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Accounting for Employee Stock Options: What Can We Learn from the Market's Perceptions?

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Abstract

The scope of this is paper is to provide new empirical evidence on the value relevance of employee stock options (*ESO*s) in Europe. We show, empirically, that the market participants when pricing a firm's equity place approximately the same valuation weights on the *ESO*-deferred compensation expense (the so called "*ESO* asset") and the compensation option liability (the so called "*ESO* liability"). Our empirical findings support the theoretical work of Ohlson and Penman who suggest that the deferred compensation expense be treated as a contra-liability. The second contribution of our work rests on the nature of the *ESO* expense. We show that the distinction between persistent and non-persistent *ESO* expenses is of critical importance for the market participants. Accordingly, an improved accounting disclosure should assist the investors in assessing the long-term goals of the *ESO* plans at the firm level.

1. Introduction

The proper method for accounting for employee stock options (*ESO*s) is a highly debated issue with the resolution being closely related to the objective of financial reporting. The IASB board recently reaffirmed that the fundamental objective of general purpose financial reporting is "to provide financial information about the reporting entity that is useful to present and potential equity investors, lenders and other creditors in making decisions in their capacity as capital providers" (IASB Discussion paper "Preliminary Views on an improved Conceptual Framework for Financial Reporting – The Reporting Entity", May 29, 2008). Given

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this objective, the focus of the accounting should be on the reporting entity rather than on the owners of the firm suggesting that *ESO*s are better classified as equity instruments provided their settlement does not typically imply any "sacrifice" of the entity resources in the form of cash or another financial asset. Moreover, equity-settled stock options pose no credit risk to the current shareholders and hence it would be inappropriate to classify them as debt for calculating default risk.

Some researchers (see, e.g., Christensen and Feltham, 2003; Penman, 2003) observe that the desire to serve the information needs of all capital providers sacrifices the usefulness of the annual reports for the owners of the firms. Under an owner-focussed objective, *ESO*s would logically be classified as liabilities as they also may impose a cost in the form of a transfer of shareholder wealth from equity holders to third parties. Accordingly, under this ownership approach, *ESO*s should be classified as liabilities.

A growing body of empirical research that has looked at the association between market prices and the value of the *ESO*s granted by U.S. companies has supported the idea that the stock market interprets the value of the *ESO*s granted as a liability. In particular, the Landsman et al. (2006) paper concludes that the most value relevant way to account for the *ESO*s is the so called Asset and Liability method, that is characterized by the recognition of (i) the fair value of the option as a liability, including any subsequent gains and losses on the marking-to-market of that liability in income and (ii) an asset, the deferred compensation expense, equal to the fair value of the options at grant date that is amortized over its vesting period. A non-trivial issue that undermines this proposed form of accounting is that the effective recognition of the expected benefits of the *ESO*s as a balance sheet asset challenges the current definition of financial assets as the firm has no property right over its employees. Ohlson and Penman (2005) suggest an interesting solution to this impasse: the *ESO*-deferred compensation expense should be treated as a contra-liability account,[1] that is the balance in the deferred compensation expense is netted against the compensation option liability.

In this article we make three major contributions based on the assumptions that the major purpose of accounting reports is to inform shareholders:

1. The extant academic literature has predominantly focused on stock-based compensation within the context of the Unites States (see, for instance, Aboody, 1996; Skinner, 1996; Rees and Stott, 2001; Bell et al., 2002; Espahbodi et al., 2002; Hanlon et al., 2003; Aboody et al., 2004; Aboody et al., 2006; Landsman et al., 2006). The overriding conclusion of these papers is in favor of applying the Asset and

Liability method to account for *ESO*s. This paper offers the opportunity to determine the extent to which the findings of this U.S. research can be generalized to a European setting where the institutional environment and the practices for issuing *ESO*s are quite different. Murphy (1999) reports that nearly all executive pay packages in the United States contain stock options, and that during the 1990s stock options became the single largest component of compensation in all industries except utilities. Murphy also reports that the overwhelming majority of these options have their exercise price set at fair market value as at their issue date, 10-year terms and no performance hurdles attached. In contrast, Europe offers a setting in which there is substantial variation in equity compensation because of the different legal, institutional and fiscal context and because the practice of issuing *ESO*s is more recent and less widespread (Mathieu, 2009).

2. Stemming from the theoretical work of Ohlson and Penman (2005), we empirically investigate whether the market participants give the same valuation weight to the deferred compensation expense as they do to the compensation option liability. If this proves to be true, a single figure consisting of the compensation option liability net of the deferred compensation expense could be disclosed in the financial reporting without sacrificing value relevant information and so overcome any issues posed by the direct recognition of the benefits of the *ESO* as an asset.
3. We investigate whether the market incorporates the *ESO* expense into price differently, depending on the impact that the *ESO*s issued in any given year have on the total number of *ESO*s outstanding. On face value, one would expect that the market should interpret the *ESO* expense as a cost and hence empirical studies would be expected to find that it has a negative impact on valuation. Somewhat surprisingly, we find the empirical evidence on the relationship between *ESO* expense and valuation to be mixed – some studies finding a positive relationship, some no relationship while others find the expected negative relationship. In order to resolve these conflicting findings we pursue the proposition that the benefits of the *ESO*s are maximized when management are consistently granted *ESO*s through time. As a consequence, the *ESO*s expense should have a lower negative impact on the market valuation, or possibly even a positive one, for those firms that maintain a relatively constant amount of *ESO*s outstanding (i.e., follow a persistent program for granting new options) compared with those firms whose *ESO*s outstanding vary a lot through time (i.e., follow a non-persistent program for granting new options).

This paper is organized as follows. We develop our hypotheses in Section 2 while in Section 3 we present our research questions and the models to be used in the tests. Section 4 explains data sources, sample composition, and variables used.[2] The empirical results are presented and discussed in Section 5. Section 6 summarizes and concludes the paper.

2. Hypothesis Development

Below we provide a brief summary of the recent theoretical and empirical research on which we are going to draw in this article.

2.1. Prior Theoretical Research: Deferred Compensation Expense Should be Treated as a Contra-Liability Account

Ohlson and Penman (2005) propose a method of accounting for claims whose payoffs depend on the performance of a firm's stock price, e.g. warrants, convertible bonds and compensation options. They adopt a proprietorship view implying that (i) the financial statements are framed from the perspective of current stockholders; (ii) other comprehensive income, as distinct from net income, should pick up unexpected and unrealized changes in common shareholders' equity. Following this view, the distinction between what is equity and what is debt is defined *a priori*. All claims (derivatives on an issuer's basic ownership instrument), other than those of the holders of common outstanding shares, are liabilities. This view is very close to the basic ownership approach adopted by the FASB in its preliminary views document "Financial Instruments with Characteristics of Equity" (November 2007). Under the FASB approach, a written option to issue a basic ownership instrument is classified as a liability, simply because a written option will be exercised only if its exercise price is less than the fair value of the basic ownership instruments to be received, and so as a consequence the current shareholders stand to suffer a loss. The FASB's document does not distinguish between derivatives on the issuer's basic ownership instrument and compensation options. In the case of compensation option, the lack of a cash exchange implies that a subjective estimate of the fair value of the options liability must determine the debit to an "intangible" asset, the Compensation Expense, that does not tie in with anything remotely associated with property rights. Ruling out deferred compensation expense as an asset, Ohlson and Penman suggest that it should be treated as a contra-liability account, i.e. the balance in the Deferred Compensation Expense is netted against the Compensation Option Liability.

2.2. Prior Empirical Research on the Value Relevance of the ESO Grants

The empirical model used in this study draws on the analysis undertaken by Landsman et al. (2006) who conclude that the most value relevant way to account for *ESO*s is the so called Asset And Liability method.[3] Although their empirical analysis is generally supportive of the higher value relevance of the Asset and Liability method, it is troublesome that they find that the option expense (i.e., the amortization of the deferred compensation expense) adds to the market value of the equity while, from a theoretical point of view, its sign should be negative. The authors' interpretation of this unexpected result is that the option asset is measured with error and the *ESO* expense provides a correction.

There is not a convincing body of empirical research to inform us as to what is the nature of the relationship between *ESO* expense and share price. Some previous researches find a positive relation between a firm's share price and the *ESO* expense and interpret that outcome as driven by the fact that expected benefits related to *ESO* prevail over the stock-based compensation cost. Rees and Stott (2001) find a significant positive association between the disclosed stock option expense and the firm value and note that it is greater for high-growth companies, with a high demand for cash. This means that the incentive benefits provided by *ESO*s outweigh their dilution cost and that *ESO*s convey a positive signal to the market. Bell et al. (2002) study the effect of *ESO*s on firm value for a sample of 85 profitable computer software companies. They employ the abnormal earnings valuation model developed by Feltham and Ohlson to analyze the value relevance of three alternative accounting treatments for *ESO*s, which are the APB 25, Exposure Draft and SFAS 123 methods. The authors conclude that *ESO* expense is value relevant with a positive and significant coefficient; thus suggesting that investors value *ESO* expense as an "intangible asset" rather than an expense.

Other researchers have found either no relationship or a negative relationship between the *ESO* expense and a firm's share price. For example, Aboody (1996) finds that *ESO* expenses and firm value are unrelated but that there is a negative relationship between the fair value of the outstanding *ESO*s and firm value. Going further in his analysis, Aboody shows that the total sample results are driven by the vested in-the-money options, while the correlation is inverted (positive) for *ESO*s early in their vesting stage. The explanation being that vested *ESO*s are likely to be exercised so the expected value of their incentive effect weakens and they are viewed as a net cost to the current shareholders.

Aboody, Barth and Kasznik (2004) investigate the association between stock-based compensation and the equity market values after the adoption of SFAS 123 (revised 2004). They find that the *ESO* expense is viewed as a cost by investors and the expected future earnings are positively affected by the stock-based compensation expense. When the expected earnings growth variable is removed, the coefficient on the stock-based compensation expense becomes positive although insignificant. This finding is interpreted by the authors as the evidence that under certain conditions the expected incentive effects of stock-based compensation offset the cost of dilution.

To our knowledge, no previous researchers have related the sign on the *ESO* expense to the persistency of the option-based compensation program. A persistent program is where a firm maintains a relatively constant number of *ESO*s outstanding through time by issuing new *ESO*s to replace those that lapse or are exercised. It is proposed that under these circumstances, the *ESO* program incentivizes management in a way which provides long-term benefits for the firm that are possibly not captured in the current and expected future earnings or the book value of the firm's equity. In these circumstances the expected sign of the *ESO* expense coefficient might well be positive because it is capturing these additional long-term benefits. The alternative options program is where new issues of *ESO*s are episodic and the numbers of outstanding *ESO*s are quite volatile through time. Under this type of program, the incentives to management vary through time and so may encourage opportunistic behavior, for example in the form of earnings manipulation by management (see for instance Gao and Shrieves, 2002 and Cheng and Warfield, 2005).[4] Thus the long-term benefits of the option based compensation will be reduced resulting in the *ESO* expense coefficient being negative for firms with non-persistent options programs.

3. Research Questions and Empirical Design

We contribute to the debate on the value relevance of the *ESO*s by testing the following research questions:

R1. Is the absolute value of the coefficient on the *ESO* liability statistically different from the absolute value of the coefficient on the *ESO* asset represented by the deferred compensation expense? If the market places the same valuation weight on both items, then the two coefficients should not be statistically different from each other.

R2. Is the coefficient on non-persistent *ESO* expenses statistically different from the coefficient on the persistent *ESO* expense? We

expect a lower coefficient on *ESO* expense for firms not pursuing a persistent *ESO* program because of the greater incentive this poses for managers to manipulate earnings.

Resting on Landsman et al. (2006), we utilize the so called Asset and Liability method of accounting for *ESO*s and a one-period residual income model in the form of a growing annuity to address these questions:

$$MVC_0 = BV_0 + \frac{RI_0}{COE_0 - g} + \{NETESO_0 - FVESO_0\} + \frac{\{(-ESOEXP_0 - \Delta FVESO_{(-1,0)}) - (NETESO_{-1} - FVESO_{-1}) \times COE_0\}}{COE_0 - g}$$

where *MVC* is the market value of equity; *BV* is book value of the equity gross of *ESO*; *RI* is residual income measured as net income before extraordinary items and discontinued operations plus the respective *ESO* expenses (net of tax) accrued on the firm's income statement minus an "adequate" remuneration of the book value (lagged one period); *COE* is cost of equity capital; *g* is annual growth rate of the residual income; *NETESO* is the fair value of the *ESO*s at the grant date date minus *ESOEXP* accumulated in past years; *FVESO* is fair value of *ESO*s outstanding at fiscal year-end; *ESOEXP* is *ESO* expense (net of tax); $\Delta FVESO$ is YOY change in fair value of the *ESO* liability ($= FVESO_0 - FVESO_{-1}$).

The first set of $\{\ldots\}$ brackets on the right-hand side of model (A) contains the components of equity book value for the Asset and Liability approach, and the second set of $\{\ldots\}$ brackets contains the components of residual income.

Based on the model (A) we run a set of regressions of the following basic forms[5]:

$$\begin{aligned} \mathrm{MV}_{i,0} = {} & a + a_1 BV_{i,0} + a_2 2RI_{i,0} \\ & + \{a_3 NETESO_{i,0} + a_4 FVESO_{i,0}\} \\ & + \{[\mathrm{a}_5 ESOEXP_{i,0} + a_6 \Delta FVESO_{i,(-1,0)}] \\ & + a_7 (NETESO_{i,-1} COE) + a_8 (FVESO_{i,-1} COE)\} \\ & + a_9 \mathrm{Growth\_Sales} + e_i \end{aligned} \quad (1)$$

As reported in previous studies (Aboody, 1996; Aboody et al., 2004; Landsman et al., 2006), the estimation of the above equation is affected by an endogeneity problem. Indeed, the regression of the market capitalization (dependent variable) on *ESO* value (independent variable)

generates an endogeneity problem because the stock price influences both variables. Failure to take account of this endogeneity would result in estimated *ESO* fair values that are positively correlated with regression error terms, and the resulting coefficients on the option fair-value-based variables would be biased. To address the endogeneity problem, we estimate fair value of the option liability *FVESO* using the following list of instrumental variables: average expected life of the *ESO* plans outstanding, the risk-free rate, the volatility of the underlying stock and the number of options outstanding.

In order to answer our first research question (same valuation weights on the *ESO* Asset and the *ESO* Liability) we apply a Wald test to evaluate the following restriction on the coefficients in equation (1):

$$|a3| = |a4| \quad \text{and} \quad |a7| = |a8|$$

The Wald test provides the means for testing the significance of a particular linear combination of explanatory variables in a statistical model.[6] We apply it to verify the null hypothesis that simultaneously:

- the absolute value of the coefficient on *NETESO* (a_3) is equal to absolute value of the coefficient on *FVESO* (a_4); and
- the absolute value of the coefficient on the capital charge *NETESO* $\times$ *COE* (a_7) is equal to the absolute value of the coefficient on *FVESO* $\times$ *COE* (a_8);

We will interpret a rejection of the above null hypothesis (low p-value) as the evidence that the investors do not place the same valuation weights to the *ESO* compensation asset (*NETESO*) and the *ESO* compensation liability (*FVESO*) in pricing a firm's shares.

In order to answer our second research question, we introduce in the regression a dummy variable *NONPERSISTENT* in order to distinguish the persistent or non-persistent nature of the *ESO* expense of each firm in our sample. The measure we use to asses the degree of persistence is the year-on-year change in the number of *ESO*s outstanding:

$$PRCCHG_{(-1,0)} = \frac{ESO\,\text{outstanding}_0}{ESO\,\text{outstanding}_{-1}} - 1$$

In order to rule out the possibility that our results are driven by business combinations and disposal that alter the number of *ESO* outstanding, we erase from the sample a total of 31 firm–year observations affected by major business combinations or disposals.[7]

Because both an increase and a decrease in the number of *ESO*s outstanding are equally relevant for our analysis, we rank all firm years according to the absolute value of *PRCCHG* and then set the dummy variable *NONPERSISTENT* equal to 1 for those firms in the fourth quartile by this ranking (i.e., firms with the highest year-on-year percentage variation of *ESO*s outstanding). We then run a regression of the following modified form

$$\begin{aligned} \mathrm{MV}_{i,0} = {} & a + a_0 NONPERSISTENT_{i,0} + \ldots \\ & + a_5 ESOEXP_{i,0} + \ldots + a_{10} NONPERSISTENT \\ & \times ESOEXP_{i,0} + e_i \end{aligned} \tag{2}$$

The coefficient (a_{10}) on the interaction effect *NONPERSISTENT* × *ESOEXP* captures the adjustment the market applies to the valuation of the *ESO* expense of firms that show a high year-on-year variation in the number of *ESO* outstanding (low persistence) in comparison with the *ESO* expense in firms that have a higher persistence over time in the number of *ESO* outstanding.

4. Sample and measurement of variables

It was only with the mandatory adoption of IFRS 2 in 2004 that European listed firms have been required to disclose detailed information on their *ESO* plans. As a consequence, our analysis is based on a subset of European non-financial firms included in the DJ Stoxx600 index for which the required set of accounting and market data for fiscal years 2005 and 2006 is available.

An important condition for a company to enter in our sample is the availability of data specifying the features for all of the different tranches of *ESO*s outstanding at the end of the 2004, 2005 and 2006 fiscal year (i.e., the grant date, vesting period, strike price, maturity, number of *ESO*s, type and currency of the underlying asset, number of *ESO*s forfeited and exercised during 2005 and 2006).

The resulting "full information" set is restricted to 213 firm–year observations (109 firm-observations for 2005 and 104 for 2006). All data pertaining to the stock options were hand-collected from the firms' financial reports. Companies disclosing *ESO*s data only at an aggregate level (usually weighted average measures referring to aggregate classes of *ESO*s), without providing the analytical details for each tranche, were excluded.

The estimation of the fair value of *ESO*s at the grant date is based on the modified Black and Scholes formula, which takes into account the expected dividend yield.

While we acknowledge that this approach cannot represent the best valuation methodology for *ESO*s for all the firms (see, for instance, Carpenter, 1998 and Poitras, 2007), we also note that it is commonly used by the companies for their accounting valuations and in the extant literature on the *ESO* issue, so we assume it is adequate for the purposes of this paper.

At each valuation date, the value of the *ESO*s outstanding at the firm level is obtained by summing up the estimated fair value of every different tranche of *ESO*s granted by the firm, each with its own characteristics (expected life, strike price, vesting period, issue date, etc.).

Below we provide a brief description of each variable, addressing the reader to the appendix for an analytical description of their measurement.

$ESOEXP_t$ is our estimation at the valuation date of the *ESO* expense (net of taxes) for fiscal year t ($t = 2005, 2006$), determined by using the estimated fair value of the *ESO*s at the grant date and the residual vesting period. We chose to use our estimate instead of the figure reported in the annual statement to preserve the homogeneity of the *ESO* expense with the other *ESO* variables that, necessarily, had to be estimated.

$NETESO_t$ is the estimated fair value of *ESO*s at the grant date minus the amortization accumulated until the evaluation date (alternatively, 2005 and 2006 fiscal year end). If we assume that the benefits expected by the *ESO*s at the grant date are "consumed" during the vesting period, and that the annual amortization is a proxy that captures the pro-quota of these benefits, *NETESO* represents the intangible asset encompassing the amount of the expected benefits still to be enjoyed by the company.[8]

$FVESO_t$ refers to the fair value of *ESO*s outstanding calculated by applying a modified Black–Scholes formula at the generic evaluation date t (which alternatively represents the 2004, 2005, 2006 fiscal year end date). The same methodology has been applied to calculate the fair value of the stock options at the grant date (from which we derive the *ESOEXP* and *NETESO* variables for the non-vested *ESO*s).

Landsman et al. (2006) state that the fair value of *ESO*s outstanding at each fiscal year end should be recorded on the firms' accounts as a liability, reflecting the way it is considered by the investors.

$\Delta FVESO_t$ refers to the variation in the fair value of *ESO*s during the specific fiscal year analyzed (2005 or 2006). This is the amount that should be recorded in the income statement when a fair value accounting method with a mark-to-market accounting of the *ESO*s is being applied.

Residual income (*RI*) for each fiscal year (2005, 2006) is measured as net income before extraordinary items and discontinued operations plus the respective *ESO* expense (net of tax) accrued on the firm's income statement minus an equilibrium remuneration of the book value (lagged one period) computed using a firm-specific cost of equity capital (r) based on the capital asset pricing model (CAPM).

Growth_Sales represents a proxy for the expected growth for the specific company and is measured as the annual growth rate of firm's revenues implied in the equity analysts' consensus (sourced by I/B/E/S) over the next 3 years (2 years when 3-year forecasts are not available).[9]

5. Empirical results

Table 1 reports a set of descriptive statistics for our sample of 213 firm/year observations. As expected, the market capitalization is highly and positively correlated with the book value and the residual income figures, confirming the sound foundations of the residual income model. Moreover, the correlations between the *ESO* variables are high and positive suggesting that a strong and direct relationship exists among these variables.

In Table 2 we report the estimated coefficients of Equation (1). All the coefficients, except the intercept, are significantly different from zero. This empirically establishes the value relevance of all the variables included in the "asset and liability" method to account for the *ESO*s and confirms that the conclusions stated in Landsman et al. (2006) hold for our sample of European firms.

In particular, our equation (1) substantially replicates the "asset and liability" method applied by Landsman et al. (2006), with the addition of an additional variable (*Growth_Sales*) to account for the firm's expected growth rate.

As Landsman et al. (2006) demonstrate, the empirical model representing the accounting treatment of *ESO*s under IFRS 2 and FAS 123 is nested in the more general "asset and liability" model and can be obtained by restricting the value of the coefficients a_3, a_4, a_6, a_7 and a_8 to zero. Therefore our finding that all the coefficients are significantly different from zero implies that the information embedded in the "asset and liability" method is more value relevant than that provided by the current accounting under IFRS2/FASB 123.

We note that the sign of the coefficient on the *ESO* expense (*ESOEXP*) is positive even after controlling for expected growth of revenues, but it is contrary to intuition and to results of some previous studies (see for instance

Table 1. *Descriptive statistics for the sample variables*

	BV	*ΔFVESO*	*ESOEXP*	*FVESO*	*Growth_Sales (%)*
Mean	8,368,986	69,096	15,394	171,496	8.84
Median	2,918,749	24,486	4,868	59,846	6.44
SD	14,661,032	150,120	31,812	297,580	10.14

	MVC	*NETESO*	*RI*
Mean	24,699,947	39,668	753,621
Median	9,725,000	10,411	220,090
SD	50,244,104	87,108	2,092,814

	BV	*ΔFVESO*	*ESOEXP*	*FVESO*	*Growth_Sales*	*MVC*	*NETESO*	*RI*
BV	1	0.549	0.768	0.746	− 0.170	0.915	0.705	0.779
ΔFVESO	0.549	1	0.620	0.709	0.017	0.648	0.661	0.579
ESOEXP	0.768	0.620	1	0.880	− 0.049	0.820	0.898	0.711
FVESO	0.746	0.709	0.880	1	− 0.035	0.789	0.892	0.675
Growth_Sales	− 0.170	0.017	− 0.049	− 0.035	1	− 0.080	− 0.001	− 0.087
MVC	0.915	0.648	0.820	0.789	− 0.080	1	0.791	0.902
NETESO	0.705	0.661	0.898	0.892	− 0.001	0.791	1	0.660
RI	0.779	0.579	0.711	0.675	− 0.087	0.902	0.660	1

Data in €'000 except *Growth_Sales*.
BV, book value of the equity under current *IFRS*; *ΔFVESO*, YOY change in fair value of the *ESO* liability (= $FVESO_0 - FVESO_{-1}$); *ESOEXP*, *ESO* expense (net of tax) in year *t*; *FVESO*, fair value of *ESO*s outstanding at fiscal year-end ($t-1$); *Growth_Sales*, expected annual growth rate in revenues over the next 2/3 years (*consensus*, sourced by I/B/E/S); *MVC*, market value of the equity three months after the fiscal year end; *NETESO*, the fair value of the *ESO*s at issue date minus *ESOEXP* accumulated in past years; *RI*, residual income measured as net income before extraordinary items and discontinued operations plus the respective *ESO* expenses (net of tax) accrued on the firm's income statement minus an "adequate" remuneration of the book value (lagged one period).

Table 2. *The estimated coefficients for the equity side residual model*

Variable	*Coefficient*	*t-Statistic*	*Probability*
C	162,674	0.15	0.878
BV_0	1.43	5.36	0.000
RI_0	8.69	4.88	0.000
$NETESO_0$	196.43	3.36	0.001
$FVESO_0$	− 189.55	− 3.70	0.000
$ESOEXP_0$	435.79	2.94	0.004
$\Delta FVESO_{(-1.0)}$	88.69	2.99	0.003
$NETESO_{-1} \times COE_0$	− 1452.33	− 2.08	0.039
$FVESO_{-1} \times COE_0$	1400.14	3.42	0.001
Growth_Sales	1,418,4225	2.33	0.021
R^2	0.923		
Adjusted R^2	0.919		
F-statistic	279.5		
Probability (*F*-statistic)	0.000		

Dependent variable: MVC_0.
Method: Two-Stage Least Squares.
White's heteroskedasticity-consistent standard errors and covariance.
Instrument list for the estimate of *FVESO*: average time to expiration of the *ESO* outstanding, risk-free rate at the fiscal year end, volatility of the underlying stock returns and number of *ESO* outstanding.

Aboody et al., 2004). Similar to Landsman et al. (2006), we conclude that the coefficient on the *ESO* expense is influenced by measurement errors and that the positive sign represents a correction for the underestimation of the *ESO* benefits. In our analysis of the second research reported below, we show that when we control (by using a dummy variable) for firms, which are classified as non-persistent issuers of *ESO*s, the coefficient on the *ESO* expense of those firms is negative. In other words, the incurrence of *ESO* expenses only has a positive impact on valuation in those cases where it is assumed that the issuance of the *ESO*s provides the right incentives to management to maximize long-term performance

Coming to details of Table 2, the coefficients are generally higher than those reported in Landsman et al. (2006), but of similar order of magnitude. As noted above, the coefficient on the *ESO* expense (*ESOEXP*) is positive as are the coefficients on the option asset (*NETESO*), the change in the option liability ($\Delta FVESO$) and the capital charge on the option liability ($FVESO \times COE$). Moreover, the coefficient is negative on option liability (*FVESO*) and on capital charge on the option asset ($NETESO \times COE$).

In line with the prior literature, the analysis based on our sample of European firms confirms that the *ESO*-deferred compensation expense (*NETESO*) and the fair value of the option liability (*FVESO*) both provide (value) relevant information in pricing a firm's equity value.

Table 3. *Wald's test on coefficient restrictions*

Test STATISTIC	*Value*	*df*	*Probability*
F-statistic	0.0067	2, 203	0.993
χ^2	0.0134	2	0.993
Null-Hypothesis Summary			
Normalized restriction (= 0)		*Value*	*SE*
$C(FVESO_0)+C(NETESO_0)$		6.8802	59.63347
$C(FVESO_{-1} \times COE)+C(NETESO_{-1} \times COE)$		− 52.190	734.0533

We next use the estimated equation to investigate our first research question, that is to test the hypothesis that the coefficients on the option liability (*FVESO*) and the *ESO*-deferred compensation expense (the *ESO*-expected benefits represented by the *NETESO* variable) are of the same magnitude. As mentioned above, we performed the Wald test on the null hypothesis of simultaneous equality among the absolute value of those coefficients

$$H_0 = |a3| = |a4| \quad \text{and} \quad |a7| = |a8|$$

The results from the Wald test are reported in Table 3 and suggest that the null hypothesis can not be rejected, indicating that the two pairs of coefficients are of an equal absolute level.

We interpret this result as the evidence that the investors place the same valuation weights to the deferred compensation expense and the compensation option liability when valuing firms. From the point of view of the Standards Setters, this imply that any decision to disclose the current fair value of *ESO*s outstanding also should take into account the corresponding value of the *ESO*s' benefits. This finding also provides empirical support to the Ohlson and Penman (2005) proposal that the *ESO*-deferred compensation expense should be treated as a contra-liability to be netted against the option liability. Indeed, based on the evidence stated above, the equation 1 can be re-expressed in the following reduced form without losing any value relevant information

$$\begin{aligned} \mathrm{MV}_{i,0} = {} & a + a_1 BV_{i,0} + a_2 RI_{i,0} + a_3(FVESO_{i,0} - NETESO_{i,0}) \\ & + \{[a_4 ESOEXP_{i,0} + a_5 \Delta FVESO_{i,(-1,0)}] \\ & + a_6(FVESO_{i,-1} - NETESO_{i,-1})COE_{i,0}\} \\ & + a_7 \mathrm{Growth\_Sales} + e_i \end{aligned} \tag{1a}$$

Table 4. *Testing the difference between the recurring and non recurring ESO expenses – Equity side approach*

Variable	*Coefficient*	*t-Statistic*	*Probability*
C	456,718	0.44	0.658
$NONPERSISTENT$ (dummy)	109,7749	0.90	0.371
BV_0	1.36	5.61	0.000
RI_0	8.56	4.10	0.000
$FVESO_0 - NETESO_0$	− 193.33	− 2.81	0.006
$ESOEXP_0$	474.53	4.41	0.000
$\Delta FVESO_{(-1,0)}$	97.19	3.30	0.001
$(FVESO_{-1} - NETESO_{-1}) \times COE$	1391.62	2.81	0.006
Growth_Sales	16,769,648	2.29	0.023
$NONPERSISTENT \times ESOEXP_0$	− 930.46	− 3.33	0.001
R^2	0.955		
Adjusted R^2	0.952		
F-statistic	451		
Probability (*F*-statistic)	0.000		

Dependent variable: *MVC*.
Method: two-stage least squares.
White's heteroskedasticity-consistent standard errors and covariance.
Instrument list for the estimate of *FVESO*: average time to expiration of the *ESO* outstanding, risk-free rate at the fiscal year end, volatility of the underlying stock returns and number of *ESO* outstanding.

Using the reduced form of equation (1a), we now move to investigate the second research question as to the relationship between the persistent/non-persistent nature of the *ESO*s and the market value of the firm's equity. Following the approach discussed on the final part of Section 3, we address this issue by introducing a dummy variable (*NONPERSISTENT*) in equations (1a) to control for the persistent or non-persistent nature of the *ESO* expense. The new regression equation (1b) becomes

$$\begin{aligned} \mathrm{MV}_{i,0} = {} & a + a_1 BV_{i,0} + a_2 RI_{i,0} + a_3(FVESO_{i,0} - NETESO_{i,0)} \\ & + \{[\mathrm{a}_4 ESOEXP_{i,0} + a_5 \Delta FVESO_{i,(-1,0)}] \\ & + a_6(FVESO_{i,-1} - NETESO_{i,-1})COE_{i,0}\} \\ & + a_7 \mathrm{Growth\_Sales} + a_8 NONPERSISTENT \\ & \times ESOEXP_{i,0} + a_9 NONPERSISTENT_{i,0} + e_i \end{aligned} \tag{1b}$$

The two regressors added to the equation, the main effect *NONPERSISTENT* and the interaction effect $NONPERSISTENT \times ESOEXP$, control for the differential effect of the non-persistent *ESO* expense associated with the firms enclosed in the fourth quartile.

The results of the analysis are reported in Table 4. The two important findings are (i) the net coefficient (a_4+a_8) on the *ESO* expense classified

as non-persistent is *negative* and statistically significant and (ii) the coefficient (a_4) on the *ESO* expense classified as persistent is *positive* and statistically significant.[10] The implication of these findings is that market participants put different valuation weights on persistent as opposed to the non-persistent programs for issuing *ESO*s. These findings suggest that the persistent *ESO* programs are perceived by investors as incentive packages with attached long-term future benefits that are not already incorporated in book value, earnings and the medium-term-expected growth (I/B/E/S consensus). This suggests that accounting principles should require different disclosure regimes for *ESO*s issued to replace those exercised or lapsed during the year from those issued without this scope.

6. Conclusions

This paper shows, empirically, that the results of U.S. literature concerning the value relevance of the Asset and Liability method to account for *ESO*s can be generalised to the European markets despite the different compensation practices, corporate governance regimes and fiscal laws between Europe and United States. This finding endorses the idea that the use by market participants of accounting information (or accounting based information) is the same all over the world and harmonization of accounting principles should be achieved to enhance the consistency, comparability and efficiency of financial statements, enabling global markets to move with less friction. Using the standard setters' words: ''A common set of high quality global standards remains the long-term strategic priority of both the FASB and the IASB'' (A Roadmap for Convergence between IFRSs and U.S. GAAP 2006–2008, Memorandum of Understanding between the FASB and the IASB, 27 February 2006.).

This paper also shows that the deferred compensation expense (the so called ''*ESO* asset'') and the option liability component of the *ESO*s (the so called ''*ESO* liability'') are given the same valuation weights, with opposite sign, by the market participants when forming the market prices. To our knowledge, no previous research has explicitly tested the differential value relevance of these two option components, neither in Europe or the United States. We do it for the first time and provide two valuable insight to the standard setters: (i) we reaffirm the recommendation of some previous research that any decision to disclose the current fair value of *ESO*s outstanding should take into account also the corresponding value of the *ESO*s' benefits and (ii) we provide empirical

support to the theoretical conclusion of Ohlson and Penman (2005) that the deferred compensation expense be treated as a contra-liability to be netted against the option liability in order to overcome the issues a direct recognition of the expected benefits of the *ESO*s as an asset would pose.

The third contribution of our work rests on the nature of the *ESO* expense. We show that the distinction between persistent and non-persistent option-based compensations is of critical importance for the market participants and hence consideration should be given as to how these two items should be best reported. We suggest that the persistent and non-persistent *ESO*s expenses should be disclosed separately in order to improve the informational content of accounting numbers to investors.

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Appendix

Definition of the Main Variables Related to the ESOs Fair Value Estimation and Amortization

$ESOEXP_t$ is our estimation of the *ESO* expense (net of taxes) for fiscal year t ($t = 2005, 2006$), so it generally differs from the amortization effectively reported by the firms and used to calculate the *RI* variable (i.e., the residual income gross of *ESO* expense).

ESO expense is first determined on an individual (single-*ESO*) basis as the estimated fair value of a single *ESO* at the grant date divided by the number of years in the vesting period.[11] The total *ESO* expense at the firm level is the sum of all the single-*ESO* expenses.

The *ESO* expense for a specific year is defined as the sum of the contribution from the following classes of *ESO*s[12]:

(1) *ESO*s not yet vested at the beginning of the period but that are both vested and exercised during the year: this class of *ESO*s does not figure in the total number of *ESO*s outstanding at the fiscal year end, but contributes to the *ESO* expense recorded during the year;
(2) *ESO*s existing at the fiscal year end and not yet vested: the number of non-vested *ESO*s outstanding at the end of the period represents the sum of the non-vested *ESO*s issued during the year (whose amortization refers to a period less than 1 year) and the non-vested *ESO*s existing at the beginning of the year net of the actual number of *ESO*s forfeited and expired (the amortization of this component refers to the entire year). Because there is not any public information available supporting a reasonable estimate of expected forfeitures for each tranche of *ESO*s, our calculation of the total amount of the *ESO* expense refers to the actual number of *ESO*s existing at the fiscal year end.

$NETESO_t$ is equal to the estimated fair value (see below $FVESO_t$ for the estimation methodology) of *ESO*s at issue date minus the amortization (*ESOEXP*) accumulated until the evaluation date (alternatively, 2005 and 2006 fiscal year end). It only refers to non-vested *ESO*s because for vested *ESO*s the fair value at issue is already completely amortized (so *NETESO* is null). If we assume that the benefits expected by the *ESO*s at the issue date are "consumed" during the vesting period, so that the annual amortization is a proxy that captures the pro-quota of these benefits, *NETESO* represents the intangible asset encompassing the amount of the expected benefits still to be enjoyed by the company.[13]

$FVESO_t$ refers to the fair value of *ESO*s outstanding at the generic evaluation date t (alternatively the 2004,[14] 2005, 2006 fiscal year end date).

Landsman et al. (2006) state that this amount should be recorded as a liability at each fiscal year end reflecting the way it is considered by the investors.

The same methodology applied to calculate the fair value of the *ESO*s at the evaluation dates has also been used for estimating the fair value of the stock options at the grant date (from which we derive the *ESOEXP* and *NETESO* variables for the non-vested *ESO*s).

The total amount of the *ESO*s fair value is based on the calculation of a single-*ESO* fair value times the number of outstanding *ESO*s at the specific evaluation date.

The calculation takes in account the different features of the *ESO*s and is determined for each tranche issued; thus, the total fair value of the *ESO*s outstanding at the company level is the summation of the fair value of each tranche of stock options.

In general, the fair value of the *ESO*s has been estimated by applying a modified Black–Scholes model to take in account an expected dividend yield.[15] The definition of the input variables used in the model is as follows:

- Expected term of the options at the grant date is estimated by using the ''simplified'' method for plain-vanilla stock options addressed in the Staff Accounting Bulletin (SAB) No. 110 *Share-Based Payment*[16]:

$$\begin{aligned}&\text{Expected term at the grant date}\\&\quad = (\text{vesting term} + \text{original contractual term})/2\\&\quad = \text{vesting term} + (\text{original contractual term} - \text{vesting term})/2\end{aligned}$$

The expected term of a *ESO* is always defined with respect to its specific grant date. The expected term at each evaluation date (2004, 2005 and 2006 fiscal year end) is computed by subtracting from the expected term at the grant date the number of years passed since that date.[17] When this difference is negative (which implies that the vesting period is expired at least) we assume an expected term of zero, i.e. we consider only the intrinsic value of the stock option. *ESO*s granted with the same features but with graded vesting periods (e.g., *ESO*s with a given original contractual term but with 25 per cent of the options that vests annually) are treated as separate tranches, each one with its own expected term and features (following the previous example, if the 25 per cent of the granted *ESO*s vests annually, then we consider four different tranches whose vesting periods spans from 1 to 4 years ahead).

- the price of the underlying asset is sourced by DataStream[18];
- the expected dividend yield[19] is based on the daily average of the dividend yield during the 6 months before the evaluation date; the dividend yield is sourced by DataStream and excludes extraordinary dividends;
- the risk-free rate is based on the redemption yield of the country-specific benchmarks of the government bonds sourced by

DataStream with a maturity equal to the expected term of the specific stock option[20];

- the volatility of the return of the underlying asset is measured over a previous period whose length matches the expected term of the stock options (if data are missing, we use the longest time series available). The matching process is similar to the one applied to the risk-free rate. The average daily volatility is annualized by multiplying it by the square root of 255 (the average numbers of open market days during a year).

To be consistent with the market prices, the parameters used to calculate the *ESO*s fair value are adjusted for the capital operations (e.g., stock splits, stock dividends, etc.).[21]

$\Delta FVESO_t$ refers to the variation ("delta") of the fair value of *ESO*s during the specific fiscal year analyzed (2005 or 2006). This is the amount that should be recorded in the income statement when a fair value accounting method with a mark-to-market procedure is being applied. As we rely on a full-information data set, which considers the specific features of each tranche of *ESO*s, we calculate the variation of the fair value by summing up the contribution of the following classes of stock options [22]:

(a) *ESO*s existing at the beginning of the fiscal year and that are not exercised during the period (included *ESO*s forfeited or lapsed unexercised during the year);
(b) *ESO*s existing at the beginning of the year, which are exercised during the year;
(c) *ESO*s granted during the year.

Regarding the first class of *ESO*s (sub a), the relevant variation of the fair value is computed as the difference between:

- the fair value of all *ESO*s outstanding at the end of period excluding the new granted stock options; and
- the fair value of all *ESO*s outstanding at the beginning of period excluding the stock options which are exercised during the period.

This computation includes the variation of the fair value due to the *ESO*s existing at the beginning of the year that are forfeited or lapse unexercised during the period.

The second class of *ESO*s (sub b) generates a variation of fair value during the period equal to the difference between the fair value at the exercise date and at the beginning of the period.[23]

To correctly compute the change in the fair value of the *ESO*s exercised during the period we would need to know the fair value at the exercise date, which is equal to the difference between the current price of the underlying security[24] and the strike price at that date. Our analytical database provides us with the strike price measure, but the financial reports typically do not disclose the exercise date. Thus we estimated the price of the underlying security in the following way:

- for *ESO*s which are already vested at the beginning of the year, we assume that the price at the exercise date is equal to the average price of the fiscal year (2005 or 2006);
- for *ESO*s which vest during the year, we assume that the price at the exercise date is equal to the average price calculated on the portion of the fiscal year (2005 or 2006) beyond the vesting date;

The third class of *ESO*s (*ESO*s granted during the year, sub c) contributes to the variation of the fair value too.

The right measure of the variation of fair value for the new granted stock options is equal to the difference between their fair value at the end of the period and at the grant date. *ESO*s usually are granted at the money and have a positive fair value (represented by their time value). Our full-information database allows us to estimate analytically the fair value of the *ESO*s at their grant date[25] and to compute the right measure of the variation of the fair value for this class of *ESO*s.

Summarizing, the total variation in the fair value of *ESO*s, which should be recorded in the income statement in a specific fiscal year (2005 or 2006), is made up of the following three components:

(1) Fair value of *ESO*s outstanding at the end of the period excluding stock options granted during the period *less* fair value of *ESO*s outstanding at the beginning of the period excluding the stock options, which are exercised during the fiscal year;
(2) Fair value at the exercise date of the *ESO*s exercised during the period *less* their fair value at the beginning of the period;
(3) Fair value at the end of the period of *ESO*s granted during the period *less* their fair value at the grant date.

Growth_Sales represents a proxy for the expected growth for the specific company and is measured as the annual growth rate of firm's revenues implied in the equity analysts' consensus (sourced by I/B/E/S) over the next 3 years (2 years when 3 years forecasts are not available).

Residual income (*RI*) for each fiscal year (2005, 2006) is measured as net income before extraordinary items and discontinued operations plus the respective *ESO* expenses (net of tax) accrued on the firm's income statement[26] minus an "adequate" remuneration of the book value (lagged one period). This "adequate" capital charge is computed using a firm-specific cost of equity capital (r) estimated as follows:

Cost of equity capital (r) is a firm-specific measure based on the CAPM with the following parameters:

- risk-free rate = firm's country-specific risk-free rate equal to the 10-year benchmark of the government bond index sourced by DataStream;
- market risk premium = 4.5 per cent (constant across all the countries);
- β coefficient based on the regression between the weekly returns of the specific firm against the local market index returns over a 2-year period (sourced by DataStream).

Notes

1. Contra-accounts are typically used in bookkeeping to record asset and liability valuation changes. A typical example is the contra-liability account "discount on notes payable," which decreases the balance sheet valuation of the liability.

2. The appendix at the end of the paper describes in details the construction of the variables employed.

3. As already noted in the Introduction, this method recognizes (i) the fair value of the option as a liability, including subsequent gains and losses on marking-to-market of that liability in income and (ii) an asset equal to the fair value of the options at grant date and amortizes it over its vesting period.

4. The authors interpret this finding arguing that it is difficult, if not impossible, for a firm to manage earnings upward consistently. It is a feature of the accruals accounting: you can only increase current earnings at the expense of future earnings. If the level of equity incentives is persistent over the years, playing with earnings is for them just shifting personal wealth and not creating new one (zero sum game). As a consequence, managers that are assigned a persistent level of option-based compensation are less likely to engage in earnings manipulations; conversely, managers with low persistence in their option-based compensation are more likely to manipulate upwards (when they are assigned a relatively high level of equity incentives) or downward (when they are assigned a relatively low level of equity incentives, in order to save earnings for the future). The market anticipates these compensation-related opportunistic behaviours and incorporates the *ESO* expense into prices differently.

5. The variables and their measurement are explained in the next section and in Appendix A. We estimate the equation using unscaled data. Convincing reasons to estimate cross-sectional equity valuation models similar to ours using unscaled data are provided by Barth and Kallapur (1996).

6. More details on the Wald test can be found in most econometric textbook, such as Greene (2003).

7. In particular, we erased the firm year observation where the ratio "acquisitions/total assets" is above 10 per cent and the ratio "discontinued operations/total assets" is above 1 per cent or below -1 per cent. Untabulated results with different specification of these cut-offs show that the statistical inferences do not change. The "acquisitions" figure is the COMPUSTAT item "AQC," i.e. the cash outflow of funds used for and/or the costs relating to acquisition of a company in the current year or effects of an acquisition in a prior year carried over to the current year. The "discontinued operations" figure is the COMPUSTAT item "DO," i.e. the total income/(loss) from operations of a division or divisions discontinued or sold by the company and the gain/(loss) on the disposal of the division(s) reported after taxes. We also verified that the firm-year observation occurred after a stock split and/or stock dividends were expressed on a comparable base. If this were not the case, we adjusted the number of *ESO* outstanding using the adjustment factor available on COMPUSTAT.

8. Actually the calculation refers to the amount of benefits expected at the issue date, as *NETESO* represents the portion of the fair value at issue not yet amortized.

9. We choose to use the growth in sales as it should be less dependent on the incentive effect of stock options than is growth in operating income (*EBIT*) or earnings. Anyway, the use of the growth rate in earnings would not change the statistical inferences of the analysis.

10. Unreported robustness test show that the results of the analysis are similar when using the percentage change of the *ESO* expense itself as a proxy for the persistence of the option-based compensations.

11. *ESO*s fair value measurement at issue date and at the different estimation dates (2004, 2005, 2006 fiscal year end) is based on a modified Black–Scholes model to take in account an expected dividend yield. A detailed explanation of those calculations is presented right below, when we discuss the *ESO*s fair value variable (*FVESO*).

12. That is, to determine the total amount of *ESO* expense we multiply the specific single-*ESO* expense times the number of *ESO*s included in each class defined below and then we sum up.

13. Actually the calculation refers to the amount of benefits expected at the issue date, as *NETESO* represents the portion of the fair value at issue not yet amortized.

14. The fair value estimation at 2004 end is required to calculate the variation of the fair value during 2005 year.

15. We acknowledge that *ESO*s features (e.g.: existence of a vesting period during which the *ESO* exercise is prevented; the requirement that option holder needs to stay employed at the company at least until the end of the vesting period; non-transferability; long-term expiration; specific tax treatment) make them somewhat different from the traded option and that the Black–Scholes model may be inappropriate to determine the precise fair value of stock options. Many authors criticized the SFAS 123 and 123R disclosure requirements regarding the *ESO*s fair value stating that it is virtually impossible to get a precise estimation of stock options' fair value (e.g., Malkiel and Baumol, 2002; Hagopian, 2006).

16. SAB-110 was recently issued by the staff of the Office of the Chief Accountant and the Division of Corporation Finance of the Securities and Exchange Commission (SEC) to allow companies without an adequate access to historical data to fulfill the requirements of the SFAS 123(R) in evaluating the stock options. SAB-110, indeed, extend the opportunity to use the simplified approach provided by SAB-107, issued in March 2005, beyond its 2007 expiration date. The simplified method addressed for estimating the expected term of a granted plain-vanilla option considers the following formula:

$$\text{Expected term} = (\text{vesting term} + \text{original contractual term})/2$$

17. For example, assume that we are estimating the fair value of an *ESO* at the 2005 fiscal year end. The *ESO* was granted 3 years before with 3 years of vesting period and a contractual term of 10 years. Its expected term at the grant date is equal to 6.5 years [= (3+10)/2]. The expected term of the same *ESO* evaluated at 2005 fiscal year end is 3.5 years, that is 6.5 years (expected term at the grant date) minus 3 years (years passed since the grant date).

18. By default, the time series of prices are adjusted for the capital operations (such as stock splits or stock dividends).

19. We have considered the log version of the dividend yield, i.e. log (1+dividend yield).

20. In particular, we have built a yield curve by using the Euribor rate for durations rounded to 1 year and the country-specific benchmark rates provided by DataStream for durations greater than 1 year. All these durations represent an integer multiple of 1 year, i.e., they are 2, 3, 4, etc. years. When the benchmark risk-free rates were not available for a specific duration, interpolation was used. We have matched the expected term of each *ESO*, rounded to the closest integer, with the yield curve for the risk-free rates defined as above (i.e., for an expected term equal to 2.6 years the matched risk-free rate corresponds to the 3 years rate, while for an expected term equal to 2.4 years the matched risk-free rate corresponds to the 2 years rate).

The risk-free rates are transformed in instantaneous rates, as required by the Black–Scholes model, using the log (1+risk-free rate).

21. To understand the nature of these adjustments, assume that a stock split 1:2 has occurred after the 2006 fiscal year end, say at the beginning of the 2008. After this date, the time series of the market prices of the specific security (which is assumed to be the underlying asset of the *ESO*) are retroactively adjusted by DataStream dividing the unadjusted prices by a factor of 2. If the stock options were issued at the money, their unadjusted strike price now results the double of the adjusted market price. So we need to adjust the strike price and the number of *ESO*s outstanding to perform a consistent fair value estimation using adjusted market prices.

22. Prior research (e.g., Landsman et al., 2006) usually consider an aggregate amount of *ESO*s outstanding at the estimation dates, as if it was a single option with its own expected term (usually assumed equal to the expected term of the most recent stock options) and strike price (corresponding to a weighted average of strike prices of existing *ESO*s). Moreover, the variation of the fair value of this aggregate of *ESO*s is calculated as the simple difference between the fair value at the end and at the beginning of the period, without taking in account the effect due to *ESO*s exercised and issued during the period.

23. For example, assume that at the beginning of the period the total fair value of existing stock options is 300 and that all of these stock options are exercised during the period. The fair value at the exercise date is 280. The actual variation of the fair value is − 20 (= 280–300). If we measure the variation of the fair value simply as the difference between the fair value at the end and at the beginning of the fiscal year end, we get − 300 (= 0–300), because at the end of the period the *ESO*s disappear (they are already exercised) and their fair value is implicitly assumed to be zero.

24. Usually the security underlying a stock option refers to the shares of the company object of analysis. In some cases stock option are written by parent companies on the shares of their subsidiaries or are issued directly by the subsidiaries on their own shares (sometime denominated in a different currency too).

25. As stated above, we employee a modified Black–Scholes model to estimate the fair value of stock options at the grant date and at each of the estimation dates (2004, 2005 and 2006 fiscal year end). Our analytical fair value estimation takes in account the specific features (expected term, strike price, etc.), which characterized the different tranches of the granted *ESO*s.

26. We highlight that the net income used to calculate the residual income is "grossed up" of the amount of *ESO* expenses effectively disclosed in the financial statement footnotes and recorded in the income statement for the specific year. Only in few cases the accrued amount was not available; in those cases we used our own estimation of the *ESO* expense (the amortization of the fair value at issue estimated by applying a modified Black–Scholes model and using our own assumptions in determining the relative input variables).