point out by Geczy, Milton and Schrand (1997) market imperfections might be necessary for optimal derivative use, they are not sufficient conditions. In fact, a firm's ultimate decision to use derivatives also depends on the level of its exposure to foreign exchange and interest rate risk and the cost of managing foreign exchange and interest rate risks. These models, proxies variables related to accounting data and associated predictions are discussed next.

2.1 Taxes

Smith and Stulz (1985) demonstrate that hedging increases the expected value of an equityholder's ownership claim when a progressive statutory tax schedule creates concavities in a firm's expected profit function. Reducing variance through hedging increases the expected value of tax benefits. Graham and Smith (1999) simulate important features of the corporate tax code to explicitly measure tax function convexity for a large sample of U.S. firms. They find that roughly one-half of corporations face a convex tax schedule. For these firms, the average tax savings achievable by reducing income volatility by 5% are approximately about 5% of income. However, the savings are material for only about 10% of COMPUSTAT firms. Graham and Smith also find that the tax function is effectively concave for 25% of their sample, although the tax incentives to increase volatility are typically small. To characterize the relevance of tax, we use as empirical proxes the level of tax payment. If firms do not hedge their cash

flows, the utilization of these tax shields may be postponed to a later date, thereby reducing their present value. Hedging increases the present value of these tax shields by smoothing out corporate earnings. The tax hypothesis predicts that probability of derivative use is positively associated with the amount of tax paid.

2.2 Banckuptcy costs

Smith and Stulz (1985) also show that exogenous bankruptcy costs create incentives for bondholders to support optimal hedging. By reducing the variance of a firm cash flow, hedging decreases the probability of financial distress. Given the ability of financial derivatives to reduce financial distress and so bankruptcy costs, firm hedging makes it possible to increase debt capacity and therefore firm value. Based on this model, the probability of using derivatives is higher for firms with higher expected costs of financial distress. Nance Smith and Smithson (1993) argue that if there is a fixed cost component of financial distress, then smaller firms are more likely to hedge.

Froot, Scharfstein and Stein (1993) formalise the Smith and Stulz financial distress explanation for optimal hedging by endogenising bankruptcy costs. In particular, Froot et al (1993) argue that without hedging, firms are more likely to pursue suboptimal investment projects (Meyers (1977)). In fact if the access to external financing (debt and/or equity) is costly, firms with investment projects requiring funding will hedge their cash flow to avoid a shortfall in their funds that could precipitate a costly visit to the capital markets. Since there is likely to be more asymmetric information about the quality of new projects for firms with high growth opportunity, their model predicts that hedging is more likely for firms with elevate growth opportunity. We use as proxies of growth opportunities the ratio of firm's research and development expenditures to its total asset.

Fixed costs associated with capital market visits are likely to make financing more expensive for smaller firms, therefore leading to the prediction that smaller firms are more likely to hedge. As a proxy for firm size, we use two variables: Total Assets and sales. Hence, hedgers are predicted to have smaller firm value than non-hedgers because of financial distress.

Dependence on external financing is also related to the firm borrowing capacity. We use as proxies in this case long term debt ratio (long term debt/Total Asset), short

term debt ratio (short term debt / Total Asset) and leverage. Previous models predicts that higher is long term debt ratio more likely is the firm use of derivatives.

Moreover, Stulz (1996), Ross (1997), and Leland (1998) suggest an alternative reason that debt ratios and hedging practices may be positively correlated: hedging, by reducing the volatility of income and/or reducing the probability of financial distress, increases debt capacity. If firms add leverage in response to greater debt capacity, the associated increase in interest deductions reduces tax liabilities and increases firm value. Thus, the ability to increase debt capacity provides a tax incentive to hedge.

2.3 Agency costs

When derivatives are used in equityholders' interests, we expect the firm market value to increase since derivatives hedging is a business decision that benefits shareholders' wealth and has to be considered as any other disinterested, well-informed, investing or operating decision made in good faith by corporate management.

DeMarzo and Duffie (1991) argue that equityholders can benefit from hedging when managers have private information about an unobservable risk that affects the firm's payoffs. In their model, hedging gives uninformed equityholders reduced noise in their information set concerning the variability of a firm's payoffs because hedging reduces their variance. Equityholders support hedging because they can make better portfolio optimisation decision. Clearly, the asymmetry of information is higher for small firms since they are studied les by analyst and the availability of information are lower. For this reason we use as proxies (as before) two variables: Total Assets and sales and we assume that larger firms are negatively related to the asymmetry of information and thus negatively related to the probability of hedging.

Theory of asymmetry of information could be used also to analyse the relation between derivative use and debt. In fact Ross (1977) demonstrate that the value of a firm increases when leverage and so debt increases because leverage represents an important signal to the market. For this reason a financial incentive-signaling equilibrium derives from the financial package chosen by the manager that distinguish "good" firms from "bad" firm because only "good" firms can support a particular financial package that make non optimal (i.e. default) a mimicking strategy for "bad" firms. Clearly, this package include also derivatives. Derivative use in this case could be

a signal of “bad” firm when debt are high. Thus, the ability to increase debt could be associated to a reduction of derivative use.

2.4 Exposure

Firm with accounting earnings resulting from exposure to foreign exchange and interest rate risk have greater potential benefits of using derivatives. In fact, the higher a firm’s foreign pretax income, the greater the benefit from hedging. We use as a proxy of this variable: Pre-tax foreign exchange income, foreign exchange losses, Foreign exchange net income and exchange rate loss carry forward. We additionally measure exposure to foreign exchange-rate risk by using the ratio of foreign sales to total sales.
Regards interest rate risk, exposure to interest rate (a high leverage) have greater potential benefits of using derivatives. Debt ratio, leverage, ???? capital gain on bonds are proxies of this.

2.5 Costs of derivative use.

Organizing the Treasury for risk management involves significant fixed costs. If the costs are high anough, a firm will not use any derivative. Costs associated with implementing and maintaining a risk management program, including those related to the acquisition of expertise, exhibit economies of scales related to the amount of risk management. A survey by Dolde (1993) found that more than 45% of the Fortune 500 firms surveyed used at least one full-time professional for risk management. In addition to professional staff, he reported that more than 20% of the sample firms use local area networks in their risk management operations. There are also economies of scale in obtaining information on hedging techniques (he found that management’s lack of familiarity with sophisticated financial instruments is a major impediment towards the hedging decision). Moreover, economies of scales in transaction costs associated with trading financial derivatives are relevant. Nance, Smith and Smithson (1993) hypothesize that the presence of these fixed costs suggests that small firms are less likely to hedge than large firms.

In this work we would like to introduce another variable relevant for the cost of derivative use. If such instruments has been used in the past, and so fixed cost has been

already sustained, the likelihood of continuing to use derivative is higher. In this work we do analyse also this variable.

2.5 Summary of empirical predictions

We consider 16 individual firm variables in line with the models presented above: Total asset, ratio of Research and Development to Total asset, ratio of short term debt to Total Asset, ratio of long term debt to Total asset, leverage, Sales, exchange rate loss carry forward, Foreign sales, Interest rate payments, Pre-tax foreign exchange income, foreign exchange losses, Foreign exchange net income, Income, tax payment.

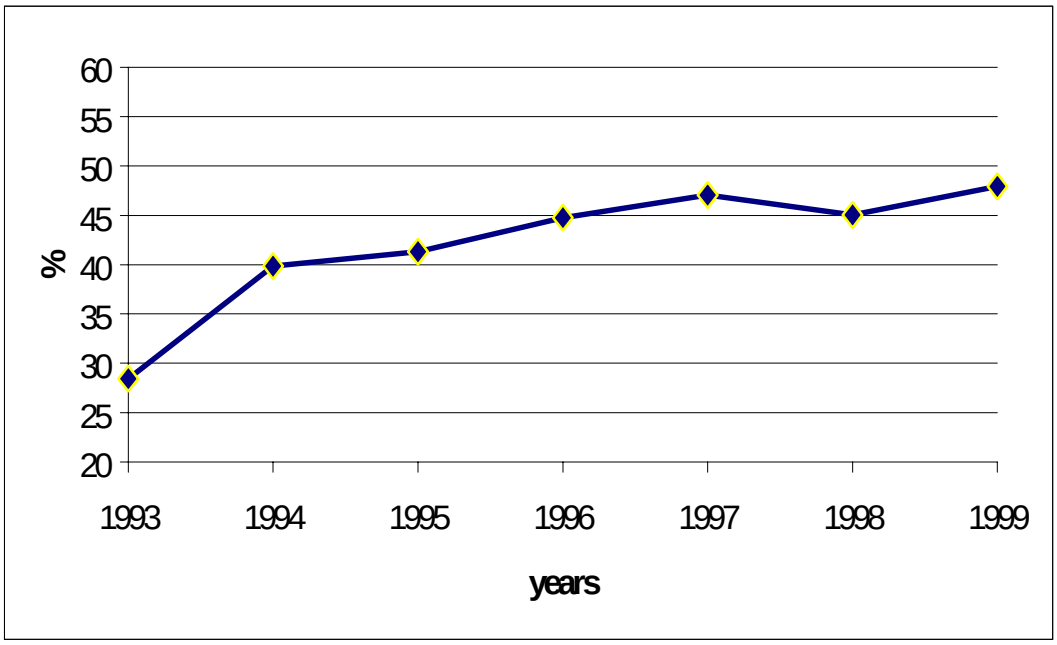
The models discussed above in this section generate the predictions summarized in Table 1 with respect to the proxies we use.

VARIABLE	Tax	Fin. Distress	Agency Costs	Exposure	Cost of hedging
Total asset		-	-		+
R&D/Total asset		+	+		
Short term Debt / Total asset		+	+/-		
Long term debt / Total asset		+	+/-		
Foreign exchange provision	?				
Leverage		+	+/-		
Sales		-	-		+
Foreign trading				+	+
Foreign trading / sales				+	+
Financial costs	?			+	+
Foreign exchange losses	?			+	+
Foreign exchange profit	+			+	+
Foreign exchange net income				+	+
Foreign exchange losses / Financial costs	?			?	?
Income n-1	+				
Tax n-1	+				

Table 1 – Predicted Signs of coefficient Estimates.

3. Sample Companies and Derivatives Usage

We examine an average of 150 firms balance-sheets from 1993 till 1999. Our analysis shows that about 45% of Italian non-financial firms listed on the Italian Stock Markets declare that they use derivatives, and the evolution of derivative use is characterized by a positive trend. Figure 1 shows the evolution of derivative use in percentage from 1993 till 1999.



From Figure 1 we observe that the use of derivatives was limited to a small fractions of firms in 1993 (28.45% of the non-financial firms listed at the Milan Stock Exchange); starting from 1994 (that is after the 1992 Italian sort out from the European Monetary System) the derivative use has increased a lot, and, in few years, the percentage became close to 50% in line with the empirical evidence of the 1995-1998 Wharton Survey of US non-financial firms (56.9%) and quite at odds with the results by Bodnar and Gebhart (1998) German Survey (77.8%)

Moreover, we analyse the general pattern of usage across industry from 1993 till 1999. Table 1 splits the companies by industry groups. Industry classification is based on the official classification index of the European Community NACE.

	1994		1995		1996		1997		1998		1999	
	%	TOT	%	TOT	%	TOT	%	TOT	%	TOT	%	TOT
RETAIL	40,0	5	20,0	5	50,0	4	25,0	4	0,0	4	33,3	3
CONSUMER	56,3	16	61,9	21	62,5	24	63,6	22	65,2	23	70,0	20
MOTORS	71,4	7	62,5	8	50,0	8	71,4	7	71,4	7	66,7	9
CHEMICALS	52,4	21	57,7	26	57,7	26	66,7	24	62,5	24	56,5	23
CONSTRUCTION	37,5	16	31,2	16	33,3	12	36,4	11	38,5	13	45,4	11
ELECTRO	44,4	18	38,9	18	47,6	21	46,1	26	44,4	27	47,8	23
SERVICE	16,1	31	14,3	35	15,1	33	18,7	32	20,0	35	30,0	30
MACHINERY	57,1	7	100,0	7	88,9	9	88,9	9	87,5	8	85,7	7
MINING	33,3	3	33,3	3	33,3	3	33,3	3	33,3	3	33,3	3
UTILITIES	16,7	6	25,0	8	33,3	9	30,0	10	25,0	8	25,0	12
Total	40.0	130	41,4	147	45,0	149	47,3	148	45,4	152	48,9	141

Table 1. - Derivative use by industry

Table 1 indicates that the derivative use is highly heterogeneous between sectors. This suggests that the determinants of derivative use are primarily driven by economic considerations such as activities and firm characteristics and not only the result of corporate culture or other firm specific characteristic. Moreover, even the evolution of derivative use is different across industries. There is a general positive trend but we do observe no trend in some industry or even a negative trend.

Comparing our results with those deriving from the cross-section analysis by Wharton survey and Bodnar and Gebhart (1998) German survey we observe a reduced use of derivatives compared to USA on Utilities, Service and Chemicals.

Regards the area of use, Figure 2 reveals that companies use derivatives primarily to manage foreign exchange risk. At least 75% in fact use currency derivatives and only 32% use interest rate derivatives; a low percentage use both type of derivatives (25%); so only one quarter of the companies using derivatives are exploiting the economy of scale deriving from the risk management of foreign exchange and interest rate risk. In reality these percentage are higher since there are almost 19% of firms that declare only generically their use of derivatives. Nevertheless, at least one half of the companies use only currency derivatives.

These results are in line with USA and Germany regards the foreign exchange exposure, on the contrary, the use of interest rate derivatives is about one half of that observed in US and Germany. This result is quite surprising since Italian interest rate volatility has been quite high compared to German interest rate volatility. Two potential (partial) explanations of this could be (i) that interest rate volatility is lower than exchange rate volatility and (ii) the lack of Italian firms in managing capital structure.

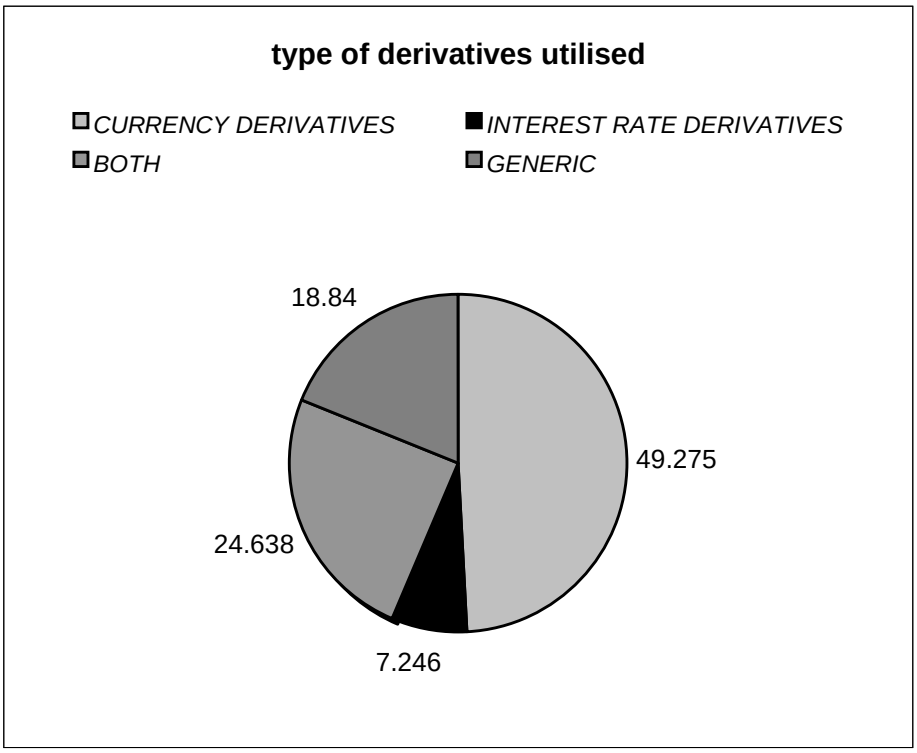


Figure 2 – Use of Derivative across risk classes

The financial markets offer a broad variety of derivative instruments. The preference among derivative instruments is not always declared. Nevertheless, in our data sample we are able to observe the following evolution, reported in Table 2. We observe that the instrument mainly used is the swap (almost 30-40% use such instrument) instead the use of options is only 13%. Assuming that the companies that declare in details the instruments they use is in a good approximation of the rest of the sample, this results suggests that the relation between swaps and option use is 4 to 1. From the results of the Wharton and German Survey instead we observe for USA a relation of 2 to 1 and for Germany 3 to 1. This implies that, conditional to our data base, it seems that the use of option is less developed than in USA and Germany.

	1993	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
SWAPS	46,8	40,7	33,8	32,8	42,5	47,7	40,3
OPZIONI	12,5	7,4	8,1	16,4	13,7	16,4	13,2

Table 2 – Instrument choice declared when derivatives are used.

4. Empirical evidence of determinats derivative use.

In order to examine the determinants of derivative use we perform different analysis. In particular we curried out a univariate test, repeating the cross-section analysis of the difference in mean between user and non user and test the null hypothesis with the T-Welch test[1]. Then we estimate logit regression in a panel contest to distinguish among the possible explanations for derivatives use and how the results change during time.

4.1 Univariate Tests

The results of univariate analysis for the proxy variables described in the previous sections and tests of the differences between the means of these variables for users and non users of derivatives are presented in Table 3.

Table 3 indicates that user firms have significantly greater foreign exposure. In fact all the variables related to foreign exchange activity are statistically significant almost every year, in particular foreign sales ratio. This result is in line with that highlighted in the descriptive analysis which shows that companies use derivatives primarily to manage foreign exchange risk.

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[1] The T-Welch test null Hypothesis is:

$H_0 : \mu_1 - \mu_2 = 0$ with μ_1 is the firm derivative user mean value of the variable and μ_2 is the firm derivative non user mean value of the variable.

The test statistic is:

$$T_{n,m} = \frac{(\overline{X}_1 - \overline{X}_2)}{\sqrt{s_1/n + s_2/m}}$$

where X_1 *and* X_2 are the sample means, s_1 e s_2 sample variances and n and m are respectively the number of observations.

$T_{n,m}$ follows a t - Student distribution with g degrees fo freedom, where:

$$g = \frac{\left[s_1^2/n + s_2^2/m \right]^2}{\frac{\left(s_1^2/n \right)^2}{n-1} + \frac{\left(s_2^2/m \right)^2}{m-1}}$$

From 1997, derivative user are generally larger than non-user, and they differ significantly with respect to variables that are proxies for growth opportunities.

The univariate test suggests that users of currency derivatives are not statistically different from nonusers with respect to firm borrowing capacity: debt and leverage. The result is in line with the limited use of interest rate derivatives.

In summary, the univariate analysis highlights that derivative use is mainly related to exposure and economy of scale. The univariate results related to the proxies for financial distress and tax are mixed. Although debt ratio and tax are statistically lower than those of non user, the means are not statistically different almost all the times.

	1994	**1995**	**1996**	**1997**	**1998**	**1999**
Total Asset	2157683 (0.99)	**4329548* (1.66)**	3153706 (1.32)	**6756980*** (2.72)**	**7167928*** (3.00)**	**13632924*** (3.16)**
R & D	-3999.5 (-0.72)	-1656.2 (-0.44)	422.3 (0.24)	**3891.1* (1.75)**	**4356.4** (2.42)**	6964.426 (1.63)
Short Term Debt	863337 (0.96)	1466173 (1.33)	1084073 (1.04)	**2592968** (2.60)**	**2733625*** (2.95)**	**4357396*** (3.18)**
Long Term Debt	329304.2 (0.92)	**742697.5* (1.73)**	499086.3 (1.48)	**1067699*** (3.15)**	**1192342*** (3.23)**	**2914617*** (2.63)**
Short Term Debt / Tot. Asset'	**0.079031*** (2.64)**	0.032697 (1.08)	0.035429 (1.19)	0.013251 (0.43)	-0.54112 (-0.83)	-0.92178 (-0.97)
Long Term Debt / Tot. Asset'	0.018097 (0.83)	0.01471 (0.7)	0.01044 (0.53)	0.020237 (1.10)	-0.5396 (-0.88)	-0.71954 (-0.97)
Foreign exchange provision	-5559.4 (-1.14)	4077.6 (0.76)	1986.4 (0.60)	3814.8 (2.02)	**763.4** (2.34)**	410.0446 (1.15)
Leverage	-4.22764 (-0.86)	**-7.58505* (-1.7)**	0.58563 (0.19)	3.12415 (1.03)	2.86596 (1.03)	3.803725 (1.25)
Sales	2167164 (1.58)	**4065374** (1.98)**	3075720 (1.69)	**4797842** (2.54)**	**4860284*** (2.78)**	**7566706*** (3.18)**
Foreign trading	**1725413** (2.00)**	**2298076** (2.34)**	**1839988** (2.14)**	**2262086** (2.48)**	**2314625*** (2.68)**	**3134548** (2.52)**
Foreign trading / Sales	**0.254395*** (5.14)**	**0.258842*** (5.21)**	**0.445503** (2.05)**	**0.437176** (2.38)**	**0.280964*** (6.20)**	**0.24994*** (5.00)**
Financial costs	**139120.8* (1.73)**	**238740.2* (1.92)**	**136366.5* (1.73)**	**208111*** (3.01)**	**195626.6*** (3.52)**	**302564.2*** (3.19)**
Foreign exchange losses	**28879*** (2.64)**	**34695.9*** (2.91)**	**18767*** (2.74)**	**41252*** (2.69)**	**37283.4** (2.55)**	**94984.39*** (2.65)**
Foreign exchange profit	**25915.7** (2.53)**	**52216.6** (2.08)**	**18950.2** (2.29)**	**33363.3** (2.53)**	**31165.7** (2.50)**	**73659.36** (2.30)**
Foreign exchange net income	-2963 (-0.91)	17520.5 (1.06)	183.2 (0.07)	**-7888.3** (-2.17)**	**-6118* (-1.92)**	-21508.4 (-1.37)
Foreign exchange losses / Financial costs	**0.076314** (2.43)**	**0.120727*** (3.29)**	**0.094724*** (3.26)**	**0.19363*** (5.40)**	**0.142163*** (4.57)**	**0.18541*** (4.98)**
Income n-1	**-83089.3** (-1.82)**	50830.4 (0.77)	**139661.4** (1.88)**	112616.6 (1.42)	**162867.4* (1.74)**	**178791.9* (1.70)**
Tax n-1	-4311.76 (-0.17)	43909 (1.01)	45462.1 (0.61)	144900.5* (1.78)	153883.1** (1.98)	206404.9* (1.98)

Table 3 – Summary of differences in accounting characteristics of firm that use derivatives against non users. The t-statistics in parentheses are given for tests of the equality of means between derivative users and non users.

4.2 Logit Analysis

Logistic regressions relate the probability of hedging to the determinants of hedging. Our objective is to distinguish among the possible explanations for derivative use and observe which variable mainly affects the probability of derivative use. We perform the analysis in panel form, so we are able to analyse if the explanation of derivative use is changing during time.

Table 4 presents the results of logit regressions where the dependent variable is equal to one for derivative users and zero for nonusers.

Even if multiple proxies are available to measure some firm characteristics (such as exposure to foreign exchange risk) the analysis of correlation coefficients between the independent variables evidences that they are statistically less correlated and so they are able to capture certain peculiarity of the firm that it is important to evaluate.

	1994	**1995**	**1996**	**1997**	**1998**	**1999**
tot asset'	0.002 (0.33)	0.004 (0.97)	0.003 (0.68)	**0.053***** **(3.29)**	**0.045***** **(3.47)**	**0.012***** **(3.31)**
R&D/total asset'	-8.002 (-0.43)	-0.014 (-0.83)	0.009 (0.35)	-0.028 (-0.75)	-0.034 (-1.16)	-9.369 (-0.56)
Short term debt / tot. asset'	**0.505*** **(1.66)**	0.011 (0.27)	0.024 (0.60)	-0.011 (-0.25)	-0.002 (-0.03)	0.032 (0.08)
Long term debt / tot. asset'	0.072 (0.13)	0.036 (0.63)	0.073 (1.24)	0.016 (0.24)	**-0.137*** **(-1.61)**	-0.404 (-1.20)
Foreign exchange provision / tot. asset'	-6.303 (-0.55)	-0.009 (-0.08)	-0.017 (-1.08)	-0.029 (-0.60)	**0.162**** **(1.76**)	14.231 (0.60)
Leverage	-0.003 (-1.17)	-0.053 (-1.12)	0.021 (0.69)	-0.022 (-0.55)	0.000 (-0.01)	-0.003 (-0.92)
Sales / tot. asset'	-0.060 (-0.359)	0.007 (0.37)	0.079 (0.52)	0.003 (0.18)	-0.082 (-0.58)	0.080 (0.85)
Foreign trading / sales	**0.625***** **(3.12)**	**0.056***** **(2.40)**	**0.050***** **(3.16)**	**0.046***** **(2.46)**	**0.056***** **(2.67)**	**0.589***** **(3.08)**
Financial costs / tot. asset'	4.458 (1.27)	0.281 (0.85)	0.031 (0.89)	**0.008**** **(2.05)**	**0.086***** **(2.58)**	1.932 (0.38)
Foreign exchange losses / tot. asset'	3.993 (0.01)	0.116 (0.01)	-0.061 (-0.01)	-0.011 (-0.02)	-0.135 (-0.01)	6.108 (0.01)
Foreign exchange profit / tot. asset'	15.850 (0.03)	0.078 (0.01)	-0.045 -(0.01)	-0.007 (-0.01)	-0.133 (-0.01)	-4.220 (-0.01)
Foreign exchange net income / tot. asset'	12.249 (0.03)	0.255 (0.02)	0.158 (0.22)	0.007 (0.01)	0.032 (0.02)	-10.477 (-0.02)
Foreign exchange losses / financial costs	-0.543 (-0.72)	-0.015 (-0.22)	0.043 (0.76)	**0.112***** **(2.32)**	**0.096***** **(2.18)**	0.248 (0.46)
Income n-1 / tot. asset'	0.805 (0.85)	**0.051*** **(1.69)**	0.102 (0.82)	**0.032***** **(2.15)**	**0.343*** **(1.49)**	0.431 (0.27)
tax n-1/ tot. asset	1.502 (0.62)	0.077 (0.87)	**0.497**** **(1.78)**	-0.018 (-0.68)	**-0.055*** **(-1.56)**	-2.196 (-1.06)

Table 4 – Logit Regression Estimates of the Likelihood of using derivatives. The t-statistics in parentheses are for the Logit coefficients

Table 4 reports marginal changes in the probability of using derivative instruments, implied by the logit coefficient estimates, that result from a unit change in the explanatory variables.

As Table 4 shows, tax, research and development ratio and leverage are not significant determinants of derivative use. Regards to exposure, only foreign sales ratio is a relevant determinant of derivative use. All the other variables such as pre-tax foreign income, are not statistically significant and this highlights the fact that derivative use is characterized by hedging passively the foreign exposure.

Moreover, interest rate exposure proxies presents mixed results. In most of the years, debt ratios are not statistically significant and even the proxy for interest payment (foreign exchange losses/financial costs). It seems that interest rate exposure is not so relevant and derivative are not use to hedge interest rate risk.

The results related to economy of scale are mixed. Firm size is only recently significant with a positive sign, and sales are statistically significant only for few years. Nevertheless, the sign is some time positive and some other negative. This is in line with the mixture of prediction on such proxies made by tax and financial distress theories against exposure and cost of hedging theories.

5. Conclusion

This paper examine the determinants of derivative use of Italian non-financial firms. We demonstrate by the panel analysis that the results could be extremely different if confronted in the different years, so determinants of derivative use could change during time.

Generally, the variable most important in the study of the determinants of derivative use is the foreign sales. Only recently, another variable is resulted determinant: the firm size. This is a evidence that also the economy of scale is a key variable of derivative use.

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