The Impact of Derivatives Usage on Firm Value: Evidence from Greece

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Abstract

This paper presents evidence on the use of derivative contracts in the risk management process of Greek non-financial firms and its potential impact on firm value. The sample of the research consists of 81 Greek non-financial firms with exposure to financial risks that are listed in the Athens Stock Exchange and have their annual report published according to the International Financial Reporting Standards (I.F.R.S) for the years 2004-2006. The subject of investigation is whether hedging with derivatives materially increases firm value as many related research has proven, or whether hedging does not affect firm value and can be attributed to managerial or other motives. Having used Tobin's Q as a proxy for firm value a positive and significant effect of hedging on it is verified, 4.6% of firm value on average, not only concerning the general use of derivatives, but also the use of foreign exchange derivatives and interest rate derivatives in particular. Controlling for managerial motives does not change the sign of the hedging premium, nor its magnitude.

Keywords: risk management, financial risk, derivatives, corporate finance, Greece.
JEL classification: G 32

I. Introduction.

Hedging corporate risks with the use of derivative contracts has been an increasingly popular corporate activity during the last decades. This evolution is directly related to the gradual shift of interest to the volatility of the financial and capital markets worldwide and to the crucial effect this volatility has on the performance and the profitability of firms. The constantly transforming financial environment and the activation of firms in the contemporary globalized market makes more and more imperative the identification and administration at the management level of the corporate exposure to sources of financial risk, such as the foreign exchange rates, the interest rates, the equity and the commodity prices.

During the last two decades there have been numerous studies trying to analyse the determinants and the theoretical motives behind this corporate activity, as well as its correlation with other corporate aspects such as the capital structure of the firm, the amount of leverage, the investment policy and the growth opportunities of the firm. However, limited is the extent of research with respect to the question of whether hedging with derivatives is a value increasing corporate activity for non-financial firms and what is the amount of its impact on firm value, if any.

A significant drawback in the applied research concerning the corporate use of derivatives has been the limited information about the hedging positions of firms. This lack of available data is attributed to the fact that until recently firms in most countries were not obliged to reveal to the public neither the risks they face, nor the actions they take to manage these risks. A major exception has been the United States where since the beginning of 90s firms are required to disclose information about the usage of financial instruments with off-balance sheet risk and with concentration of credit risk.

The latest convergence that is globally observed with respect to the way the financial statements of the firms are compiled and presented, has led to the implementation of the International Financial Reporting Standards (I.F.R.S.) in many countries worldwide as well as in Greece, a country-member of Eurozone. According to the I.F.R.S. firms must disclose whether they use derivative contracts or not for hedging or trading purposes and they have to provide information about the whole specter of risks they face and the actions they take to properly handle them.

This major change in the disclosure requirements of the native firms has allowed to investigate whether the use of derivative contracts for hedging purposes is a value increasing strategy for firms with exposure to financial risks and to quantify the impact of hedging on firm value. In order to verify this basic hypothesis non-financial firms with exposure to risks such as the foreign exchange risk, the interest rates risk, the commodity price and equity price risk are considered, they are categorized as hedgers or non-hedgers depending on whether they report using derivatives for any of those risk categories in their annual report and differences in their value are recorded and analyzed.

The remainder of the article is organized as follows. A review of previous research on the use of derivatives is presented in section II, while section III discusses the sample construction and the definition of the variables that will be used. Sections IV and V present the methodology and the results of the univariate and the multivariate analysis undertaken respectively and the last section VI concludes.

II. Review of previous surveys.

Despite the fact that the literature concerning the corporate use of derivatives has been extensive and the main concept behind corporate hedging has been firm value maximization, the direct impact of hedging on firm value had not been examined by any researcher until the recent past. The first to investigate the contribution of derivatives to value maximization have been Allayannis and Weston [Allayannis/Weston, 2001]. In their article "The use of foreign currency derivatives and firm market value" they consider the use of foreign currency derivatives in a sample of non-financial firms and how this practice affects firm value[1], and they reveal a positive relationship between firm value and hedging. The impact of derivatives usage is statistically and economically significant for firms with exposure to foreign exchange risk and it amounts 4.87% of firm value on average, after a series of controls.

This pioneering research is considered the introduction to the *direct* approach in the attempt to empirically verify that derivatives usage is positively evaluated by the market and is significantly associated with firm value, with an adequate number of

[1] Firm value is proxied by the variable Tobin's Q.

studies to follow. The main difference of the *direct* approach from the previously used one is that derivatives usage is now the independent variable and under examination is its relationship with firm value which is the dependent variable of the model, after controlling for other factors that also influence firm value[2]. The hedge dummy coefficient in the regression is interpreted as the premium or the discount on firm value which is created by the use of derivatives[3].

After Allayannis and Weston [Allayannis/Weston, 2001] an extensive number of researchers has focused on the investigation of the relationship between hedging and firm value, some of them by exactly implementing the initial model and others by adjusting it to the occasional economic environment under consideration, with controversial up to now results. Carter, Rogers and Simkins [Carter et al., 2004(a)] examine in the U.S. airline industry not only whether hedging fuel price risk ads value to the firm, but also if the source of the added value is accordant to the hedging theory. Since the fuel cost amounts on average 13% of the firm's operational cost, using derivatives to manage the volatility in fuel prices is a justifiable choice for firms in the industry. The authors implement the Allayannis/Weston model with slight adjustments and find hedging to create a premium of 14.94% -16.08% on firm value, statistically significant at the level of 10% and 1%. The size of the premium is larger than in previous studies, which may be attributed to the fact that all firms in the sample spend a greater amount of their income for fuels and this influences heavily their value. In order to identify the source of the premium they repeat the previous analysis but they now use a dummy that measures the interaction between hedging and capital expenditures, they find that capital expenditures are valued higher for hedgers and they estimate that 52%-100% of the value premium is created by the ability of hedging to stabilize and protect capital expenditures and to avoid underinvestment.

In another empirical research under the same methodology in the U.S. oil and gas producers, Jin and Jorion [Jin/Jorion, 2006] disclose that derivatives usage reduces the firm's stock price sensitivity with respect to oil and gas prices and contrary to previous studies find derivatives to have no significant impact on firm

[2] According to the indirect approach, researchers try to prove whether hedging is conducted subject to the motives suggested by the theory, such as tax reduction, reduction of costs of financial distress and of agency costs, etc., in which case firm value is increased. Under this methodology, hedging is the dependent variable.

[3] In the whole article hedging is used alternatively to the term "derivatives usage". Firms that use derivatives for other than hedging reasons are not considered derivatives users.

value. The main contribution of the study is a new, simple estimation of Tobin's Q which is the proxy for firm value and the outcome of the analysis, which shows that derivatives usage is insignificantly related to value (hedging gas prices leads to a 3.7% discount in firm value, while oil hedging rises firm value by 0.7%, in both cases without statistical significance). Unable to support the hypothesis that firms that hedge their exposures are valued higher relative to firms that do not hedge, the authors attribute the establishment of hedging to the personal benefits of the management team. With respect to the hedging premium that other studies have documented, they attribute it to factors such as the information asymmetry or the operational hedging which influence firm value, but happens to be positively correlated with the use of derivatives.

In line with previous researchers Lookman (2003) investigates the impact of hedging in a sample of oil and gas exploration and production (E&P) firms, he differentiates by discerning firm exposure to "primary" and "secondary" risks depending on how extensive influence they have on the financial operation of the firm and finds that hedging the primary risk exposure leads to a value discount of 17%, while hedging the secondary exposure creates a premium of 26.7% contrary to expectations. Therefore he concludes that hedging does not lead to higher firm value and introduces an alternative hypothesis, according to which the observed effect on firm value is caused by the fact that hedging serves as a "noisy proxy" for other variables that are associated with firm value and have not been taken into account. Once these factors are introduced into the analysis, the valuation effects become insignificant.

A study of much greater scale undertaken by Bartram, Brown and Fehle [Bartram et al., 2003] in a sample of 7319 non financial firms in 50 countries shows extensive usage of derivatives outside United States and provides evidence in favour of the hypothesis that hedging is a value adding corporate activity. The results reveal significantly higher firm value for hedgers of the interest rate risk in all countries, while the evidence concerning the foreign exchange risk is also positive but weaker. As far as the motivation behind hedging is concerned, the authors believe that the findings are more consistent with an alternative "naïve hypothesis" that firms simply hedge once reaching a certain level of financial sophistication.

Dan, Gu and Xu [Dan et al., 2005] try a different econometric approach, they focus on the potential existence of non linear returns due to hedging and they use

linear and non linear generalized additive models in their analysis in order to examine this possibility. They conclude that derivatives usage has no significant impact on firm value and that leverage is the only control variable that is significantly but negatively related to value. The evidence suggests that the non linear GAM model fits better the data than the linear one.

From the viewpoint of managerial motives Hagelin, Holmen, Knopf and Pramborg [Hagelin et al., 2004] prove that when the hedging strategy is based upon incentives from manager's stock options, firm value decreases. In particular, beside the implementation of the initial model of Allayannis/Weston (2001) where they find that hedging is only positively correlated with firm value without causing any increase in it, they estimate an interactive term between hedge and option delta which captures the valuation effect of derivatives usage when managers hedge their option portfolios. They conclude that when hedges are used to reduce the stock price sensitivity of managerial stock options, hedging creates a value discount.

In a totally different spirit and far from the previous methodology Graham and Rogers [Graham/Rogers, 2002] examine if firms hedge their risks in response to tax incentives and how this affects their value. Hedging appears to increase the mean corporate leverage by 3.03%, effect that creates tax benefits due to increased interest deduction equal to 1.1%-2.1% of market value of assets and an equivalent increase in firm value.

Contrary to most of the previous studies, Guay and Kothari [Guay/Kothari, 2003] find that the extent of the corporate financial risk that is hedged is too small to influence firm value, especially in the amount previously mentioned. The controls that have taken place illustrate that in the case of a simultaneous extreme change in the interest rates, foreign exchange rates and commodity prices, the expected change in the value of the corporate derivatives portfolio will not exceed 4% of the book value of firm's assets and thus derivatives usage does not have a significant influence on firm value. In addition, the average firm uses derivatives adequate to hedge 3%-6% of the total corporate exposure to the volatility of the foreign exchange and interest rates, which is also a very small position to have significant value effects.

Finally, Allayannis, Rountree and Weston [Allayannis et al., 2005] examine the volatility of cashflows and its relationship with firm value, they support the hypothesis that investors evaluate higher firms with smooth cashflows and find strong evidence that the increase in the volatility of cashflows by one standard deviation

leads to a reduction of 30%-37% in firm value. Since derivatives usage leads to the minimization of the volatility of corporate cashflows, it is made obvious the exact mechanism through which hedging affects firm value.

III. Sample description and definition of variables.

In accordance with the existing literature the sample of the current research consists of firms that are listed in the Athens Stock Exchange and fulfill the following criterions: a) they are non-financial firms[4] -financial firms are excluded because they are usually both end users and intermediaries in derivative transactions, they often act as market makers in derivatives markets and thus their motives and behaviour are not representative of the hedging behaviour of non-financial firms-, b) their base and headquarters are in Greece, c) they have their annual report published according to the International Financial Reporting Standards for the fiscal years 2004-2006[5], d) they are exposed to any of the foreign exchange risk, interest rate risk, commodity or equity price risk and e) their annual turnover is €100 million or more for each of the examined years. The criterion of the annual turnover has been set in order to exclude small firms so that the sample matches as close as possible the sample of related studies, however the huge differences in size make the comparison with U.S. and Canadian firms quite difficult.

The number of firms that fulfill these criterions are 81 and thus for the three years period a balanced panel data of 243 firm-year observations emerges (both time-series and cross-sectional data). The main advantages of a balanced panel data approach is that it allows for the control of individual heterogeneity, it gives more informative data, less collinearity, more degrees of freedom and more efficiency, as well as it eliminates any potential bias resulting from aggregation over firms or individuals (Baltagi, 1995).

[4] According to the Athens Stock Exchange classification financial firms include retail and investment banks, insurances, real estate and leasing companies, brokerage and investing houses and all kind of funds, which are all excluded from the sample.

[5] I.F.R.S. were initially implemented on 01.01.2005 but for reasons of comparability and transparency firms were required to also publish their balance sheet for fiscal year 2004 according to the I.F.R.S, fact that made the collection of the required information concerning firms' hedging positions of that year possible.

The sample is thereafter divided according to whether firms are exposed to foreign exchange risk or interest rate risk[6]. A firm is considered to have an exposure to foreign exchange risk if it reports foreign assets, sales or income for the three-year period examined, while the exposure to interest rate risk is documented if the firm reports fluctuating debt over the same period. 60 firms report exposure to foreign exchange risk and thus there are 180 such firm-year observations, while the firms reporting interest rate risk exposure amount 74 and so 222 firm-year observations emerge.

The sample is also divided depending on whether firms use derivatives for hedging purposes. A company is considered a hedger when the full sample is considered if it uses any kind of derivative contract for risk management purposes and in this case the hedge dummy takes the value of 1. In the sample of firms with foreign exchange exposure a firm is considered a hedger only if it uses foreign exchange derivatives (the FCD dummy takes the value of 1) and in the sample of interest rate risk exposed firms hedgers are identified by the use of derivatives with underlying value interest rates (the IRD dummy takes the value of 1 in this case), allowing the construction of three independent hedging dummies.

The main variable on which the current analysis is based and which can be used as indication of both the value and the growth options of the firm, is the variable Tobin's Q. Tobin's Q is defined as the ratio of the market value of the firm to the replacement cost of its assets and if it takes a value of grater than unit then the market appreciates the value of the firm to be higher than the next best use of firm's assets, which is their replacement cost. The existing literature provides many different definitions of this variable, with the more accurate one to be developed by Lindenberg and Ross [Lindenberg/Ross, 1981], however due to limitations in the availability of data the methodology selected to estimate Tobin's Q in this research follows an algorithm undertaken by most of the researchers in similar studies. According to it, Q is defined as the sum of total assets and market value of equity minus the book value of equity, all divided by total assets[7]. In addition, two alternative ways of estimating Q are used: the first one is the ratio of market to book value of equity, while the

[6] All firms in the sample have exposure to at least one financial risk. As the number of firms that report exposure to commodity price risk is limited and the number of firms that report hedging that risk is even smaller, the sample is not divided according to whether firms have exposure to commodity price risk. None of the firms in the sample reports exposure to equity price risk.

[7] This methodology of estimating Q is followed by Pramborg (2004), Allayannis et al. (2003), Hagelin et.al (2004), Jin/Jorion (2006), Lookman (2003).

second one is the ratio of market value of equity to total sales, all three used as proxies of firm value.

Table 1.A, Panel A, presents the summary statistics of the main variables that are used in the article for the whole sample of firms, while Panels B and C present summary statistics for the same variables regarding firms with exposure to foreign exchange risk and interest rate risk respectively. The exact definitions of these variables and others that will be used in the upcoming analysis are given in Table 2.

The mean value of assets in the whole sample approaches €924 millions and the mean value of sales approaches €727 millions, while the median value of both these variables differs substantially from the mean, which is a sign of skewness. The 78% of firms report exposure to foreign exchange risk, the sales from operation abroad as percentage of total sales are 21.8% on average, the ratio of total debt to book value of equity approaches 1.54 on average, while the mean market value for firms in the whole sample is close to €764 millions. The 44% of firms in the whole sample use any kind of derivatives and in particular 34% of them use foreign exchange derivatives and 28% of them derivatives with underlying value interest rates.

The mean value of Tobin's Q for firms in the whole sample is 1.447, is greater than unit and indicates that the market assess the average firm to generate excess profits and to perform better than the cost of its assets justify. As the mean value of Q is higher than the median value (1.122) which is a sign of skewness in the distribution (right skewed distribution), in the multivariate analysis that will follow the natural logarithm of Q is used, so that its distribution becomes more symmetric[8].

In the last section of Panel A the statistics of the control variables that will be later used in the multivariate analysis are presented and their estimation follows Allayannis and Weston [Allayannis/Weston, 2001]. The return on assets for firms in the full sample is 5.7% on average, the capital expenditures as percentage of total sales approaches 9.2%, while the mean leverage is higher than unity (1.115 versus 0.469 which is the median value). The R&D expenses as percentage of assets and the advertising expenses as percentage of sales are extremely low for most firms, sometimes reaching zero. Finally 76.1% of firms pay a dividend and 34.5% of them

[8] Also observed in Lang and Stulz [Lang/Stulz, 1994], Allayannis and Weston [Allayannis/Weston, 2001] and in most other related research.

are activated in more than one business segments, attitude that will be later analyzed as to the impact that is expected to create on firm value.

A brief comparison of the data presented in Panels B and C between firms with foreign exchange exposure and interest rate exposure respectively reveals that firms exposed to foreign exchange risk have on average slightly higher sales, their foreign sales are a larger part of their total sales as expected, their mean market value is substantially higher and they appear to use derivatives at a greater extent than firms with exposure to interest rate risk. As far as Tobin's Q and the alternative ways of estimating it are concerned, such firms show greater mean value in all cases.

Since the main target of the current research is to reveal differences in the corporate factors that can be attributed to hedging, the sample of the firms is also divided with respect to whether firms use derivatives or not. Table 1.B presents the summary statistics for the same variables as before, for hedgers in Panel A (108 firm-year observations) and for non-hedgers in Panel B (135 firm-year observations).

Firms that used derivatives during this period have on average much larger size both in terms of assets and sales relative to non-users of derivatives, fact that verifies previous empirical evidence which supported that it is the large firms that use derivatives more often and not the smaller ones, contrary to what the theory suggests. In an attempt to explain this contradiction previous researchers provide two different arguments, according to the first of which the establishment of a position in derivatives markets requires significant initial costs and it is easier for large firms to bear these costs, due to economies of scale. On the other hand some researchers support the "naïve hypothesis" that firms start hedging their risks once they achieve a certain level of financial sophistication, as at this level financial analysts and rating houses consider risk management extremely important and they put significant external pressure on managers, as they expect firms to use derivatives[9].

In addition hedgers appear to have at least as double a market value as that of non hedgers both in terms of mean and median value, fact which indicates that investors value higher firms that hedge their risks and may be interpreted as a sign of a premium on firm value due to hedging, hypothesis that is left to be verified in a forthcoming section. From the viewpoint of leverage, the data do not verify that firms hedge their risks in order to increase their borrowing capacity or to reduce their

[9] "Naive hypothesis of financial sophistication", Bartram et al., (2003).

probability of financial distress, as hedgers appear to be less leveraged than non-hedgers, contrary to expectations.

Furthermore, the control variables offer mixed results: hedgers and non-hedgers appear to have almost the same mean return on assets, when the theory suggests that the users of derivatives should be non-profitable firms with high risk of financial distress. Significant however is the difference in the ratio of capital expenditures to total sales, since derivatives users have a mean value of 11.6% contrary to 7.3% of non-users. It can be thus supported that one of the major motives in the decision to use derivatives is to reduce the underinvestment cost in firms with high growth options and investment opportunities, as hedging theory orders.

Hedgers have on average a lower ratio of long term debt to book value of equity contrary to expectations, while 88% of them pay a dividend, versus 66% of non-hedgers. The payment of a dividend is interpreted as ability to access the financial markets, as such firms are less likely to be financially constrained and thus they are expected to have easier access to the derivative markets and especially to the Over the Counter contracts. On the other hand it can be argued that firms which pay a dividend are usually healthy enough to avoid a financial distress even without the use of derivatives and they may be characterized by lack of investment opportunities[10], as in the opposite case they would use their excessive liquidity to finance investment projects with positive net present value.

Finally, the evolution in the extent of usage of derivatives among firms in the sample is presented in Table 3 for the time period 2004-2006. As it can be seen the number of firms that used derivatives has grown from 34 in year 2004 to 38 firms in year 2006, which amounts 46.91% of all firms in the sample. The use of currency derivatives in the sample of firms with foreign exchange exposure has almost remained constant and amounts 40% in those firms, whereas the usage of interest rate derivatives has increased over time and is conducted by 23 firms in year 2006, which is 31.08% of firms with interest rate exposure.

[10] Argument that contradicts the empirical evidence which supports a positive correlation between hedging and investment opportunities.

IV. Univariate analysis.

The main hypothesis the hedging literature deals with is that firms that use derivatives for hedging are rewarded by investors with higher valuation compared to non-users and thus a significant difference between hedgers and non-hedgers in terms of firm value should emerge, a premium that could be attributed to derivatives usage. In order to empirically verify this hypothesis a test of equality of the mean and median of the firm value as given by Tobin's Q and of the two alternative variables is conducted, as well as a comparison of total assets among hedgers and non-hedgers. The test is performed separately for all firms, firms with foreign exposure and firms with interest rate exposure respectively and the results are mixed, as shown in Table 4.

Panel A presents the results of the test of equality of means and medians between hedgers and non-hedgers in the full sample, while Panels B and C present the same test between users and non-users of currency derivatives among firms with foreign exchange exposure and of interest rate derivatives among firms with relative exposure respectively. Column 1 gives the mean or median values for hedgers, column 2 the same values for non-hedgers, in column 3 the difference between the two is presented, column 4 gives the t-statistic for means and the outcome of the Wilcoxon/Mann-Whitney test for median values where appropriate and column 5 gives the critical probability of each outcome, which defines its significance.

In the full sample the test reveals that the difference in the mean value of Tobin's Q between hedgers and non-hedgers is negative and insignificant, while the difference in the median value of the same variable is positive and insignificant. When using the alternative Q1 the difference in mean value is negative but the difference in median is positive and significant, whereas when the alternative Q2 is examined the difference in both mean and median values is positive and significant at 1% in favour of hedgers, as is also the comparison of the mean and median values of total assets. These results demonstrate that hedgers are valued slightly higher than non-hedgers, but the size of the premium is not consistent, nor is it robust as expected.

Since the results are repeated even weaker in the sample of firms with foreign exchange exposure (Panel B) or in the same trend as before in the sample of firms with interest rate exposure (Panel C), it cannot be supported that derivatives usage leads to significantly higher firm value at first glance. On that account a multivariate

analysis is required in order to isolate other factors that usually affect firm value, a procedure that takes place in the next section and is expected to reveal what the exact relationship between hedging and firm value is and what is its nature.

V. Multivariate analysis.

A. The empirical model used.

This part of the analysis is based on the empirical model of Allayannis and Weston [Allayannis/Weston, 2001] which has the form of

$$\ln(Tobin'sQ) = a + \beta hedge + \gamma X + \varepsilon \quad (1),$$

where Tobin's Q is the proxy for firm value, hedge is the hedging dummy, X is a number of control variables and ε is the error term. The reason the natural logarithm of Tobin's Q is used is to control for the skewness of the variable, as happens with the two alternative ways of calculating Q. The hedging dummy differentiates as already explained depending on the sample of firms that is investigated and shows whether the firm uses foreign currency, interest rate or any kind of derivative contract. In all three cases the coefficient of the hedge dummy β is interpreted as a premium or a discount on firm value due to hedging, depending on the sign of the coefficient.

The control variables[11] (X) of the model that allow the exclusion of any other impact on firm value Q besides hedging are:

a) the *log of total assets* and alternatively the *log of total sales* as a proxy for size. Since the evidence as to whether size leads to higher profitability is ambiguous, so is its expected sign with respect to Q,

b) a *dividend dummy* as a proxy for access to financial markets, which takes the value of 1 if the firm paid a dividend during the examined period and 0 in the opposite case. As firms may ignore projects due to inability to fund them and their value may remain high because of that, the variable is expected to be negatively related to Q,

c) the *ratio of long-term debt to book value of equity* as an indication of leverage also with an ambiguous sign,

d) the *return on assets* as a measure of profitability. More profitable firms have higher Q, so a positive sign is expected,

[11] As in Allayannis/Weston (2001).

e) *capital expenditures scaled by total sales* as a measure of investment growth, together with the *ratio of advertising expenses to total sales* and the *ratio of research and development expenses to total assets* for the same reason, all three expected to be positive related to firm value Q,

f) the *ratio of sales from operation abroad to total sales* as an indication of geographic diversification and expecting a positive association with Q,

g) an *industry diversification dummy* that shows if a firm is activated in more than one business segments, which is usually negatively related to firm value according to previous studies

and h) three *year dummies* depending on the fiscal year the data refer to. Contrary to Allayannis and Weston [Allayannis/Weston, 2001] lack of available data does not allow control for the credit quality by making use of the credit rating of each firm, while the econometric method chosen does not allow control for industry effects that may arise due to the industry the firm is activated to[12].

B. The econometric methodology.

As has already been mentioned, the main advantage of a balanced panel data analysis is the ability to control for the existence of the "non-observable individual heterogeneity". The basic idea behind this term is that there are individual characteristics that is difficult to be observed or measured and which vary among cross sections but are constant over time. However the pooled Ordinary Least Squares regression which is the simplest and most common method of analyzing balanced panel data does not take into account the effect of the individual heterogeneity when it exists and therefore leads to a biased estimator. On that account most of the previous researchers have controlled for the potential existence of individual-specific effects and have followed a different from OLS methodology, such as a random or fixed effects model or a non-linear analysis.

In order to select the estimation method of the current regression analysis the Breusch-Pagan test and the Hausman test were conducted, as the econometric theory dictates. The Breusch-Pagan test is a Lagrange Multiplier test and controls for the existence of individual heterogeneity, i.e. whether the pooled OLS is an appropriate

[12]The selected fixed effects methodology assigns each firm a unique intercept, which in combination with the 14 industry dummies described in Table 2, leads to perfect collinearity (near singular matrix) and the econometric software cannot produce results.

method or not. It is based on the null hypothesis that $\sigma_{\alpha}^{2} = 0$, which is the same as $cor(\varepsilon_{i,t}, \varepsilon_{is}) = 0, t \neq s$. Under the null hypothesis LM is distributed as chi-squared with one degree of freedom. The test and its results are displayed in Table 5, the value of the test statistic is higher than the 5% critical value and consequently the null hypothesis is rejected. Thus there are individual-specific effects in the data and the random effects model suits better than the pooled OLS method.

The Hausman test which was afterwards conducted distinguishes between the random and the fixed effects model and under its null hypothesis no correlation among the residuals and the regressors is allowed, which means that in such case only the random effects estimator is consistent and efficient. Under the null hypothesis the test statistic is asymptotically distributed as chi-squared with λ degrees of freedom. The outcome of the test in Table 6 shows that the null hypothesis is rejected at the 5% level, therefore the estimator of the fixed effects method is the consistent and efficient one and the fixed effects is the suitable econometric methodology to be undertaken.

Furthermore, the standard errors are corrected for the potential existence of heteroscedasticity -which is a quite common phenomenon in panel data where the cross-section dimension exists- by using the White cross-section method (1980). This method provides a coefficient covariance estimator that is robust to cross-equation (contemporaneous) correlation as well as to different error variances in each cross-section. Last but not least, there is no sign of serial correlation in the residuals and thus no further action has taken place.

C. The results of the empirical analysis.

The results of the empirical analysis as described by equation (1) are presented in Table 7, where in Panel A the outcome of the basic regression with dependent variable the Tobin's Q is shown, while in Panels B and C the same regression is repeated, but now the dependent variable is the alternative estimation of Q, AltQ1 and AltQ2 respectively. Under the column of "all firms" are the results of the regression in the whole sample of 81 firms with exposure to financial risks (243 observations), where the hedge dummy differentiates depending on the usage of any kind of derivative contract. Under the column of "firms with FX exposure" is examined the sample of 60 firms with foreign exchange exposure and whether they have used foreign exchange derivatives (FCD dummy equal to 1or 0) and in the last column the

outcome of the regression in the 74 firms with interest rate exposure is shown, where the hedge dummy (IRD dummy) alters subject to the use of interest rate derivatives.

In Panel A the results in the full sample verify the initial hypothesis that firms that hedge their risks with derivatives are valued higher. The coefficient of the hedge dummy which depicts the effect of hedging on firm value is positive and significant, with a value of 0.04. As the hedge dummy coefficient is interpreted as a change of x% in firm value due to full hedging ceteris paribus, this value of the coefficient equals a premium of 4% on firm value. The size of the premium is in line with previous research of Allayannis and Weston [Allayannis/Weston 2001] and others, who have found hedging to create a value premium of 3.6%-14%, while in some cases its size reaches 16% or 26% in firms with excessive exposure to risks[13].

In addition, most of the control variables do have the expected sign and many of them are statistically significant. The sales from operation abroad as a proxy for geographical diversification are positively related to Q though without significance, the logarithm of total assets as indication of size has a negative sign as in Lang and Stulz [Lang/Stulz, 1994] also without significance, while more profitable firms appear to have higher Q as expected. The capital expenditures as percentage of total sales show significance with respect to Q but have the opposite of the expected sign, as the market seems to value less firms with high capital expenditures and investment opportunities contrary to what the theory predicts**,** while the activation in many business segments leads to significantly lower firm value, in line with most previous research. Firms with more leverage have lower value, whereas firms that paid a dividend have significantly higher Q, fact that can be anticipated as a signal on behalf of firm management of constant future profitability[14]. Meanwhile, both the research and development expenses and the advertising expenses are positively related to Q, the former ones are significant at the level of 1%, as that significant but with a negative sign are the year dummies.

In the subsample of firms with foreign exchange exposure the coefficient of the foreign exchange derivatives dummy takes the value of 0.083, which even though it is not statistically significant, is within the expected range and verifies the positive relationship between hedging and firm value. The parameters of the control variables

[13] Carter et al (2004a) and Lookman (2003).
[14] The results do not support the interpretation of the dividend dummy as indication of the ability of firm to access the financial markets, which in that case should be negatively related to firm value Q.

remain almost the same and the coefficient of determination (R-squared) is maintained at high levels. Under the next column of firms with interest rate exposure the significant effect of the usage of interest rate derivatives on firm value is confirmed, as the coefficient of the corresponding hedge dummy reaches 0.061 or 6.1% premium on firm value, significant at the level of 5%. As far as the control variables are concerned, the only change worth mentioning is the sign of the proxy for size that is now positively and significantly related to Q.

The previous analysis is repeated in Panel B of the same table, with only difference the proxy for firm value, which is now given by the logarithm of the alternative estimation of Tobin's Q, Q1 (equal to the ratio of market to book value of equity)[15]. In the whole sample the hedge coefficient is positive, significant at 5% and equals 0.092, while from the viewpoint of the control variables the negative relationship between size and firm value and the positive relationship between profitability and firm value are strengthened (statistical significance of 10%). The coefficient of the foreign exchange derivatives dummy in firms with relative exposure is significantly different from zero at the level of 1% and amounts 0.363, value which is among the largest ever observed in studies of this kind that use the fixed effects methodology. An increase of that magnitude in firm value cannot be attributed exclusively to the use of derivatives, even in firms with excessive exposure to risks and on that account it is treated with reservations. In firms with exposure to interest rate risk the hedge dummy coefficient takes the value of -0.094, i.e. a discount in firm value due to hedging with derivatives, outcome that contradicts the results of most previous studies, however without any sign of significance.

Finally, in order to determine whether the change in the estimation of firm value also alters the nature of the impact of hedging on firm value, the same regression as before is run with dependent variable the ratio of market value of equity to total sales this time. (alternative Q2). The outcome of the estimation is displayed in Panel C of Table 7, the hedge coefficient in the full sample takes the value of 0.117, which is within the acceptable range but not significant, while the foreign currency derivatives usage dummy coefficient in firms with relative exposure remains highly significant at the level of 1% and almost as extreme as before, with a value of 0.339.

[15] The ratio of market to book value of equity –as also the variable Tobin's Q- reflects not only firm value but also the growth options of the firm, as these have been incorporated in stock price. The same holds for the ratio of market value of equity to total sales, variable that will be used immediately after.

In firms with interest rate exposure the use of interest rate derivatives has a positive but not significant impact on firm value- the size of the coefficient is 0.155-, the coefficients of the control variables hold almost the same, whereas the year dummies are significant, as in all previous cases.

D. Sensitivity analysis.

In order to uphold the robustness of the initial results with respect to the impact of hedging on firm value -as given by the main proxy Tobin's Q-, a sensitivity analysis is conducted that comprises three different tests. These are:

i) Elimination of outliers.

According to the first of it control takes place for the potential impact of outliers by censoring the values of the dependent variable Tobin's Q and by repeating the initial regression. The very distant from the mean values of Q are removed from the sample, and as a consequence the firm-years observations in the full sample are reduced to 238, in the sample of firms with foreign exposure to 176 and in the sample of firms with interest rate exposure to 219, thus the panel of the data ceases to be balanced in all three cases. The main target of this method is to reduce the "noise" in the data and to improve the fit of the regression so as to better explain the relationship between hedging and firm value and as Table 8 displays, this technique leads to the strengthening of the results.

Derivatives usage leads to significantly higher firm value for firms in the full sample -5% premium significant at the level of 1%- while premium of almost equal size (5.1%) and significance (level of 5%) is created in firms with exposure to interest rates through the use of derivatives suitable for hedging this type of risk. Firms with exposure to foreign exchange risk that use derivatives for hedging are rewarded even more by the market with a premium of 12% on firm value, highly significant at the level of 1%. These results are truly more qualitative and support the existence of a positive and significant relation between hedging and firm value. No striking changes are observed in the coefficients of the control variables, with the exception of the profitability dummy coefficient whose sign fluctuates and is not significant and of the capital expenditures that are strongly negatively related to firm value, contrary to expectations. The research and development expenses have a positive relation with

firm value, the year dummies are significant as always and the fit of the regression is preserved in really high levels (R-squared between 0.886 and 0.914).

ii) Treatment of potential collinearity with the use of alternative control variable.

The existence of high correlation between two variables of a model because the one can be expressed as a function of the other is a commonly addressed problem in econometric studies of this kind, which may introduce some noise and may lead to inconsistent results. In the case of the current regression the total assets of the firm are used in the estimation method of the dependent variable Tobin's Q, as well as a proxy for size, in order to control for its effect on the value of the firm (control variable in the form of logarithm). In an attempt to eliminate the probability of any amount of influence on that account on the parameters of the investigated relationship between hedging and firm value, the initial analysis is repeated with the logarithm of total sales in the position of total assets to control for the effect of size and the results are displayed in Table 9.

In comparison with the results of the initial regression as presented in Panel A of Table 7, this test does not produce any major quantitative, but mainly a few qualitative changes. The hedge dummy coefficient in the full sample increases from 0.04 to 0.05 and preserves its significance at the level of 1%, while the respective coefficient in firms with foreign exchange exposure remains almost the same – 0.083 in previous test, 0.0087 in this one- but becomes significant at the level of 10%. As far as the usage of interest rate derivatives in firms with relative exposure is concerned a differentiation takes place, as the dummy coefficient increases to 0.093 from 0.061 at the beginning and becomes significant at 1%, contrary to a weaker significance of 5% in the initial regression. The coefficient of the size proxy (log of total sales) becomes strictly positive in all samples and highly significant (at the level of 1% and 5%) and its value lies within the range 0.126-0.167, however the other control variables display no substantial change. The coefficient of determination R^2 keeps taking really high prices.

iii) Control for the potential existence of managerial motives.

The last dimension of the sensitivity analysis is related to the potential influence that managerial motives concurrently have on the hedging decision and on firm performance, which may be powerful enough to alter the observed relationship between derivatives usage and firm value. An extensive part of the corporate hedging theory is attributed to the agency costs that arise due to the conflict between managers and shareholders and to how derivatives can help minimize this cost of the company. A limited number of researchers, among those who have dealt with derivatives usage, argue that the impact of hedging on firm value is caused by the fact that it is a noisy proxy for other factors that have an effect on firm value and which have not been previously considered in the analysis and they support that managerial motives are one of such factors[16]. Controlling for these motives leads to a severe loss of up to 70% of the magnitude and of the statistical significance of the hedging premium on firm value.

Moreover, other researchers such as Hagelin et al. (2004) examine the possession on behalf of management of stock options and how this common practice affects their hedging strategy. They conclude that when derivatives usage is performed according to the dictates of theory (to reduce the underinvestment costs, taxes, costs of financial distress, etc.) it leads to higher firm value, whereas when it is performed in order to reduce the price sensitivity (delta) of the stock options held by the management team, then it leads to a significant discount in firm value.

As a proxy for managerial motives the CEO dummy is used, which takes the value of one if the CEO is the largest shareholder or belongs to the family who is the controlling shareholder of the firm and zero otherwise and is used as an additional control variable to the basic regression, in accordance with Hagelin et al. (2004)[17]. When the CEO is the largest shareholder, he has two different options: he can either fall into line with the rest of the shareholders and seek to maximize the firm value by choosing the optimal hedging strategy, or he can hedge his personal excessive exposure that stems from the ownership of the firm, policy that will lead to a non-efficient and expensive corporate hedging strategy (total hedge even of secondary risks, at very high cost).

[16] Lookman (2003).

[17] Lack of detailed data concerning the stock option program of firms does not allow usage of more sophisticated variables such as the sensitivity parameters of the stock options (greeks), as proxies for managerial motives.

The results are displayed in Table 10, however conclusions can be extracted only for the full sample and for the subsample of firms with exposure to interest rate risk. The econometric software cannot produce results for the sample of firms with foreign exchange exposure, due to perfect collinearity. The coefficient of the hedge dummy in the full sample remains positive and as significant as in the initial regression at the level of 1% (Table 7, Panel A) and not only is it not weakened, but its magnitude increases slightly from 0.04 to 0.046. In firms with interest rate exposure hedging appears to create ceteris paribus a premium of 5.6% on firm value, significant at the level of 10%, contrary to a premium of 6.1% on firm value, of 5% significance in the initial regression.

In both samples the differentiation in the impact of derivatives usage on firm value after controlling for managerial motives is much smaller compared to previous studies and the hypothesis that hedging is a 'noisy proxy" for other variables, for which when control takes place the positive relationship between hedging and firm value disappears is not confirmed. Meanwhile, the CEO dummy coefficient is negative and not statistically significant as in Hagelin et al. (2004), but falls short of size (-0.04 on average versus -0.17 in the corresponding survey).

E. Interpretation of the results.

Having completed the empirical analysis, a brief review leads to the following critical conclusions: a) for firms in the whole sample the hedge dummy coefficient is on average 0.046, significant at the level of 1% in all tests where Tobin's Q is used as a proxy for firm value, b) for firms with exposure to foreign exchange risk the coefficient of the foreign exchange derivatives usage dummy takes on average the value of 0.096, significant at the level of 1% and 10% and c) the interest rate derivatives usage dummy for firms with relative exposure takes on average the value of 0.065, also with significance of 1% to 10%. These results emerge from the analysis of the basic regression as well as from the sensitivity analysis that consists of three different controls as they have been previously described, always with Tobin's Q as the dependent variable.

It thus becomes obvious that the impact of hedge on firm value is more powerful in the full sample where it leads to a significant value premium of 4.6%, contrary to a weaker impact in the two subsamples. This happens as hedging in the full sample proxies the use of any kind of derivative contrary to the sample of firms

with foreign exchange risk exposure for example, where the hedge dummy represents the use of foreign exchange derivatives only. However in this case firms which are exposed to foreign exchange risk and use commodity or interest rate derivatives only, due to parallel exposure, enjoy the benefits of hedging but are considered non-hedgers of the risk under examination, fact that makes harder the identification of a significant relation between usage of derivatives and firm value.

Meanwhile, the use of the two alternative estimations of the dependent variable Q as proxies for firm value leads to weaker and somewhat different results – the hedge dummy coefficient increases in magnitude and approaches the value of 0.10 without being always statistically significant, with the exception of the foreign currency hedge dummy coefficient that takes the extreme value of 0.351 and is highly significant-, which are not totally comparable to the results when using Tobin's Q. The only previous research that provides comparable data concerning the alternative estimations of Q is the one conducted by Allayannis and Weston [Allayannis/Weston, 2001], who have found the use of foreign exchange derivatives to have caused a premium of 5.2% and 7.4% on firm value as proxied by Q1 and Q2 alternatively, significant at the level of 1% in both cases.

Back into the analysis with Tobin's Q as the dependent variable, the size of the premium which emerges is in line with many of the relative studies conducted in the past. For example, Bartram et al. (2003) find the hedge dummy coefficient in an internationalized sample to take the value of 0.09 significant at 10% and in particular the interest rate derivatives usage to have a significant impact of 13% on firm value, significant at 1%. Carter et al. (2004a) in a sample of firms with high exposure to fuel prices find the coefficient of the relative derivatives dummy to be highly significant and to vary between 0.12 and 0.16, while Hagelin et al. (2004) estimate the premium on firm value from the use of foreign exchange derivatives to be 17.2%, which reduces to 7.9% after controlling for managerial motives and becomes insignificant. Allayannis et al. (2003) find a premium of 14.5% in firms with foreign exchange exposure which declines to 9% after censoring the data for outliers, whereas as a basis for comparison stand the conclusions of Allayannis and Weston [Allayannis/Weston, 2001], who have found hedging to create a value premium of 4.8% on average, after a series of tests.

The differences in the size of the premium observed are attributed to the totally different samples under investigation, as well as to the alternative econometric

methods undertaken. Nevertheless, it is highly satisfactory that the impact on firm value that this paper reveals -4.6% on average in the full sample of firms- is within the accepted range and very close to the corresponding premium of Allayannis and Weston [Allayannis/Weston, 2001], whose methodology the current analysis follows, and is adequately significant on an econometric basis. On the other hand, as potential weaknesses of the current analysis could be perceived the limited time horizon of the research and the inability to control for other factors examined in previous studies that might influence both hedging and firm value, such as the effectiveness of the management, the agency costs between managers and stockholders and the degree of financial constraint of the firm.

From the viewpoint of the origin of the revealed hedging premium on firm value, it is based on the main motives the hedging theory suggests and on previous studies that have managed to quantify the effects of these motives. In particular, Carter et al. (2004a) argue that at least 52% of the impact of hedging on firm value they have revealed stems from its capacity to constrain the underinvestment problem and to protect the ability of firms to implement their investment program, even in adverse financial conditions. Graham and Rogers [Graham/Rogers, 2002] estimate the usage of derivatives to increase the mean leverage of firms by 3.03%, which creates tax benefits from the additional debt equal to 1.1%-2.1% of the market value of firm's assets and contributes to an equivalent rise in firm value. Allayannis and Weston [Allayannis/Weston, 2001] consider the costs of financial distress for a firm approaching such a situation to be 0.02% of its value and due to hedging default can be avoided, increasing the firm value by the same amount. Last, with respect to the cash flow volatility, Allayannis et al. (2005) confirm that the market evaluates higher firms with smooth and easily predictable cashflows. Since a basic motive for hedging corporate risks is the reduction in cash flow volatility which has a severe cost for firms (an increase in cash flow volatility by one standard deviation leads to an aggregate reduction in firm value by 30%-37%), it is this the exact mechanism through with hedging contributes to the maximization of firm value, according to the authors.

VI. Conclusions.

This research aims to provide an answer to the question of whether using derivatives for hedging corporate risks is a value adding corporate activity. Built on the most widely accepted model for estimating the hedge effect on firm value, the empirical analysis is adjusted to the domestic financial environment, while embodying the latest evidence from related studies concerning factors that influence the hedging activity.

The outcome of the analysis is supportive of a positive and statistically significant relationship between hedging with derivatives and firm value for firms with exposure to financial risks, which is confirmed after a series of controls. It is interpreted as evidence that when hedging is rationally performed it leads to higher firm value. There is no evidence in favour of the hypothesis that managers engage in hedging for their own benefit as in this case firm value would decrease, or that hedging is a "noisy proxy" for omitted variables that are correlated with firm value.

Considerable contribution of this research is that it verifies the positive value effect of derivatives in a sample of firms that are much smaller, less internationalized, less sophisticated and familiar with the global financial industry, contrary to the sample of most previous studies. However, it is revealed that even in a small, regional market as the native one, hedging with derivatives may strengthen the growth options of the firm and contribute value to it, as well as that there are certain factors and corporate properties that necessitate hedging, irrespective of the environment of activation.

Table 1.A.
Summary statistics

This table presents the summary statistics of all variables for the years 2004-2006. Panel A includes 81 firms (whole sample) with a total of 243 firm-year observations, Panel B includes the 60 firms of the sample with exposure to Foreign Exchange risk and has 180 firm-year observations, while Panel C includes the 74 firms of the sample with exposure to the interest rate risk and thus 222 firm-year observations emerge. Definitions of the variables are presented in Table 2.

	No. Obs	Mean	Std. Dev.	Median	Min.	Max.
Panel A: Full Sample						
Total Assets (millions Euro)	243	923.975	1960.37	330.939	31.658	12938.08
Total Sales (millions Euro)	243	726.872	1265.33	281.115	100.669	8121.49
Foreign Exposure dummy	243	0.786	0.411	1.00	0.00	1.00
Tot. Debt/ BVEquity	243	1.540	3.592	0.895	0.00	51.41
Foreign Sales/ Tot. Sales	243	0.218	0.274	0.083	0.00	0.96
MVEquity (millions Euro)	243	763.865	1710.56	189.528	14.905	11155.81
Interest Rate Exposure	243	0.946	0.225	1.00	0.00	1.00
HEDGE dummy	243	0.444	0.498	0.00	0.00	1.00
FCD dummy	243	0.341	0.475	0.00	0.00	1.00
IRD dummy	243	0.279	0.449	0.00	0.00	1.00
Tobin's Q	243	1.447	1.070	1.122	0.435	10.19
AltQ1: MVEquity/BVEquity	243	0.821	1.103	0.509	0.065	9.730
AltQ2: MVEquity/ Total Sales	243	0.878	0.735	0.620	0.067	3.656
Control Variables						
Return on Assets	243	0.057	0.082	0.036	0.00	0.628
Cap. Expenditures/ Tot. Sales	243	0.092	0.143	0.050	0.001	1.027
Leverage: Long Debt/ BVEquity	243	1.115	5.530	0.469	0.00	74.09
R&D/ Tot.Assets	243	0.00	0.003	0.00	0.00	0.024
Dividend dummy	243	0.761	0.427	1.00	0.00	1.00
Industry diversif. Dummy	243	0.345	0.476	0.00	0.00	1.00
Advertising/ Tot. Sales	243	0.007	0.0199	0.00	0.00	0.111

Table 1.A. (continued)	No. Obs	Mean	Std. Dev.	Median	Min.	Max.
Panel B: Firms with Foreign Exchange exposure						
Total Assets (millions Euro)	180	917.283	1703.39	331.028	91.458	12548.60
Total Sales (millions Euro)	180	812.580	1361.34	309.192	100.669	8121.49
Foreign Sales/ Tot.Sales	180	0.268	0.281	0.138	0.00	0.96
MVEquity (millions Euro)	180	889.073	1892.46	220.773	14.905	11155.81
HEDGE dummy	180	0.477	0.500	0.00	0.00	1.00
FCD dummy	180	0.388	0.488	0.00	0.00	1.00
IRD dummy	180	0.283	0.451	0.00	0.00	1.00
Tobin's Q	180	1.529	1.191	1.164	0.435	10.19
AltQ1: MVEquity/BVEquity	180	0.901	1.212	0.563	0.072	9.730
AltQ2: MVEquity/ Total Sales	180	0.892	0.704	0.662	0.067	3.656
Panel C: Firms with Interest Rate exposure						
Total Assets (millions Euro)	222	969.837	2043.06	331.737	31.658	12938.08
Total Sales (millions Euro)	222	720.145	1265.28	279.004	100.669	8121.49
Foreign Sales/ Tot.Sales	222	0.229	0.274	0.097	0.00	0.96
MVEquity (millions Euro)	222	699.189	1539.40	180.735	14.905	11155.81
HEDGE dummy	222	0.450	0.498	0.00	0.00	1.00
FCD dummy	222	0.346	0.477	0.00	0.00	1.00
IRD dummy	222	0.297	0.458	0.00	0.00	1.00
Tobin's Q	222	1.322	0.604	1.106	0.646	4.121
AltQ1: MVEquity/BVEquity	222	0.681	0.634	0.494	0.065	3.314
AltQ2: MVEquity/ Total Sales	222	0.845	0.737	0.575	0.067	3.656

Table 1.B.
Summary statistics

This table presents the summary statistics of all variables for the years 2004-2006. Panel A describes firms that use derivatives for hedging their risks with a total of 108 firm-year observations. Firms that do not use derivatives for hedging are included in Panel B, where 135 firm-year observations emerge. Definitions of the variables are presented in Table 2.

	No. Obs	Mean	Std. Dev.	Median	Min.	Max.
Panel A: Hedgers (full sample)						
Total Assets (millions Euro)	108	1564.16	2779.14	481.385	82.198	12938.09
Total Sales (millions Euro)	108	1073.04	1645.53	372.263	104.442	8121.49
Foreign Exposure dummy	108	0.833	0.374	1.00	0.00	1.00
Foreign Sales/ Tot. Sales	108	0.307	0.276	0.241	0.00	0.884
MVEquity (millions Euro)	108	1180.39	2068.82	296.521	25.831	11155.81
Tot. Debt/ BVEquity	108	1.143	1.011	0.927	0.00	6.861
Interest Rate Exposure	108	0.963	0.189	1.00	0.00	1.00
FCD dummy	108	0.768	0.423	1.00	0.00	1.00
IRD dummy	108	0.629	0.485	1.00	0.00	1.00
Tobin's Q	108	1.406	0.672	1.164	0.435	3.387
AltQ1: MVEquity/BVEquity	108	0.794	0.665	0.515	0.129	2.91
AltQ2: MVEquity/ Total Sales	108	1.030	0.784	0.830	0.147	3.656
Control Variables						
Return on Assets	108	0.058	0.053	0.044	0.00	0.24
Cap. Expenditures/ Tot. Sales	108	0.116	0.178	0.060	0.001	1.027
Leverage: Long Debt/ BVEquity	108	0.766	0.796	0.653	0.00	4.81
R&D/ Tot.Assets	108	0.00	0.003	0.00	0.00	0.022
Dividend dummy	108	0.88	0.327	1.00	0.00	1.00
Industry diversif. Dummy	108	0.370	0.485	0.00	0.00	1.00
Advertising/ Tot. Sales	108	0.003	0.008	0.00	0.00	0.048

Table 1.B. (continued)	No. Obs	Mean	Std. Dev.	Median	Min.	Max.
Panel B: Non-hedgers (full sample)						
Total Assets (millions Euro)	135	411.822	422.446	282.873	31.658	2544.25
Total Sales (millions Euro)	135	449.934	745.283	223.184	100.669	4633.43
Foreign Exposure dummy	135	0.748	0.435	1.00	0.00	1.00
Foreign Sales/ Tot. Sales	135	0.147	0.250	0.019	0.00	0.96
MVEquity (millions Euro)	135	430.642	1270.81	120.574	14.905	9340.32
Tot. Debt/ BVEquity	135	1.858	4.718	0.868	0.00	51.41
Interest Rate Exposure	135	0.933	0.250	1.00	0.00	1.00
Tobin's Q	135	1.480	1.306	1.097	0.646	10.19
AltQ1: MVEquity/BVEquity	135	0.841	1.357	0.501	0.065	9.73
AltQ2: MVEquity/ Total Sales	135	0.755	0.672	0.507	0.067	3.097
Control Variables						
Return on Assets	135	0.056	0.099	0.029	0.00	0.628
Cap. Expenditures/ Tot. Sales	135	0.073	0.103	0.041	0.001	0.628
Leverage: Long Debt/ BVEquity	135	1.152	6.369	0.358	0.00	74.09
R&D/ Tot.Assets	135	0.00	0.003	0.00	0.00	0.024
Dividend dummy	135	0.666	0.473	1.00	0.00	1.00
Industry diversif. Dummy	135	0.326	0.470	0.00	0.00	1.00
Advertising/ Tot. Sales	135	0.011	0.025	0.00	0.00	0.111

Table 2

List of Variables

This table presents the definitions of the variables used in this article.

Total Assets (TAss)	Book value of total assets in millions Euro
Total Sales (Tsal)	Book value of total sales in millions Euro
Foreign exposure dummy (FX exposure)	Equals one if the firm reports any foreign assets, income or sales and zero otherwise
Foreign Sales/ Tot.Sales (FSTS)	Sales from operation abroad divided by the book value of total sales (as an indication of the geographical diversification of the firm)
Market Value of Equity (MVE)	Number of oustanding common equities multiplied by the market price of equity on 31/12 each year, in millions Euro
Interest Rate Exposure dummy (IR expo)	Equals one if the firm reports any debt in fluctuating interest rate and zero otherwise
Total Debt/ BVEquity (TD/BVE)	Amount of total debt divided by the book value of common equity
Hedge dummy (HDG)	Equals one if the firm reports hedging it's risks through the use of any kind of derivative with underlying value foreign currencies, interest rates or commodities and zero otherwise
Foreign Currency Derivatives dummy (FCD dummy)	Equals one if the firm reports hedging it's risks through the use of any kind of derivative with underlying value foreign currencies and zero otherwise
Interest Rates Derivatives dummy (IRD dummy)	Equals one if the firm reports hedging it's risks through the use of any kind of derivative with underlying value interest rates and zero otherwise
Tobin's Q	Book value of total assets minus book value of equity plus market value of common equity all divided by book value of total assets
AltQ1: MVE/BVE	Market value of common equity divided by the book value of common equity
AltQ2: MVE/ Total Sales	Market value of common equity divided by the book value of total sales
Return On Assets (ROA)	Annual net income after taxes divided by the book value of total assets
Capital Expenditures/ Tot. Sales (CXTS)	Ratio of expenditures on new capital to total sales
Leverage: Long Debt/ BVEquity (LDBE)	Amount of long term debt divided by the book value of common equity
R&D/ Tot.Assets (RDTAS)	Research and Development expenditures scaled by the book value of total assets
Dividend dummy (DIV)	Equals one if the firm paid dividend that year and zero otherwise
Industry Diversification dummy (IND)	Equals one if the firm is active in more than one business segment and zero otherwise

Advertising/ Tot. Sales (ADSA)	Ratio of advertising expenditures to total sales
CEO dummy (CEO)	Equals one if the manager is the controling (largest) shareholder or comes from the family who is the largest shareholder and zero otherwise
Y1 (year) dummy	Equals one if the firm data concern fiscal year 2004 and zero otherwise
Y2 (year) dummy	Equals one if the firm data concern fiscal year 2005 and zero otherwise
Y3 (year) dummy	Equals one if the firm data concern fiscal year 2006 and zero otherwise
Industry dummy I1	Equals one if the firm is activated in the Oil and Gas Industry (ICB 0500) and zero otherwise
Industry dummy I2	Equals one if the firm is activated in the Chemicals Industry (ICB 1300) and zero otherwise
Industry dummy I3	Equals one if the firm is activated in the Raw Materials Industry (ICB 1700) and zero otherwise
Industry dummy I4	Equals one if the firm is activated in the Construction and Construction Materials Industry (ICB 2300) and zero otherwise
Industry dummy I5	Equals one if the firm is activated in the Manufacturing Products and Services Industry (ICB 2700) and zero otherwise
Industry dummy I6	Equals one if the firm is activated in the Food and Beverages Industry (ICB 3500) and zero otherwise
Industry dummy I7	Equals one if the firm is activated in the Personal and House Products Industry (ICB 3700) and zero otherwise
Industry dummy I8	Equals one if the firm is activated in the Health Services Sector (ICB 4500) and zero otherwise
Industry dummy I9	Equals one if the firm is activated in the Trade Sector (ICB 5300) and zero otherwise
Industry dummy I10	Equals one if the firm is activated in the Media and Publishing Sector (ICB 5500) and zero otherwise
Industry dummy I11	Equals one if the firm is activated in the Travel and Leisure Industry (ICB 5700) and zero otherwise
Industry dummy I12	Equals one if the firm is activated in the Telecommunication Industry (ICB 6500) and zero otherwise
Industry dummy I13	Equals one if the firm is activated in the Utilities Sector (ICB 7500) and zero otherwise
Industry dummy I14	Equals one if the firm is activated in the Technology Industry (ICB 9500) and zero otherwise

Table 3
Firms' Hedging over time

This Table presents the alteration in the number of firms that use derivatives across the years 2004-2006. Firms are distinguished on whether they have exposure to foreign exchange risk and to interest rate risk. The definitions of the variables are presented in Table 2.

Years	**2004**	**2005**	**2006**	**Total**
Full Sample				
Number of firms	81	81	81	243
Hedgers	34	36	38	108
%	41.98%	44.44%	46.91%	44.44%
Firms with FX exposure				
No of firms	60	60	60	180
FX hedgers	23	23	24	70
%	38.33%	38.33%	40.00%	38.89%
Firms with IR exposure				
No of firms	74	74	74	222
IR hedgers	21	22	23	66
%	28.38%	29.73%	31.08%	29.73%

Table 4
Comparison of hedgers and non-hedgers

This table presents the comparison in the mean and median values of certain variables between hedgers and non-hedgers, not only in the full sample (Panel A) but also in the sample of firms with exposure to foreign exchange risk (Panel B) and with exposure to interest rate risk (Panel C). Results were produced by using the econometric software Eviews, Edition 5, which follows the t-statistic methodology for the comparison of means and the Wilcoxon/ Mann-Whitney one for the comparison of medians and gives the corresponding p-values in each case. The definitions of the variables are presented in Table 2.

Panel A: hedgers versus non-hedgers, Full Sample

Variable	(1) Hedgers (108 obs)	(2) Non-hedgers (135 obs)	(3)= (1)-(2) Difference	tstat /(mean), Wilcoxon/ (median)	(p- value)
Tobin's Q (mean)	1.406	1.480	- 0.074	0.538	0.590
Tobin's Q (median)	1.164	1.097	0.067	1.167	0.243
Alt Q1: MVE/BVE (mean)	0.794	0.841	- 0.047	0.326	0.744
Alt Q1: MVE/BVE (med.)	0.515	0.501	0.014	2.094	0.03
Alt Q2:MVE/TSAL (mean)	1.030	0.755	0.275	2.94	0.003
Alt Q2:MVE/TSAL (med.)	0.830	0.507	0.323	3.424	0.000
Tot.Assets /millions Euro (mean)	1564.16	411.822	1152.34	4.751	0.000
Tot.Assets /millions Euro (median)	481.385	282.873	198.512	5.497	0.000

Panel B: For. Currency Derivatives users versus non-users among firms with FX exposure

Variable	(1) Hedgers (70 obs)	(2) Non-hedgers (110 obs)	(3)= (1)-(2) Difference	tstat / (mean), Wilcoxon/ (median)	(p.value)
Tobin's Q (mean)	1.481	1.560	- 0.079	0.434	0.664
Tobin's Q (median)	1.178	1.139	0.039	1.119	0.263
Alt Q1: MVE/BVE (mean)	0.885	0.912	- 0.027	0.141	0.887
Alt Q1: MVE/BVE (med.)	0.599	0.553	0.046	1.861	0.062
Alt Q2:MVE/TSAL (mean)	1.012	0.815	0.197	1.834	0.068
Alt Q2:MVE/TSAL (med.)	0.796	0.575	0.221	2.271	0.023
Tot.Assets /millions Euro (mean)	1047.23	834.587	212.646	0.815	0.415
Tot.Assets /millions Euro (median)	535.851	287.345	248.506	3.816	0.000

Panel C: Interest Rate Derivatives users versus non-users among firms with IR exposure

Variable	(1) Hedgers (66 obs)	(2) Non-hedgers (156 obs)	(3)= (1)-(2) Difference	tstat /(mean), Wilcoxon/ (median)	(p.value)
Tobin's Q (mean)	1.386	1.295	0.091	1.019	0.308
Tobin's Q (median)	1.117	1.099	0.018	0.587	0.556
Alt Q1: MVE/BVE (mean)	0.746	0.654	0.092	0.986	0.324
Alt Q1: MVE/BVE (med.)	0.473	0.506	- 0.033	0.828	0.407
Alt Q2:MVE/TSAL (mean)	1.091	0.742	0.349	3.296	0.001
Alt Q2:MVE/TSAL (med.)	0.853	0.504	0.349	3.104	0.001
Tot.Assets /millions Euro (mean)	2086.98	497.200	1589.78	5.658	0.000
Tot.Assets /millions Euro (median)	680.031	294.700	385.331	5.709	0.000

Table 5
Breusch-Pagan test

Dependent Variable: LOG(?Q)
Method: Pooled Least Squares
Sample: 2004 2006
Included observations: 3
Cross-sections included: 81
Total pool (balanced) observations: 243

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.090880	0.290479	-0.312862	0.7547
?HDG	0.030279	0.050552	0.598972	0.5498
?FSTS	-0.059516	0.087868	-0.677341	0.4989
LOG(?TAS)	0.006817	0.023284	0.292778	0.7700
?ROA	3.266956	0.285909	11.42658	0.0000
?CXTS	-0.008454	0.158808	-0.053232	0.9576
?IND	-0.022002	0.047413	-0.464050	0.6430
?LDBE	0.002106	0.004652	0.452825	0.6511
?DIV	0.039540	0.056428	0.700725	0.4842
?ADSA	2.890799	1.126063	2.567172	0.0109
?RDTAS	15.63335	6.965299	2.244462	0.0257

R-squared	0.433893	F-statistic	17.78162
Adjusted R-squared	0.409491	Prob(F-statistic)	0.000000
Sum squared resid	26.48374	Durbin-Watson stat	0.816003

The test is performed by running the above regression with the logarithm of Tobin's Q as the dependent variable and the LM value is calculated by following the type

$$LM = \frac{NT}{2(T-1)}\left(\frac{S_1}{S_2}-1\right)^2 \sim \chi_1^2, \qquad \text{where } S_1 = \sum_{i=1}^{N}\left(\sum_{t=1}^{T}\hat{u}_{it}\right)^2 \text{ and } S_2 = \sum_{i=1}^{N}\sum_{t=1}^{T}\hat{u}_{it}^2,$$

N the number of cross sections (firms) and *T* the number of years.

Under the null hypothesis the LM statistic is asymptotically distributed as χ_1^2. The 5% critical value from χ_1^2 is 3.841. Since the estimated LM value in the test is 54.33 and is larger than the critical value, the null hypothesis that $\sigma_\alpha^2 = 0$ is rejected at the 5% level. As a consequence the random effects model is preferred versus the ordinary least square method.

This test was performed by the use of the econometric software Eviews, Edition 5.

Table 6

Hausman test

Hausman test (fixed versus random effects)	
Chi-Square (10d.f.)	67.581

The Hausman test statistic is given by the type

$$m = \hat{\mathbf{q}}' \left[\hat{\mathbf{V}}(\hat{\mathbf{q}}) \right]^{-1} \hat{\mathbf{q}} \square \chi^2_{\mathbf{k}},$$

where $\hat{\mathbf{q}} = \hat{\beta}_{\mathbf{FE}} - \hat{\beta}_{\mathbf{RE}}$, $\hat{\mathbf{V}}(\hat{\mathbf{q}}) = \hat{\mathbf{V}}\left(\hat{\beta}_{\mathbf{FE}}\right) - \hat{\mathbf{V}}\left(\hat{\beta}_{\mathbf{RE}}\right)$ and *k* the degrees of freedom (their number is equal to the number of the independent variables of the regression).

Under the null hypothesis the test statistic *m* is asymptotically distributed as χ^2_{10} . The resulting Hausman test statistic is *m* = 67.58 and is much higher than the 5% critical value from χ^2_{10} which is equal to 27.68. On that account the null hypothesis of random and not fixed effects in the residuals is rejected and the appropriate model to use is the fixed effects model.

This test was performed by the use of the econometric software Eviews, Edition 5.

Table 7

Effect of Derivatives use on firm value: regression results

This table presents the results for fixed-effects regressions on the use of derivatives on firm value. In panel A the dependent variable is the logarithm of Tobin's Q, while in Panel B and C the dependent variable is the logarithm of the alternative Q1 (defined as the ratio of Market to Book value of Equity) and of the alternative Q2 (defined as the ratio of Market Value of Equity to Total sales) respectively. Under the column of all firms are the results of the regression in the whole sample (81 firms), under the one of firms with FX exposure are the results of the regression in firms with foreign assets, sales or income (60 firms) and under the column of firms with IR exposure are the results of the regression in firms with fluctuating debt (74 firms). C stands for the constant, HDG stands for the derivatives usage dummy, FCD stands for Foreign Currency Derivatives Usage Dummy, IRD stands for Interest Rate Derivatives Usage dummy, FSTS stands for the ratio of foreign sales to total sales, LOG(TAS) stands for the natural logarithm of total assets, ROA stands for return on assets, CXTS stands for capital expenditures to total sales, IND stands for industry diversification dummy, LDBE stands for the ratio of long term debt to Book value of Equity, DIV stands for the dividend dummy, ADSA stands for the ratio of advertising expenses to total sales, RDTAS stands for research and development expenses to total assets, Y1 and Y2 stands for year dummies of 2004 and 2005 respectively.***,**,* denote significance at the 1%, 5% and 10% respectively. T-statistics are based on White standard errors. The definitions of the variables are presented in Table 2. The estimations were conducted by using the Eviews econometric software.

Panel A. Dependent Variable: ln (Tobin's Q)

Dependent Variable: ln (Tobin's Q)	All firms	Firms with FX exposure	Firms with IR exposure
C	0.433	1.131**	-0.940***
	(1.161)	(2.046)	(-4.524)
HDG	0.040***		
	(29.845)		
FCD		0.083	
		(1.368)	
IRD			0.061**
			(2.156)
FSTS	0.065	0.057	0.113
	(1.192)	(1.419)	(1.303)
LOG(TAS)	-0.015	-0.069	0.086***
	(-0.504)	(-1.609)	(5.098)
ROA	0.124	-0.015	-0.003
	(0.375)	(-0.042)	(-0.015)
CXTS	-0.163**	-0.278*	-0.407***
	(-2.296)	(-1.671)	(-3.683)
IND	-0.087***	-0.030**	-0.081***
	(-7.028)	(-2.019)	(-3.195)
LDBE	-0.002	-0.003	-0.003
	(-0.748)	(-0.910)	(-0.944)
DIV	0.048**	0.112***	0.059**
	(2.130)	(3.341)	(2.113)
ADSA	5.709***	4.757***	6.628***
	(4.261)	(4.767)	(4.099)
RDTAS	4.098	-0.204	7.004
	(0.872)	(-0.036)	(1.285)
Y1	-0.131***	-0.174***	-0.087***
	(-60.568)	(-21.583)	(-43.365)

Y2	-0.067*** (-22.341)	-0.084*** (-10.739)	-0.054*** (-17.509)
No. Observations	243	180	222
R^2	0.895	0.921	0.875

Panel B. Dependent Variable: ln (altern.Q1= MVE/BVE)

Dependent Variable: ln (altern.Q1= MVE/BVE)	All firms	Firms with FX exposure	Firms with IR exposure
C	2.026 (1.574)	2.471*** (2.699)	0.647 (0.570)
HDG	0.092** (2.197)		
FCD		0.363*** (18.322)	
IRD			-0.094 (-1.312)
FSTS	-0.225 (-1.123)	0.019 (0.117)	-0.139 (-0.680)
LOG(TAS)	-0.203* (-1.893)	-0.261*** (-3.218)	-0.097 (-1.028)
ROA	1.761* (1.839)	1.527* (1.716)	1.592** (1.998)
CXTS	-0.172 (-1.125)	-0.531 (-1.298)	-0.484*** (-7.547)
IND	-0.195*** (-3.279)	0.193*** (4.453)	-0.159*** (-2.644)
LDBE	-0.009 (-0.867)	-0.010 (-0.992)	-0.010 (-0.938)
DIV	0.132* (1.923)	0.307*** (3.909)	0.151** (2.267)
ADSA	9.893*** (3.398)	10.805** (2.590)	10.729*** (3.895)
RDTAS	-3.213 (-0.155)	-6.054 (-0.270)	-0.665 (-0.030)
Y1	-0.413*** (-49.367)	-0.428*** (-30.528)	-0.376*** (-31.026)
Y2	-0.206*** (-17.871)	-0.174*** (-7.851)	-0.202*** (-17.371)
No. Observations	243	180	222
R^2	0.910	0.905	0.896

Panel C. Dependent Variable: ln (altern.Q2= MVE/TSALES)

Dependent Variable: ln (altern.Q2= MVE/TSALES)	All firms	Firms with FX exposure	Firms with IR exposure
C	0.597 (0.334)	0.742 (0.492)	-0.060 (-0.036)
HDG	0.117 (1.078)		
FCD		0.339*** (8.107)	
IRD			0.155 (0.855)
FSTS	-0.053 (-0.277)	0.109 (0.785)	-0.029 (-0.146)
LOG(TAS)	-0.095 (-0.639)	-0.129 (-1.027)	-0.045 (-0.331)
ROA	1.522* (1.796)	1.320 (1.588)	1.399* (1.960)
CXTS	0.107 (0.533)	-0.095 (-0.182)	-0.114 (-0.922)
IND	-0.076 (-0.830)	0.218*** (4.016)	-0.084 (-1.158)
LDBE	-0.009 (-0.808)	-0.010 (-0.948)	-0.009 (-0.854)
DIV	0.167*** (3.075)	0.349*** (6.093)	0.184*** (3.504)
ADSA	10.774*** (3.889)	11.433*** (2.727)	11.313*** (4.216)
RDTAS	7.246 (0.416)	4.231 (0.233)	7.711 0.432
Y1	-0.339*** (-46.066)	-0.349*** (-30.327)	-0.326*** (-50.914)
Y2	-0.137*** (-14.179)	-0.101*** (-5.907)	-0.143*** (-18.995)
No. Observations	243	180	222
R^2	0.906	0.886	0.909

Table 8

Effect of Derivatives use on firm value: censored regression results after removing the outliers

This table presents the results for fixed-effects regression on the use of derivatives on firm value, after the removal of outliers (with respect to Q). The dependent variable is the natural logarithm of Tobin's Q. Under the column of all firms are the results of the regression in the whole sample (238 observations), under the one of firms with FX exposure are the results of the regression in firms with foreign assets, sales or income (176 observations) and under the column of firms with IR exposure are the results of the regression in firms with fluctuating debt (219 observations). C stands for the constant, HDG stands for the derivatives usage dummy, FCD stands for Foreign Currency Derivatives Usage Dummy, IRD stands for Interest Rate Derivatives Usage dummy, FSTS stands for the ratio of foreign sales to total sales, LOG(TAS) stands for the natural logarithm of total assets, ROA stands for return on assets, CXTS stands for capital expenditures to total sales, IND stands for industry diversification dummy, LDBE stands for the ratio of long term debt to Book value of Equity, DIV stands for the dividend dummy, ADSA stands for the ratio of advertising expenses to total sales, RDTAS stands for research and development expenses to total assets, Y1 and Y2 stands for year dummies of 2004 and 2005 respectively.***,**,* denote significance at the 1%, 5% and 10% respectively. T-statistics are based on White standard errors. The definitions of the variables are presented in Table 2. The estimations were conducted by using the Eviews econometric software.

Dependent Variable: ln (Tobin's Q)	All firms	Firms with FX exposure	Firms with IR exposure
C	-0.546 (-1.618)	0.055 (0.082)	-0.636** (-2.454)
HDG	0.050*** (7.778)		
FCD		0.120*** (2.801)	
IRD			0.051** (1.995)
FSTS	0.116 (1.416)	0.142** (2.223)	0.093 (1.148)
LOG(TAS)	0.059** (2.086)	0.007 0.146	0.066*** (2.953)
ROA	0.023 0.069	-0.031 (-0.092)	-0.040 (-0.142)
CXTS	-0.505*** (-19.527)	-0.602*** (-9.595)	-0.427*** (-41.787)
IND	-0.062** (-2.331)	0.045 1.231	-0.088*** (-4.132)
LDBE	-0.003 (-0.906)	-0.003 (-1.064)	-0.003 (-0.983)
DIV	0.049* (1.719)	0.110*** (2.719)	0.059** (2.191)
ADSA	3.929*** (6.979)	4.938*** (5.469)	5.119*** (8.368)
RDTAS	5.296 0.799	2.452 (0.354)	4.922 0.795
Y1	-0.102*** (-16.942)	-0.133*** (-11.734)	-0.112*** (-22.168)

Y2	-0.077*** (-5.742)	-0.079*** (-8.105)	-0.078*** (-15.057)
No. Observations	238	176	219
R^2	0.886	0.914	0.908

Table 9

Effect of Derivatives use on firm value: regression results with sales as proxy for size

This table presents the results for fixed-effects regressions on the use of derivatives on firm value with total sales as a proxy for size. The dependent variable is the natural logarithm of Tobin's Q. Under the column of all firms are the results of the regression in the whole sample (81 firms), under the one of firms with FX exposure are the results of the regression in firms with foreign assets, sales or income (60 firms) and under the column of firms with IR exposure are the results of the regression in firms with fluctuating debt (74 firms). C stands for the constant, HDG stands for the derivatives usage dummy, FCD stands for Foreign Currency Derivatives Usage Dummy, IRD stands for Interest Rate Derivatives Usage dummy, FSTS stands for the ratio of foreign sales to total sales, LOG(TSAL) stands for the natural logarithm of total sales, ROA stands for return on assets, CXTS stands for capital expenditures to total sales, IND stands for industry diversification dummy, LDBE stands for the ratio of long term debt to Book value of Equity, DIV stands for the dividend dummy, ADSA stands for the ratio of advertising expenses to total sales, RDTAS stands for research and development expenses to total assets, Y1 and Y2 stands for year dummies of 2004 and 2005 respectively.***,**,* denote significance at the 1%, 5% and 10% respectively. T-statistics are based on White standard errors. The definitions of the variables are presented in Table 2. The estimations were conducted by using the Eviews econometric software.

Dependent Variable: ln (Tobin's Q)	All firms	Firms with FX exposure	Firms with IR exposure
C	-1.522***	-1.928***	-1.452*
	(-2.614)	(-3.189)	(-1.828)
HDG	0.050***		
	(4.734)		
FCD		0.087*	
		(1.761)	
IRD			0.093***
			(3.109)
FSTS	0.077*	0.036	0.129
	(1.888)	(0.787)	(1.509)
LOG(TSAL)	0.135***	0.167***	0.126**
	(2.897)	(3.455)	(2.012)
ROA	0.144	0.050	-0.012
	0.467	(0.150)	-0.065
CXTS	-0.221**	-0.326	-0.379***
	(-2.188)	(-1.372)	(-3.543)
IND	-0.099***	-0.097*	-0.078***
	(-26.325)	(-1.872)	(-2.953)
LDBE	-0.003	-0.003	-0.003
	(-0.813)	(-0.948)	(-0.903)
DIV	0.050**	0.101***	0.059**
	(2.031)	(3.253)	(2.057)
ADSA	6.189***	5.572***	6.741***
	(4.721)	(4.922)	(3.896)
RDTAS	6.521	3.864	7.311
	(1.310)	(0.697)	(1.413)

Y1	-0.101*** (-14.912)	-0.128*** (-17.665)	-0.076*** (-9.250)
Y2	-0.048*** (-23.109)	-0.059*** (-14.809)	-0.043*** (-8.137)
No. Observations	243	180	222
R^2	0.896	0.922	0.876

Table 10

Effect of Derivatives use on firm value after controling for managerial motives

This table presents the results for fixed-effects regressions on the use of derivatives on firm value, after controling for managerial motives. The dependent variable is the natural logarithm of Tobin's Q. Under the column of all firms are the results of the regression in the whole sample (81 firms), under the one of firms with FX exposure are the results of the regression in firms with foreign assets, sales or income (60 firms) and under the column of firms with IR exposure are the results of the regression in firms with fluctuating debt (74 firms). C stands for the constant, HDG stands for the derivatives usage dummy, FCD stands for Foreign Currency Derivatives Usage Dummy, IRD stands for Interest Rate Derivatives Usage dummy, FSTS stands for the ratio of foreign sales to total sales, LOG(TAS) stands for the natural logarithm of total assets, ROA stands for return on assets, CXTS stands for capital expenditures to total sales, IND stands for industry diversification dummy, LDBE stands for the ratio of long term debt to Book value of Equity, DIV stands for the dividend dummy, ADSA stands for the ratio of advertising expenses to total sales, RDTAS stands for research and development expenses to total assets, CEO stands for management control dummy and Y1 and Y2 stands for year dummies of 2004 and 2005 respectively.***,**,* denote significance at the 1%, 5% and 10% respectively. T-statistics are based on White standard errors. The definitions of the variables are presented in Table 2. The estimations were conducted by using the Eviews econometric software.

Dependent Variable: ln (Tobin's Q)	All firms	Firms with FX exposure	Firms with IR exposure
C	0.450		-0.975***
	(1.347)		(-6.096)
HDG	0.046***		
	(2.956)		
FCD			
IRD			0.056*
			(1.843)
FSTS	0.061		0.119
	(1.004)		(1.270)
LOG(TAS)	-0.015		0.087***
	(-0.496)		(5.107)
ROA	0.125		-0.005
	(0.379)		(-0.025)
CXTS	-0.158**		-0.417***
	(-2.020)		(-3.331)
IND	-0.093***		-0.072*
	(-3.909)		(-1.904)
LDBE	-0.002		-0.003
	(-0.748)		(-0.941)
DIV	0.048**		0.059**
	(2.155)		(2.110)
ADSA	5.731***		6.601***
	(4.108)		(3.957)
RDTAS	4.112		7.007
	(0.873)		(1.280)
CEO	-0.032		-0.046
	(-0.425)		(-0.613)

Y1	-0.131***		-0.087***
	(-41.975)		(-49.153)
Y2	-0.067***		-0.054***
	(-19.832)		(-16.690)
No. Observations	243	180	222
R^2	0.895	Near singular matrix	0.875

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