DO STOCK OPTION PLANS AFFECT THE FIRM'S PERFORMANCE?
AN EMPIRICAL ANALYSIS ON THE ITALIAN CONTEXT

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Abstract

This study investigates the impact of stock option plans, defined as share-based incentive contracts provided by companies to their employees, on the value relevance of accounting information. The purpose of this study is to analyse the extent to which the value relevance of accounting information is affected by the adoption of stock option plans.

Using panel data, the empirical analysis shows that the value relevance of accounting information is affected by the adoption of stock option plans. They are seen by the market as a "cost" and not as an opportunity or an attempt to align different interests. In addition, the research results show that the market performance does not seem affected by the design of the stock option plans. However, the firm's market performance appears to be more related to the structure of the stock option plans in companies with a higher market capitalization. Thus further research is needed to deeper investigate the impact of the design of the stock option plans and the effect of the endogenous characters.

Keywords: Stock Option, Firm's Performance, Italy

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1. Introduction

Accounting literature defines the value relevance of financial information as the ability of accounting numbers to capture or summarize information that affects stock prices (e.g., Sami and Zhow, 2004). Previous researchers, using an empirical approach, have characterized the value relevance of accounting information as a statistical association between stock market values and accounting numbers (see, for example, Chang, 1999; Core, Guay and Buskirk, 2003; Francis and Schipper, 1999; Kothari and Shanken, 2003). These studies claim that accounting information which is able to change investors' expectations and modify decision makers' behaviour is value relevant.

Basic research maintains that both earnings and book values are important in equity valuation (Barth, Landsman and Lang, 2008; Choi 2007; Feltham and Ohlson, 1996; Gelb and Zarowin, 2002; Kothari and Zimmerman, 1995; Lin and Chen, 2005; Ohlson, 1995; Ou and Sepe, 2002).

Recently, a new stream of research focuses on investigating the effects of different life cycle stages on the value relevance of financial and non-financial information across industries (e.g., Chang and Kim, 2013; Chen, Chang and Fu, 2010; Hellström, 2006; Keener, 2011; Xu, 2007) and during the economic cycle (e.g., Beisland, 2013; Beltratti, Spear and Szabob, 2013; Bepari, Rahman and Mollik, 2013; Devalle, 2012; Paquita, Friday, Eng and Liu, 2006).

Assuming that accounting information disclosed to the financial market and investors' expectations is the driving force behind investment decisions (Beinsland and Hamberg, 2013) and that investors evaluate the firm's financial performance before making an investment decision (Chen *et al.*, 2010), this study considers the financial statements to be the main source of accounting information utilized by investors. Based on this assumption, the research investigates the usefulness of accounting information to investors, adding the question of the

separation between property rights and resource control.

The latter question seems to be a corporate governance matter (Melis, Carta and Gaia, 2012). Under the optimal contracting view, the adoption of a stock option plan would help the market to exercise its function of allowing the stock price to reflect the quality of the manager's action (Edmans and Gabaix, 2011; Jensen and Mekling, 1976; Murphy, 1999 and 2002; Nyberg, Fulmer, and Gerhart, 2010). However, the rent extraction view considers the remuneration paid through stock options to be a tool that allows managers to extract personal rents. Therefore, the stock option plan can lead to the adoption of inefficient compensation systems that provide incentives not related to effective management or financial performance (Bebchuk, Fried and Walker, 2001 and 2002; Edlin and Stiglitz, 1995; Hall and Murphy, 2002 and 2003; Jensen, Murphy and Wruck, 2004). The "camouflage effect" would be limited by greater transparency of stock option plans (Fried, 2008). Specifically, more information about costs and general characteristics of stock option plans would limit opportunistic behaviour of managers, making it difficult for them to use these tools for the extraction of personal rents (Heron and Lie, 2007 and 2009).

So, the link between a firm's performance and their stock option plan appears to be fundamental. In this context, beside the value relevance literature which does not pay attention to this question, some accounting scholars focused on either the short and medium term effect. The former streaming of research uses the event study methodology to calculate the abnormal return of stock price (Ding and Sun, 2001; Gerety, Hoi and Robin, 2001; Kato, Lemmon, Luo, and Schallheim, 2005; Ikäheimo, Kjellman, Holmberg and Jussila, 2004; Langman, 2007), while the latter focused, alternatively, on the medium term performance expressed by the financial ratio or stock market return as a dependent variable (Bulan, Sanyal and Yan, 2010; Duffhues and Kabir, 2008; Hillegeist and Penalva, 2004; Ozkan, 2009; Smith and Swan, 2008; Sanders and Hambrick, 2007).

Therefore, the purpose of this study is to analyse the extent to which the value relevance of accounting information is affected by the adoption of stock option plans based on the framework provided by Ohlson (1995). To this end we compared firms that adopt stock option plans with those that do not. Furthermore, we introduced a specific variable (Structure of Stock Option) intended to evaluate each stock option assignment in term of the optimal contracting view, looking at the ability of the market to discount this information.

Using panel data, the empirical analysis demonstrated that market price appears to be sensitive to income variable and financial return of investment (i.e., EBITDA out of Asset), and not related to financial position (i.e., leverage) or short term returns (i.e., dividends). This means that investors seem to be more interested in the long-term sustainability of production and believe that the firm's effectiveness and efficiency are factors that reduce market uncertainty and investment risk.

Stock option plans are seen by the market as a "cost" and not as an opportunity or an attempt to align different interests. This result is reinforced by the interaction between the stock option grant and the EBITDA variable. This means that the market discounts positively the stock option grant if the cost associated with the risk of extracting personal rent is covered by the achievement of profitability. The structure of the stock option itself does not appear to be value relevant. As we will discuss below, the structure of stock options would be relevant using OLS regression but just for the high capitalized firms.

The paper is organized as follows: the subsequent Section is dedicated to a literature review on the value relevance of accounting information. Section three analyses the literature on stock option plans. Section four discusses the hypotheses development. Section five describes the sample and data selection. Section six outlines the research methods employed. Section seven presents the research results and provides a discussion of the empirical analysis. Section eight concludes with a summary of the research findings and outlines the potential implications for further research.

2. The value relevance of accounting information

A large number of studies assess the relationship between stock market values and accounting numbers and are often referred to as value relevance studies (Barth *et al.*, 2008; Gelb and Zarowin, 2002; Holthausen and Watts, 2001; Ou and Sepe, 2002).

Traditionally the research on value relevance analyses the stock market value at a point in time as a function of a set of accounting variables such as assets, liabilities, revenues, expenses and net income (e.g., Barth, Beaver, Hand and Landsman, 2004; Beaver, 1968 and 2002, Mechelli, 2013). Thus, statistical associations between accounting information and stock prices are used to assess the degree of value relevance of accounting information for investors (Collins, Maydew and Weiss, 1997).

Earnings persistence has been identified as one major determinant of the magnitude of the earnings-returns relation. Various studies have demonstrated that earnings relate to stock prices (e.g., Ball and Brown, 1968; Beaver, 1968; Collins and Kothari, 1989; Kothari, 1992; Kothari and

Sloan, 1992; Lipe, 1990; Lipe, Bryant and Widener, 1998). The measure of this statistical association is represented by the aggregated coefficient on the future earnings changes. According to Gelb and Zarowin (2002), we refer to this measure as the future Earnings Response Coefficient (ERC). The variation can be explained by several factors, such as risk, growth, earnings persistence and interest rate (Collins and Kothari, 1989; Easton and Zmijewski, 1989). Several studies, using the principles of the Capital Asset Pricing Model, have shown that the ERC is a function of the risk-free rate and the business risk. These studies have identified a negative relationship between ERC and stock prices (Collins and Kothari, 1989; Kothari and Zimmerman, 1995). This implies that stock prices are more sensitive to earnings if the capital market requires a lower risk premium (Biddle and Seow, 1991).

Some studies highlight that the relationship depends on the quality of the accounting data (Ahearne, Griever and Warnock, 2004; Ahmed, 1994; Basu, 1997). In particular, scholars have shown how earnings transfer negative information to the capital market faster than positive information, which has led them to question accounting policy. In fact, overly conservative financial statements do not allow the capital market to perceive the real potential of the business development (Givoly and Hyan, 2000; Holthausen and Watts, 2001; Penman and Zhang, 2002).

Nevertheless, a simple earnings capitalization model, without incorporating book value, is likely misleading because book value is believed to be a value-relevant factor. Many studies have found that assets and liabilities relate to stock prices (Amir, Harris and Venuti, 1993; Cornell and Landsman, 2003; Francis and Schipper, 1999; Landsman and Magliolo, 1988). When a firm is viewed with growing concern by the market, its book value acts as a proxy for expected future normal earnings (Ohlson, 1995). The book value is a proxy for the marketable value and/or the adaptation value of equity (e.g., Barth *et al.*, 2004; Barth, Beaver and Landsman, 1998; Burgstahler and Dichev, 1997; Penman 1998; Ou and Sepe, 2002). For example, Penman (1998) has shown that, on average, book values carry more weight than earnings when performing equity valuation for firms with an extreme earnings-to-book ratio (i.e., return on equity). Barth *et al.* (1998) has demonstrated that in pricing book value multiples, the incremental explanatory power of book value (earnings) increases (decreases) when a firm's financial health deteriorates.

Given the significant role that book value plays, it follows that when a firm's current earnings are not perceived as a good indicator of future earnings, due to a large temporary item in current earnings or a change in the firm's future prospects

(such as an increased likelihood of liquidation), investors will likely turn to book value for guidance in evaluation (Choi, 2007). This shows that a lesser degree of the firm's financial autonomy corresponds to a greater degree of conservatism and a higher value relevance of accounting information (Mason, 2004; Zhang, 2000). Hence, we can argue that the significance of accounting data is a function of the degree of firm indebtedness. The value relevance of book value will increase in this situation (Lin and Chen, 2005; Callao, Jarne and Lainez, 2007; Choi 2007; Devalle and Magarini, 2012). Moreover, Collins *et al.* (1997) have found that over a forty year window the value relevance of earnings has diminished and been replaced by an increase in the value relevance of book values.

Another question regards the changes of value relevance over time and the related causes (Collins *et al.*, 1997; Francis and Schipper, 1999; Landsman and Maydew, 2002). Both Amir and Lev (1996) and Lev and Zarowin (1999) have claimed that financial accounting information has less relevance for service and technological companies in which intangible factors are not captured by accounting standards that require an expense to book intangible assets. Hence, the increased number of technological and service industries over time may affect the value relevance of earnings and book values due to the relevance of un-monitored intangible assets (Xu, Anandarajan and Curatola, 2011).

Elliot and Hanna (1996) have emphasized that there has been an increase in the number of special income items reported by companies over time. A large number of special items may influence the value relevance of earnings and book values over time. Furthermore, Ohlson (1995) has indicated that the decrease in the persistence of earnings connected with the increase in the number of special items may cause decreased relevance of earnings.

Dontoh, Radhakrishnan and Ronen (2004), on the other hand, has suggested that the decline in the value relevance of accounting information over time has been "driven by an increase in non-information-based trading". This criticism argues that the evaluation of the economic value of net assets depends on the long-term horizon, whereas accounting information, such as income, book value and dividends, relates to the short-term period (Kumar and Krishnan, 2008).

Nevertheless, many studies argue that in more realistic settings with market imperfections, accounting systems can provide information about book value and earnings which are complementary components of equity value rather than redundant (Aboody, Hughes and Liu, 2002; Bae and Jeong, 2007; Chang, 1999; Feltham and Ohlson, 1996; Ohlson, 1995; Pennman, 1998).

The general framework of the value relevance studies is provided by Ohlson (1995), who expresses the stock price as a function of both earnings and book value of equity.

Given a dividend valuation model and clean surplus accounting, stock price can be written as a linear function of earnings and book value of equity according to the Ohlson model. In this model, abnormal returns (earnings minus cost of booked capital) drive investors' decisions, even if they are expected to be zero in a fully competitive market. Ohlson (1995) has suggested that, as long as forecasts of earnings, book values and dividends follow clean surplus accounting (i.e., $bv_t = bv_{t-1} + x_t - d_t$), stock prices should be determined by book values and discounted future abnormal earnings:

(1)

$$P_t = bv_t + \sum_{i=1}^{\infty} R_f^{-i} E_t[x_{t+i}^a]$$

where, P_t denotes the share price at time t; bv_t denotes the book value per share at time t; R_f is 1 plus the risk premium; E_t represents the investors' expectation at time t; x_{t+i}^α represents abnormal earnings per share in period $t + i$; and d_t denotes the dividend per share at time t.

A large number of studies have highlighted the role that accounting information plays in capital markets (e.g., Barth *et al.*, 2008; Kothari, 2001). Other studies have shown that the value relevance of accounting information may be sensitive to variations in financial economic conditions. For instance, it has been suggested that value relevance is affected by a financial crisis (Beisland, 2013; Beltratti *et al.*, 2013; Bepari *et al.*, 2013; Devalle, 2012; Davis-Friday and Gordon, 2005; Giosi, Testarmata and Buscema, 2013), and it is generally influenced by the financial health of firms (Barth *et al.*, 1998).

The recent empirical results are mixed with respect to the impact of a financial crisis on the value relevance of accounting information (Özkan and Balsari, 2010). Some studies show that the value relevance of accounting information is significantly lower during a financial crisis (Lim, Walker, Lee and Kausar, 2011). On the contrary, other studies argue that a financial crisis has a positive impact on the value relevance of accounting information (Beltratti *et al.*, 2013; Bepari *et al.*, 2013; Devalle, 2012).

A financial crisis causes an increase in investment uncertainty, market variability and volatility of stock price (Jenkins, Kane and Velury, 2009). Hence, it is possible to predict a deterioration of the value relevance and reliability

of accounting information in investors' equity valuation decisions (Barth, Beaver and Landsman, 2001; Barth, Cram and Nelson, 2001). Moreover, a financial crisis shows a lack of transparency resulting in a widespread decline in investor confidence. This phenomenon may lead to liquidity shortages and stock market crashes (Giosi, Di Carlo, Staglianò, 2012).

3. Agency Costs, Stock Option Plans (SOPs) design and firm's performance

The adoption of stock option plans (SOPs) seems to be a solution for the principal-agent problem that had characterized public companies in the twentieth century (see, for example, Adjaoud and Ben-amar, 2010; Agrawal and Knoeber, 1996; Alvarez-Perez and Neira-Fontela 2005). The question has been that the power of agent based on asymmetric information determines opportunistic behaviour aimed at extracting personal benefit (Jensen and Meckling, 1976). The problem of misaligned interest arises and brings to light the importance of the structure of executive remuneration contracts (Anderson and Bizjak, 2003; Armstrong and Vashishtha, 2012).

The agency theory provides the basis to write down incentive contracts based on stock remuneration with the goal of reinforcing the market control function (Baker, Jensen and Murphy, 1988; Fama and Jensen, 1983). As a consequence, the manager obtains market value that reflects the success of its action. Even if the contract is a secondary source of agency cost (Jensen *et al.*, 2004), there still exists the fundamental question of the contract structure as well as the governance environment through which the contract was developed (Baker, 1940; Baker, Gibbons and Murphy, 2002; Dicks, 2012).

In fact, the SOPs appear instrumental to enhance corporate governance (Core *et al.*, 2003) but, at the same time, the contract design reflects corporate governance arrangements (Gabaix and Landier, 2008) and emphasizes either the optimal contracting view or the rent extraction view (Bebchuk *et al.*, 2001 and 2002; La Porta, Lopez-De-Silanes and Shleifer, 1999; Melis *et al.*, 2012; Zattoni and Minichilli, 2009). In the latter case the Executive Directors have the power to influence their own remuneration, and can exploit this power to extract additional rents at the expense of the shareholders (Bebchuck *et al.*, 2002) in firms with either concentrated or widespread ownership.

Zattoni (2007) points out the characteristics of the SOPs design needed to reach the alignment of agent and principal interests and to ensure medium-long term value, that is stock option design in terms of the optimal contracting view avoiding a camouflage effect. These characteristics are: identity of the SOP beneficiary, length of vesting

periods and presence of lock-up mechanism, and performance conditioned vesting or indexed exercise price.

While the identity of the SOP beneficiary seems relevant in the corporate governance studies, the others characteristics appears more significant to our aim.

First of all, the vesting period is related to the process of value creation. If the goal is to align interests in the medium term, the remuneration must be linked to the stock return and future cash flows. Therefore, the analysis of the stock return over a long period is also fundamental to avoid earnings management policies that hide a myopic manager's actions and are not priced by the market (Ronen, Tzur and Yaari, 2006). Stock price does not fully reflect short term firm performance due to both earnings management policies and market fluctuation; hence, long term remuneration contracts are needed to motivate managers toward long term value creation and offer more information to the principal about the outcome of a manager's behaviour (Peng and Roell, 2008).

The presence of the lock-up mechanism reinforces the contract in terms of optimal contracting theory (Hoi and Robin, 2004). The creation of "sustainable" shareholder value relates to the link between stock price, market trend and firm performance. The optimal contracting view requires that stock market price reflects firm performance (Kuang and Quin, 2009) and that the manager's remuneration does not discount market trend not due to the manager's action (Bertrand and Mullainathan, 2001). This is done by means of including a firm performance conditioned vesting ratio and indexed exercise price in the contract design.

With reference to the existing link between performance and stock option grant, the literature focused both on short and medium term.

The first stream of literature, based on event study methodology and cumulative abnormal return measures, focuses mainly on the market reaction to the stock option adoption and assignment. The research results do not seem univocal. Early studies, mainly focused on the U.S. market, found a positive market reaction that was independent from the contract design and not affected by the type of stock plan adopted by the firm (Defusco, Johnson and Zorn, 1990; Larcker, 1983). Further literature, on the other hand, has not reported a significant reaction, likely due to the lack of disclosure that characterizes stock option plans (Gaver, Gaver and Battistel, 1992; Street and Cereola, 2004). More recently, Gerety *et al.* (2001) have concluded that market reaction is insignificant and, hence, shareholders do not benefit from such plans.

Most recent papers have focused on non U.S. markets. In Asian and European countries a positive reaction of the market to the adoption of stock option plans seems prevalent (Ding and Sun, 2001; Kato *et al.*, 2005; Langman, 2007). Moreover, Ikäheimo *et al.* (2004) have underlined that the market reaction is affected by the type of announcement, the type of beneficiary and, more important, the dilution effect. They have reported that stock option plans with limited dilution effect convey positive information to the market, while plans targeting employees are negatively perceived. These conclusions are supported by Triki and Ureche-Rangau (2012) for the French market. They have found that the market reacts positively over short windows, and renewals of stock option plans do not convey new information.

The second stream of literature focuses on the effect of SOPs on corporate long-term performance as measured by long term accounting ratios or stock market returns, usually determined over three years. Even this stream shows mixed results. Cromier, Magnan and Fall (1999) have shown a positive relation with stock return even if dependent on shareholders' control, while Hillegeist and Penalva (2004) have reported a positive and significant relation among SOPs, ROA and Tobin's Q (see also Duffhues and Kabir, 2008; Ozkan, 2009 Smith and Swan, 2008). Conversely, other authors found a negative relation (Bulan *et al.*, 2010; Sanders and Hambrick, 2007) or an insignificant relation (Hamouda, 2006; Triki and Ureche-Rangau, 2012), even in the case of managerial stock ownership (Himmelberg, Hubbard and Palia, 1999).

Hamouda (2006) found a positive effect only when the options benefit the firm's executives, while Triki and Ureche-Rangau (2012) have not been able to separate options assigned to executives versus other employees. They have reported that the coefficients of the grant size and grant value variables (analysed separately) are insignificant, which suggests that the characteristics of stock option plans have no significant effects on the firm's long term accounting performance and stock return. Melis *et al.* (2012), on the other hand, have found that stock option plan design does not affect the medium term trend of firm performance.

Lam and Chng (2006) have stressed the lack of studies on the association between firm performance and stock option and have reported interesting results. They have analysed the motivations of the stock option plans as value enhancement, risk taking, tax saving, signalling and cash conservation. In particular, the principal-agent model predicts value enhancement for firms that adopt an incentive alignment mechanism. The agency theory predicts that managerial discretion depends on the resources managed by directors. So, Lam and Chng (2006) have identified firm size, capital intensity, market power, growth opportunities, and R&D and advertisement expenses as sources of managerial discretion.

According to Himmelberg, Hubbard and Palia (1999), these variables are used as instrumental variables able to control endogenous factors that may influence the relation between a stock option grant and performance, that is value enhancement motivation. In this model the value of the stock option (independent variable) is expressed as a function of variables related to specific motivation over panel data covering a ten year period. They found that firms grant stock options for their value enhancement, controlling for endogenous factors. Indeed, they found a convex relation between firm performance and stock option grants, wherein the firm's performance tends to decrease before increasing.

4. Gap Analysis and Hypotheses Development

Following the debate described above we are able to highlight some gaps emerging from the literature review. Firstly, the value relevance literature does not pose any questions about stock option plans. On the other hand, the corporate governance literature has only recently analysed the design of stock option plans. As argued by Melis *et al.* (2012), previous studies on ownership control focused on the adoption of stock options without paying attention to the contract design. Notwithstanding, even though considering contract design in the regression models, this variable used as independent variable reduced the stock option plans to a dummy variable without any quantitative evaluation of each stock option plans.

In reference to long term financial performance, these studies have focused more on long term trends of financial performance ratios rather than on stock return, which is investigated mainly in the short term. Moreover, these studies have not taken the value relevance approach that recognized yearly the relation between market performance and accounting information during a defined period. Furthermore, even if they consider the endogenous factors as instrumental variables aiming at controlling the relation within the regression model, such as firm and market characteristics, they do not consider the elements of design of stock option plans in the relations among variables. In fact, these studies seems limited to the consideration of the grant size or the value of stock option plans.

Stemming from these considerations, the objective of this paper is to test the following hypotheses according to the value relevance approach:

H_{1a}: *The adoption of stock option plans produces "value relevant" information;*

H_{1b}: *The value relevance of accounting information is affected by the adoption of stock option plans;*

H_2: *The design of stock option plans expressed in terms of the optimal contracting view affects market performance;*

H_3: *There are endogenous characteristics that affect the relevance of the design of stock option plans.*

While the predicted sign of the hypotheses H_{1a}, H_{1b} and H_2 is expected to be positive, we are not able to give an estimation of the sign of the H_3.

5. Sample and data selection

The study considers a sample of 147 firms listed in the Milan Stock Exchange excluding banks and insurance companies. Banks, insurance firms and other financial institutions were eliminated in view of the ownership peculiarities of the financial industry (Faccio and Lang, 2002) and their specific corporate governance regulation. We did not consider companies delisted during the period or companies with missing data.

The study considers 195 stock option plans, related to 63 companies that assigned stock options during the period 2007-2012. From this sample we eliminated stock option grants, which are similar to stock options but without an exercise price. Since some firms granted more than one SOP during the observed period, our final sample comprises 141 SOPs granted during the period 2007-2012.

As argued by Zattoni (2007) there is incomplete data information on the SOPs granted by Italian listed firms and consequently a lack of empirical studies on SOPs. For this reason we used many primary research sources by hand-collecting stock options data from companies' prospectuses according to Scheme 7 of Annex 3A of Consob Regulation n. 11971/1999. Other financial data was gathered from secondary research sources, such as the websites and the official documents provided by the Italian listed companies, the Milan Stock Exchange, Consob (Stock Exchange Commission) and Datastream platform.

6. Research Methods

Our database is a panel data set that follows a given sample of individuals over time, and thus provides multiple observations on each individual in the sample (Hsiao, 2003). Our panel data is balanced because we have the same time periods (i.e., t = 1, ..., T) for each cross-section observation. This study focuses on panels with relatively short time periods (2007-2012) and many individuals.

Panel data usually gives the researcher a large number of data points, increasing the degree of freedom and reducing the collinearity among explanatory variables, improving the efficiency of econometric estimates. More importantly, longitudinal data allows the researcher to analyse a number of relevant economic questions that cannot

be addressed using cross-sectional or time-series data sets.

The oft-touted power of panel data arises from its theoretical ability to isolate the effects of specific actions, treatments, or, more in general, policies. Therefore, the regression equation used in the study of convergence has been reformulated into a dynamic panel data model with individual (country) effects (Hausman and Taylor, 1981; Mundlak, 1978).

Moreover, this study uses the fixed-effects (FEs) because the analysis focuses on investigating the impact of accounting variables that vary over time. Statistically, FEs explore the relationship between predictor and outcome variables within an entity (country, person, company, etc.). Each entity has its own individual characteristics that may or may not influence the predictor. The underlying assumption of the FEs' use is that something within the individual may impact or bias the predictor or outcome variables and a control for this is needed. This is the rationale behind the assumption of the correlation between an entity's error term and predictor variables. Therefore, the use of FEs removes the effect of those time-invariant characteristics from the predictor variables in order to assess the predictors' net effect. Another relevant assumption of the FEs model is that those time-invariant characteristics are unique to the individual and should not be correlated with other individual characteristics. Each entity is different and, hence, the entity's error term and the constant (that captures the individual characteristics) should not be correlated with the others.

Therefore, this study proposes a multivariate regression models analysis to verify our hypotheses. The models are multivariate and preferred to a univariate one (Sami and Zhou, 2004). Hence, to test our hypothesis, we propose the following multivariate regression equation:

$$(2)\ P_{i(t)} = \beta_0 + \beta_1 LEV_{it} + \beta_2 EBITDA_{it} + \beta_3 DIVYIELD_{it} + \beta_4 Str.S.O._{·it} + \beta_5 DS.O._{·it} + \beta_6 DCAP._{·it} + \beta_1'^{DS.O._{·it}} LEV_{it} + \beta_2' DS.O_{it}.EBTDA_{it} + \beta_3' DS.O._{·it}\ DIVYIELD_{it} + \beta_4' Str.S.O._{·it}\ DCAP_{it} + \varepsilon_i$$

where the variables are defined as follows:
- Dependent variable:
- $P_{i(t)}$: price per common share, at the end of December of the following year;
- Independent variables:
- LEV_{it} : the current year's Leverage;
- $EBITDA_{it}$: the current year's Earnings Before Taxes, Depreciations and Amortisations (divided by total asset);
- $DIVYIELD_{it}$: the current year's dividend-price ratio;

- $Str.S.O._{·it}$: Structure of stock option, constructed as a measure to classify stock option plans.
- $D.S.O._{·it}$: dummy variable related to stock option.
- $DCAP._{it}$: dummy variable related to market capitalization

6.1 Accounting information choice as independent variables

First, we introduce leverage to verify if the level of debt is more value relevant during a period of financial crisis. Value relevance studies have emphasized that a greater financial exposure increases the importance of the reported accounting data (Choi, 2007; Holthausen and Watts, 2001). Choi (2007) has shown that a lower degree of a firm's financial autonomy corresponds to a greater degree of conservatism and higher value relevance of accounting information. Hence, we can argue that the significance of accounting information is a function of the degree of indebtedness. In this context, lenders prefer the adoption of very conservative accounting that reveals economic difficulties in advance and limits the subjectivity of the assessments, so that credit risk is more directly perceptible. Creditors and lenders could be more interested in valuing a firm's debt and default likelihood than in valuing the firm's stock prices (Holthausen and Watts, 2001). Finally, in a period of financial crisis, firms with high financial exposure are more risky and, thus, leverage could be more value relevant.

Second, we have chosen the EBITDA variable because most analysed companies that granted stock option during the period find that index a useful measure to align different interests. So EBITDA is the most cited performance indicator in the stock option plans (42 times). We divided EBITDA by TOTAL ASSET with the aim to consider the profitability and size of each company. Value relevance studies pay a lot of attention to the relation between the changes in the stock market values and the creation of new wealth as expressed by the accounting system. Therefore β_2 represents the *Earnings Response Coefficient* (ERC) and expresses the relation between market yield and earnings.

Third, we have chosen the DIVDEND YIELD variable for two reasons: dividends are used as a control tool by the management team and, in accordance with value relevance perspective, dividend is related to book value (Ohlson, 1995). Therefore, we substitute the book value per share (BVS) with the dividend per share (DPS). Dividends paid today influence the future expected earnings, so this variable is also related to the achievement of profitability. Thus our model separates the creation of wealth from the

distribution of wealth by considering the impact of these variables on share price mainly when companies adopt stock option plans.

6.2 Structure stock option variable

A greater degree of specification is required if we take into account the construction of the variable Str. S.O. The index was constructed as follows: we have analysed 195 stock .option plans related to 63 companies that assign stock options during the period 2007-2012. From this sample we eliminated the stock option grants, which are similar to stock options but without an exercise price. The result is a sub-sample of 141 plans. With the aim to summarize the key features of these plans we have constructed the variable taking into account:

- Vesting Period (V.P.)
- Dilutive Effect on Number of Shares (D.E.)
- The difference between market price and exercise price (DIFF.)

For those companies that had more than one assigned option per year, we weighted the variables to consider the cumulative effect deriving from different plans in each year. The variables are evaluated in terms of company perspective in accordance with the optimal contracting view.

Vesting Period (V.P.) is the period between the granting of stock options and the first possible date for their exercise. If we consider the optimal contracting view perspective we assume that: "Long vesting periods will produce a greater effect on these stock option plans". For this reason we assume that coefficient with a positive sign (+) in order to make the Str.S.O. variable and we have weighted the vesting periods in order to assign a high value to the longer vesting periods.

Dilutive Effect on Total Number of Shares (D.E.). We compute that value as follow: N° of S. related to S.O. plan / Total N° of S. This index allows us to evaluate the quantitative impact of these tools. For this reason we have taken this value with a positive sign (+).

The difference between market price and exercise price at the date of assignment (DIFF.). If:

- Mkt.Price < Ex.Price (out of the money). If market price is less than exercise price there is a gain for the individual (rent extraction view).
- Mkt.Price = Ex.Price (at the money). In this case manager and companies are in a neutral position.
- Mkt.Price > Ex.Price (in the money). If market price is greater than exercise price, there is a gain for the companies. The agents will be more motivated to increase market value in order to be able to exercise their stock option (optimal contracting view).

Considering the optimal contracting view perspective we have taken this value with the opposite sign (-). Then we calculated the following linear relation:

$$Str.S.O.i(t) = +V.P._{it} + D.E._{it} - DIFF._{it}$$

Moreover, using panel data, the study considers the time effects on accounting variables for a robust analysis. Finally, we introduce in the model two dummy variables, named $D.S.O._{it}$ e $DCAP._{it}$. $D.S.O._{it}$ is a dummy variable introduced in order to compute the gap of performance between the companies that adopt stock option plans in the period considered and the other companies. The dummy is equal to 0 for companies that do not adopt plans and 1 for companies that adopt these plans. $DCAP._{it}$ is a dummy variable related to the median of market capitalization of those companies that adopt stock option plans in the period analysed. It is equal to 1 if the market capitalization of a company that granted these compensation tools is higher than the median value of the total distribution. To introduce the interaction between the independent variables and $D.S.O._{it}$, we add as many dummy variables as there are independent variables. The dummy variables are calculated as the multiplication with the independent variables. Regarding $DCAP._{it}$ we considered only the interaction $Str.S.O._{it} * DCAP._{it}$ with the aim to capture results for companies with a high market capitalization that adopt stock option. Our assumption is that: "Firms with greater market capitalization have a greater influence on the disclosure and therefore on stock market".

We based our first analysis on a panel data model, controlling for firm fixed effects and removing all cross-sectional variation. In panel data analysis, the term "fixed effects estimator" (also known as the "within estimator") is used to refer to an estimator for the coefficients in the regression model. If we assume fixed effects, we impose time independent effects for each entity that is possibly correlated with the regressors. Such a test would fail to capture any meaningful relation between firm performance and the use of these tools, even if one existed.

Furthermore, Zhou (2001) argues that the assumption that firm performance is dependent on year-to-year variations contradicts the principal-agent model, whereby executives maximize their utility through efforts that can be predicted by firm characteristics. The cross-sectional data offers an estimate of the independent variables variation related to the dependent variables variation but does not consider the characteristics of each firm, while firm fixed effects in panel data control for the endogenous character of each firm.

Therefore, given the above discussion, we will use both panel data and cross-sectional in our evaluation.

7. Research findings

In order to ensure the absence of a linear relation among the variables we calculated the Pearson correlation. The resulting matrix shows a low degree of correlation among the variables, confirming the validity of the regression model (Table 1). Concerning the robustness of the analysis, we have also examined the multicollinearity risk among independent variables. The problem arises because in non-experimental situations, the explanatory variables in a regression equation are often highly correlated. The presence of high multicollinearity involves the change in the value of the estimate of regression coefficient to a slight modification of the observed values. When some or all of the variables are perfectly collinear, the ordinary least-squares (OLS) estimator of the parameters cannot be obtained as there is no unique solution to the normal equations.

Several indicators of multicollinearity are known in literature, but none of them can be regarded as a synthetic and normalized indicator. One of the most frequently used indicators is *VIF* (*Variance Inflation Factor*):

$$(3) \qquad VIF_j = \frac{1}{1-R_j^2}$$

VIF is not a synthetic indicator as it is calculated for each explanatory variable. If the explanatory variable j_{th} is linearly independent from the other explanatory variables, its value equals 1. In the case of extreme multicollinearity the value of the VIF indicator is infinite (Kovács, Petres and Tòth, 2005).

The research results exclude the multicollinearity among independent variables as illustrated in Table 1. This fact is confirmed by the values resulting from the VIF analysis. The highest value is assumed by $Str.S.O$ (3.9), even if it does not appear high in absolute terms.

Table 1. Correlation and VIF analysis

	P	LEV	EBITDA	DIVY.	StrSO	DSO	DCAP		VIF	
P	1.00							**VIF**		
LEV	-0.01	1.00						**LEV**		1,006
EBITDA	0.12	-0.01	1.00					**EBITDA**		1,441
DIVY.	0.01	-0.03	0.24	1.00				**DIVYIELD**		1,858
StrSO	0.05	-0.02	0.18	0.09	1.00			**StrSO**		3,918
DSO	0.04	-0.02	0.19	0.14	0.85	1.00		**DSO**		8,036
DCAP	0.14	-0.01	0.21	0.19	0.49	0.64	1.00			

Source: Our elaboration.

First model

The results of our analysis highlight four main points. Considering the panel data analysis, we have found a statistically significant and positive coefficient for the *EBITDA* variable. This result shows that the stock market reacts positively (in terms of share price) to an increase in profitability ratios.

The coefficient of *DS.O.* is negative and statistically significant. This means that the stock option plan is seen by the market as a "cost" and not as an opportunity or an attempt to align different interests. This result is more appropriate to explain the rent extraction view, while it is quite far from the optimal contracting view.

The structure of the stock option plan defined in terms of the optimal contracting perspective does not seem significant.

However, the coefficient of the variable $DS.O.*EBITDA$ shows that the achievement of profit generates a multiplicative effect on the stock price for companies that adopt these tools. This means that, despite the adoption of stock option plans being seen as a cost associated with the risk of extracting personal rent, this cost must be covered by the achievement of profitability.

Analysing the statistical coefficients reported in Table 2 we can see that R-Squared has a relatively low value, as was our expectation. Statistical literature agrees that for panel data it is quite rare to find measures to adapt to the data (Wooldridge, 2002). P-value assumes a value close to 0; for this reason we can reject the null hypothesis, so the regression slope is statistically different from 0.

Table 2. Output of the Panel Model

Balanced Panel: n=147, T=6, N=882
Residuals :
Min. 1st Qu. Median 3rd Qu.   Max.
-26.900 -1.180 -0.150 0.915 39.100
Coefficients :
Estimate Std. Error t-value Pr(>|t|)
LEV   0.0062232 0.0141961 0.4384 0.6612435
EBITDA   11.4799814 2.9914288 3.8376 0.0001351 ***
DIVYIELD   0.1310190 0.0900738 1.4546 0.1462195
StrSO   0.2210234 0.2953736 0.7483 0.4545312
DSO   -6.2937520 2.2275539 -2.8254 0.0048517 **
LEV:DSO   0.2208110 0.4231719 0.5218 0.6019689
EBITDA:DSO 15.6915159 7.3430521 2.1369 0.0329381 *
DIVYIELD:DSO 0.0566560 0.1328087 0.4266 0.6697983
StrSO:DCAP -0.1872114 0.4601221 -0.4069 0.6842210
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Total Sum of Squares: 18030
Residual Sum of Squares: 16926
R-Squared   : 0.061243
Adj. R-Squared : 0.050411
F-statistic: 5.26252 on 9 and 726 DF,   p-value: 5.7661e-07

Source: Our elaboration.

Table 3. Output of the second model (Cross Sectional Analysis)

Balanced Panel: n=147, T=6, N=882
Residuals :
Min. 1st Qu. Median 3rd Qu.   Max.
-12.167 -4.738 -2.643 0.865   6.840
Coefficients :
Estimate Std. Error t-value Pr(>|t|)
INTERCEPT   5.968967 0.490624 12.166 <2e-16 ***
LEV   -0.006901 0.023054 -0.299 0.7647
EBITDA   4.9666945 3.816714 1.301 0.1935
DIVYIELD   -0.092985 0.116100 -0.801 0.4234
StrSO   -0.121046 0.249331 -0.485 0.6275
DSO   -3.420329 1.827658 -1.871 0.0616 .
LEV:DSO   0.049852 0.367027 0.136 0.8920
EBITDA:DSO 20.504640 8.160702 2.513 0.0122 *
DIVYIELD:DSO -0.022494 0.180254 0.125 0.9007
StrSO:DCAP 1.169261 0.242848 4.815 1.74e-06 ***
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Residual Sum of Squares: 8.729 on 872 degrees of freedom
R-Squared : 0.05635, Adjusted R-squared: 0.04661
F-statistic: 5.786 on 9 and 872 DF, p-value: 7.692e-08

Source: Our elaboration.

Second model

The second model of our analysis examines the same sample, taking into account cross-sectional data analysis that does not consider the endogenous characteristics of each firm and the time dependent.

The results reported in Table 3 show us a positive and statistically significant coefficient if we look at the interaction between 〚Str.S.O.〛_( )*〚DCAP.〛_( ).This means that for the companies with a high market capitalization the stock options plan, during the period, produces a positive effect on the stock market. According to our opinion this

different result obtained with the second model may depend on the construction of the 〚Str.S.O.〛_( )variable. Probably the second model is able to better explain the relation between the variable 〚Str.S.O.〛_( )*〚DCAP.〛_( ) and the response variable.

8. Conclusions and implications for further research

The empirical analysis has produced significant research findings. H_1: "*The S.O. plans produce value relevant* information" is accepted: firms that

grant stock option increase their negative impact on share price. Also the second hypothesis H_{1a}: "*The value relevance of accounting information is affected by the adoption of Stock Option Plans (S.O.)*" is accepted, because the adoption of this tool produces a positive effect in terms of profitability.

On the other hand, if we consider the design of stock option plans, assuming the optimal contracting view, we can see that for this variable there are no significant results, which indicates that the design of a stock option plan does not affect market performance. Therefore H_2: "*The design of stock option plans expressed in terms of the optimal contracting view affects market performance*" is not accepted.

The last hypothesis H_3: "*There are endogenous characteristics that affect the relevance of the design of stock option plans*" confirms the statistical significance of Str.SO if we take into account the company's size in terms of market capitalization. Probably this assumption could result from the greater impact associated with the disclosures of larger firms.

The empirical results of this study raise a number of questions for future research in terms of content and research methods.

In terms of content, further research could refine the $Str.S.O.$ variable, adding variables related to accounting ratios;. Second, we could introduce other variables related to "endogenous characters" such as growth opportunities, intangible assets, R&D intensity as a measure of managerial discretion, volatility of financial market and type of industry. Third, additional studies could consider the evaluation of the annual and cumulative cost of S.O. plans as a change in capital reserves. Finally, further research could introduce the volatility of stock price as a measure of uncertainty.

In terms of methods, future studies could include sensitivity analysis in order to evaluate the price data dependency. In fact, a variety of statistical methods could be used, for example Monte Carlo analysis, bootstrap analysis or rolling parameters analysis. Furthermore, additional research projects could use cluster analysis instead of sensitivity analysis to take into account specific characteristics. Finally, the shift from a price regression model to a return regression model could be useful to avoid any impact that the choice of date might have on stock price in keeping with Beaver's (2002) note of caution that "timing and timeliness of information should not be overestimated". It is not possible to determine which model (price or return) is the best to carry out an unbiased analysis. The choice is generally conditioned by the objectives defined ex-ante (Kothari and Zimmerman, 1995).

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