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The level of CEO compensation for the short and long-term – a view on high-tech firms

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Abstract

This study examines the relationship between corporate performance and the Chief Executive Officer compensation in high-technology firms in the S&P 1500. The total CEO compensation and short and long-term compensations were tested regarding corporate performance. A panel data SUR model is estimated and describes the total compensation and cash compensation as a proportion of total pay for the period between 2000 and 2010 in high-technologies firms. The findings indicate that there is a strong and positive relation between CEO compensation and firm performance. This econometric study provides a better understanding on the relationship between CEO compensation and performance in high-technologies firms.

Keywords: Corporate finance; executive compensation; governance.

1. Introduction

Chief Executive Officer compensation became common in the late 1970s and early 1980s and is often discussed in the literature ever since. Following the financial crises over the world, numerous stories have appeared in the recent financial press pointing out how many executives define our contracts remuneration. These news and striking reports have raised concerns on compensation. Nevertheless, in fact no consensus view has emerged, and there is still much to learn about the determinants of CEO compensation in firms and particularly in high-technology firms.

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In high-technology firms it is possible to find innovation, R&D investments and some assets with essential competitive advantage and there are, at the same time, some risks. Different R&D spending in the firms is indicative of a large variance in the firms' performance. High-tech investment is particularly important because the returns on high-tech investment are skewed and highly uncertain, in part because R&D projects have a low probability to succeed financially. Another reason is the existing asymmetry in information shared between firms and potential investors. This happens because it is difficult to increase high-tech investments and often insiders will have much better information than outsiders about the prospects of the firm's investments. The high-tech investments often have limited value R&D investment, which is predominantly salary payments (Carpenter & Petersen, 2002). For these reasons, and because this subject is pertinent, it is interesting to examine these issues and contribute to the enrichment of research in this area, improving the understanding on CEO compensation.

Moreover, as pointed out by Makri, Lane & Gomez-Mejia (2006) to engage in innovative projects leading to innovations, the incentive schemes play a pivotal role in inducing senior organizational managers. Furthermore, to secure the stream of innovations a firm needs to enhance its economic performance with a proper pay scheme to encourage executives (Makri, Lane, & Gomez-Mejia, 2006). Appropriate incentives can be the tools in many cases, however, by basing compensation on changes in shareholder wealth. According to Graham (2012), managers often have better information than shareholders and boards in terms of identifying investment opportunities and assessing the profitability of potential projects. Furthermore, the fact that managers are expected to make higher investment decisions explains why shareholders relinquish decision rights over their assets by purchasing common stock (Graham, Li, & Qiu, 2012).

This study explores the performance determinants of CEO pays for long-term and short-term periods and points out the influence and behavior of high-tech firms. This work also attempts to examine the systematic difference in CEO pays and the performance expectations of high-tech firms and other firms. Furthermore, this paper examines how high-tech firms behave facing the cash based compensations and total CEO pays related to various performance measurements. The performance measurements pointed in this works are usually the accounting ratios of corporate finance, such as assets and the assets growth, sales, operating income before depreciation, the net income before extraordinary items and discontinued operations, earning per share and common equity. This paper contributes to the under-studied empirical literature on executive compensation for high-tech firms.

The study by Gomez-Mejia *et al.* (2000) was taken into consideration in this paper, especially how they conclude that high-technology industry executives may be more rewarded for innovation activity than for financial firm performance. The executive incentives induce higher risk and cannot bear the financial risk associated as a consequence of those actions (Gomez-Mejia, Gideon, & Balkin, 2000).

In 1990, Jensen and Murphy wrote that it is possible that CEO bonuses are strongly tied to an unexamined and/or unobservable measurement of performance. When they refer to the swings in CEO pay from year to year, they explain that the large swings are consistent with the existence of an overlooked and yet important performance measurement, and that that increase suggests that CEO pay is essentially unrelated to all relevant performance measurements (Murphy, 1999; Jensen & Murphy, 1990; Jensen & Murphy, 1990b).

The purpose of this study is to investigate the relation between the CEO pay and the performance against high-technologies firms with the balance cash compensation and total compensation. The combination of salary, incentives and bonuses is often referred to as cash compensation for executives. The CEO behavior is different when we think in short-term and long-term periods. The main goal of this paper is to provide a broader perspective on the relationship between CEO pay and firm performance and on how high-technology can improve that performance.

This work is organized as follows: Section 2 contains a revision of the main theories in the literature, as well as an analysis on executive compensation in order to address agency problems. Furthermore, this section provides an analysis which examines the appropriate measurements for corporate financial performance in high-technology firms. Section 3, explains the research hypotheses and section 4 presents the methodology, sample and data collection for the regression estimation, as well as the results of the econometric model to assess the influence that firm performance has on executive compensation. Lastly, the main conclusions are discussed, as well as some limitations and new perspectives for future research.

2. Executive compensations to address agency problems

The general acceptance of the agency theory and the parallel research on executive compensation began in the early 1980s. It was the evolution of the modern corporation with ownership separation and control that undermined the agency theory. Early studies in this area focused on documenting the relation between CEO pay and firm performance. The discussion of executive compensation must proceed with the fundamental agency problem afflicting management decision-making as background. According to Jensen and Murphy (1990), there are two approaches to agency problems. The authors state that there is an optimal contracting approach, which is when boards use design compensation schemes to maximize shareholder value with efficient incentives (Jensen & Murphy, 1990). To connect the agency problem and the executive compensation, the authors use the managerial power approach, when this connection is seen as an integral part of the agency problems. It is important to remember that the principal-agent problems treat the difficulties that arise under conditions where information is incomplete and asymmetric whenever a principal hires an agent (Murphy, 1999; Eisenhardt, 1989; Bebchuk & Fried, 2003). Furthermore, the agency theory aims at solving two problems that can occur in agency relationships. The first is the desires or goals of the principal and agent conflict and it is difficult or expensive for the principal to verify what the agent is actually doing. The problem is that the principal is unable to check if the agent has behaved correctly. Secondly, it is the problem of risk sharing facing the different attitudes toward risk, because the principal and the agent have different actions according to different risk preferences (Eisenhardt, 1989).

Hall and Lienbman (1998) argue that the solution to the agency problem is aligning the incentives of executives with the interests of shareholders by granting (or selling) stock and stock options to the CEOs. The CEOs have the correct incentives on every margin, including effort, perquisites and project choice, and support that the optimal contract is a one-to-one correspondence between firm value and CEO pay (Hall & Liebman, 1998). It is reasonable for small firms but it is not appropriate for large firms because optimal contracts represent a trade-off between incentives and risk-sharing (Eisenhardt, 1989). In their work Hall and Lienbman (1998) conclude that the relationship between pay and performance is much larger than has previously been recognized, and that this includes both gains and losses in CEO wealth. The salary and bonus vary so little because corporate board members are often reluctant to reduce CEO pay, even in response to poor performance and that may attract unwanted media attention. Using salary and bonuses to reward and penalize CEOs may only be possible to create high-powered incentives that align CEO pay with shareholder objectives (Hall & Liebman, 1998). A large part of the executive pay literature argues that compensation and managerial interests should be aligned with shareholder interests in order to solve agency problems (see, for example, the surveys by (Murphy, 1999) and by (Core, Guay, & Verrecchia, 2003a)).

Some authors see the weakness of shareholder rights more generally and warn shareholders and their advisers to focus on the corporate governance provisions that really matter for the firm's value (Bebchuk, Cohen, & Ferrell, 2009, Cremers & Nair, 2005). Others assume CEOs to be more powerful when they serve as chair of the board, when they are the only member of the board, and when they have the status of a founder (Adams, Almeida, & Ferreira, 2005).

Managers in high-technology firms have different goals than others sectors managers, such as managing intangible assets, continuous improvement, and software and product development. As a result, they must continuously innovate and sustain growth in an increasingly competitive and global market (Shim, Lee, & Joo, 2009).

2.1. Appropriate measurements of corporate financial performance in high-technology firms

This chapter provides an analysis on the different forms of measuring the firm's performance and how these engage to the level of CEO pay. The behavior of high-tech firms and its contribution to CEO compensation for the short and long-term are also analyzed. Shim (2009) argues that it is possible to confirm that the success of high-tech firms depends more on managing intangible assets. Some of these assets are technology innovation, continuous improvement, software development and knowledge-based management. High-tech firms must continuously innovate to survive and to sustain their growth (Shim, Lee, & Joo, 2009).

Equity-based compensation is widely documented in the research examining pay versus performance (Jensen & Meckling, 1976). Murphy (2003) and Jensen (2004) state that the increase in stock options pay is the result of the boards' inability to evaluate the true cost of this form of compensation. The use of equity-based compensation is encouraged by all stakeholders, such as investors, regulators and academics. The controversy over CEO compensation reflects a perception that CEOs effectively set their own pay levels. In most companies, the last decisions over executive pay are made by members outside the board of directors who are keenly aware of the conflicts of interest between managers and shareholders over the level of pay. However, the CEOs and other top managers exert at least some influence on the level and on the structure of their pay (Murphy, 1999).

In recent years, the use of restricted stocks in compensation executives has increased and has been widely criticized when these executives received dividend equivalents on restricted stocks before the vesting period. Agency cost benefits of dividend equivalent rights argue that this practice helps executives focus on the business, and rewards them for managing the business to produce cash. Therefore, this is encouraged because it is a way of distributing dividends by shareholders (Akpotaire, 2011).

Restricted stock awards are profitable for executives because the income tax consequences can be more favorable to employees than stock options. The special case of the USA and the consequences of a restricted stock mean that in some cases the award can be structured to allow for the deferral of all tax until the time of the stock sale, and for all appreciation to be taxed at capital gain rates, even if the stock is appreciated prior to vesting. In contrast, stock options can result in ordinary income to the recipient the stock has appreciated prior to vesting, with only the post-exercise appreciation deferred to the time of sale at capital gains rates. Furthermore, the preferred stock usually carries no voting rights but may carry a dividend and may have priority over common stock in the payment of dividends and upon liquidation. The preferred share investor is entitled to a preset rate of dividend that must be paid out of earnings before any dividends are distributed to common shareholders. These dividends receive favorable tax treatment relatively to other forms of income.

Earnings per share (EPS) are a popular performance metric used in executive compensation contracts (Murphy 1999, 2000). As it is commonly known, this ratio is influenced and directly punished by the increase in restricted stocks and dividend equivalents. Compensation contracts that tie managerial rewards to EPS create explicit incentives for executives to manage the EPS. Young and Jing (2011) argue that there is a net benefit to shareholders in executive compensation contracts when they use stock repurchases by EPS targets (Young & Jing, 2011). Additionally, if stock options are a sub-optimal incentive contract, Sesil *et al.* (2006) expect that, in terms of firm performance, there will be a decrease in earnings or an increase in earnings with a reduction in the rate of return on assets (Sesil, Lin, & Steven, 2006).

The use of options at the executive level associated with an increase in performance is not clear in the literature. Some argue that it is associated with a higher profit and output (Core *et al*., 2003a), while others state the opposite (Hall & Murphy, 2003). The use of stock options reduces the agency cost and incentive to maximize value creation for shareholders, and encourages risk taking, then accounting is shown by measuring corporate finance (Sesil, Lin, & Steven, 2006). They argue that adopting stock options has an impact on firm financial performance to increase operating income (OI) and investments in assets. However, there will be a significant decrease in return on assets (ROA). Others who have done previous research on stock options have focused on pay-for-performance elasticity (Hall & Murphy, 2003), while others have focused more on the determinants of share-based adoption (Core, Guay, & Verrecchia, 2003a). The adoption of stock options is associated to higher growth in income, but to significantly lower return on assets (ROA), which is evidence that options promote sub-optimal over investment.

The company's measurements are consistent with vision, mission and strategies for long-term performance and the financial criteria to monitor CEO compensation (Epstein & Roy, 2005). Usually in the USA, the compensation programs combine incentives for short and long-term periods with a set of performance measurements.

In summary, it was found that firms are subjected to the agency problem in which the CEO may not work in favor of the shareholders to maximize their wealth by improving firm performance. Furthermore, the decisions related to CEO compensation are based on the firms' accounting and finance performance. Therefore, it is theorized that CEO compensation according to firm performance using variables such as assets, return on assets, sales growth, operating income before depression and earning per share suited the high-technology firms, as presented above.

3. Research hypotheses

Some possibilities have been identified to find some relations with pay compensation and to understand how it is possible to improve firm performance and in turn the shareholder wealth. As previously discussed, existing theories provide predictions on the outlined considerations related to firm performance, allowing for two different selection hypotheses.

The first research question will be: The CEO compensation for the long-term is determinant and positively correlated with firm performance. High-technology companies support and enhance this evidence. Rejecting the null hypothesis would mean that the relative weight in terms of total compensation of each compensation component (such as salary, bonus, stock options and other compensations) are different goals for executives, as opposed to performance for the short-term. It is possible that high value firms have CEOs interested in long-term performance and in obtaining personal benefits in terms of total compensation. It might be argued that powerful incentive models are especially valuable for high value firms with high opportunities for growth that need to be decisively and vigorously pursued. It might also be that high value firms are especially likely to attract star CEOs and pay gold parachutes. The second question will be: The CEO compensation for the short-term is determinant and positively correlated with firm performance. With less intensity and yet more persistent than long-term compensation, bonuses and salary are determinant and in the same effect related to accounting performance.

4. Methodology, sample and data collection

The chosen database was the ExecuComp, which was used to find the variables and to create a sample of firms between 2000 and 2010. The ExecuComp database provides yearly data on salary, bonus, stock option and restricted stock grants, as well as managerial stock and option holdings for top executives in firms within the Standard & Poor's Index (S&P 1500). To test this hypothesis, the following specification is run on the balanced panel of high-technology firms. High-Technology firms are the firms that operate in an industry with a four-digit SIC code of 3570, 3571, 3572, 3576, 3577, 3661, 3674, 4812, 4813, 5045, 5961, 7370, 7371, 7372, or 7373, using the Fama and French classification of 48 industry groups, instead of four-digit Standard Industrial Classification (SIC) codes (Fama & French, 1997). According to Bebchuk, Cremers and Peyer (2011), in order to test the variables and to assess the abovementioned research hypotheses there are independent variables that will possibly be used by the regression model to perform the estimation. The total compensation is analyzed depending on some firm performance metrics.

At an empirical level, this analysis focuses on a sample of 1500 high-tech companies in the Standard & Poor's (stock market index based on the common stock prices) index (S&P1500), for the period between 2000 and 2010, which constitutes a sample of 15265 observations. The ExecuComp database collects information on seven independent variables – Total assets (ASSETS) and percentage change of assets (ASSETSCHG), total annual net sales (SALES), operating income before depreciation (OIBD), net income before extraordinary items (NIBEX), earning per share (EPSEX), return on assets (ROA) – and independent total compensation (TOTAL_COMP) and cash compensation (CASH) variables are listed by each year and company. Several measurements were used in this study, such as control variables. These include assets, increase in sales, the net Income and the earning per share, as a proxy of firm size, firm performance and shareholder wealth, the common predictors of executive pay. The two primary measurements of CEO pay were used. The short-term compensation consisted of annual salary and bonus, which represents the total cash compensation received during a specific year. Annual salary and bonus for 2000 and 2010 (in thousands of dollars) were taken from the ExecuComp data set. The long-term compensation represents the equity-based compensation of a CEO, as reported by Frydman (2008). As she reported in the case study of General Electric, salary and bonus are defined as the level of salaries and current bonuses, both awarded and paid out during the year. Long-term bonus measures the amount paid out during the year according to long-term bonuses awarded in prior years. Total compensation is the sum of salary, bonus, long-term bonus and the Black–Scholes value of stock options granted (Frydman, 2009).

The table below identifies the variables that were used, including their definitions, measurement units and the expected signs, as reported by the theory.

Table 1. Executive compensation dependent and independent variables

Name	Expected variation	Definition	Units
Ln (TOTAL_COMP)	(+)	Ln (the sum of the compensations of top executives includes: Salary, Bonus, Non-Equity Incentive Plan Compensation, Grant-Date Fair Value of Option Awards, Grant-Date Fair Value of Stock Awards, Deferred Compensation Earnings Reported as Compensation, and Other Compensations).	Thousands
Ln(CASH)	(+)	Ln (SALARY + Bonus) The dollar value of the base salary plus bonus earned by the named executive officer during the fiscal year.	Thousands
Ln (ASSETS)	(+)	Ln (the Total Assets as reported by the company).	Millions
ASSETCHG	(+)	The year to year percentage change in Total Assets.	Percentage
ROA	(+)	The Net Income Before Extraordinary Items and Discontinued Operations divided by Total Assets. This quotient is then multiplied by 100.	Percentage
Ln(COMMEQ)	(+)	The sum of Common Stock, Capital Surplus, Retained Earnings, and Treasury Stock adjustments.	Millions
EPSEX	(–)	Earnings per Share (Primary) Excluding Extraordinary Items and Discontinued Operations.	
(OIBD/ASSETS)*100	(+)	Ln (the Operating Income Before Depreciation as reported by the company/Assets).This quotient is then multiplied by 100.	Percentage
Ln(NIBEX)	(+)	Ln (the Net Income Before Extraordinary Items and Discontinued Operations).	Millions
Ln(SALES)	(+)	Ln (The Net Annual Sales as reported by the company).	Millions
SIC		Standard Industrial Classification Code.	
SPCODE	(+) and (–)	Current S&P Index membership "SP" = S&P 500 "MD" = S&P Midcap Index "SM" = S&P Small cap Index "EX" = not on a major S&P Index	

The High-Tech Dummy (DHTECH) is equal to one if the firm operates in an industry with a four-digit SIC code of 3570, 3571, 3572, 3576, 3577, 3661, 3674, 4812, 4813, 5045, 5961, 7370, 7371, 7372, or 7373, instead of four-digit SIC codes (Fama & French, 1997). Other dummy variables are used, YEAR for the period between 2001 and 2010. The main variables of the analysis in the system equation are T_COMP (defined by the sum of Salary, Bonus, Non-Equity Incentive Plan Compensation, Grant-Date Fair Value of Option Awards, Grant-Date Fair Value of Stock Awards, Deferred Compensation Earnings Reported as Compensation and Other Compensations) and CASH (Salary plus bonus) of all top executives in each company.

Table 2, presents the descriptive statistics of the observed variables. Some interesting outcomes were found as a result of this study.

Table 2. Descriptive statistics individual sample

	TOTAL_ COMP	CASH	ROA	NIBEX	EPSEX	SALES	ASSET CHG	ASSETS	COMMEQ	OIBD	DHT ECH
Mean	13727.19	4156.375	1.577071	288.9755	3.470422	5488.187	39.96929	15205.21	2714.774	1000.633	0.144150
Median	8089.794	2937.509	3.874000	58.40650	1.200000	1239.655	6.034000	1746.966	637.0890	176.3185	0.000000
Maximum	641446.2	199115.9	3551.351	45220.00	8548.000	425071.0	522050.0	3221972.	211686.0	124840.0	1.000000
Minimum	0.000000	0.000000	-10300.00	-99289.00	-231.670	-4,234.47	-99.4270	0.000000	-111403.0	-76735.00	0.000000
Std. Dev.	20478.12	5100.741	82.64384	2018.437	113.8698	16956.91	3705.640	88055.59	9044.259	3833.163	0.351251
Skewness	8.7409	9.9984	-94.4612	-9.3868	55.3268	10.6209	140.8027	15.88214	8.802576	9.601327	2.026239
Observ	19678	19889	19869	19870	19842	19870	19855	19872	19872	19606	19889

The descriptive statistics of the variables for total CEO compensation for high-tech firms are presented in Table 2. In the S&P1500, in the period between 2000 and 2010, there are about 14.415% high-technology firms, and it is possible to observe that the group of top executives in each company has an average total compensation around USD 13,727 million and earn in cash around USD 4.156 million. Other interesting finding is that, in this period and in this group of companies, there is an increase in assets and returns on assets around 39.96% and 1.57%, respectively.

The models introduced by the system equation presented below were used to test whether firm performance is relevant to explain executive compensation for the long and short-term. Firstly, the model for the long-term,

$$\begin{aligned} Ln\,(T\_COMP)_{ij} = {} & b_{11} + b_{12}*\ln(ASSETS)_{ij} + b_{13}*ASSETCHG_{ij} + b_{14}*ROA_{ij} + b_{15}*\ln(OIBD/ASSETS*100)_{ij} + \\ & b_{16}*\ln(SALES)_{ij} + b_{17}*\ln(NIBEX)_{ij} + + b_{18}*ERPSEX_{ij} + b_{19}*SPCODE_{ij} + b_{10}*DHTECH_{ij} + \\ & b_{31}*\ln(COMMEQ)_{ij} + \sum_{2001}^{2010} \partial j*Yearj_{.} + u_{ij} \end{aligned} \quad (1)$$

and for the short-term

$$\begin{aligned} Ln\,(CASH)_{ij} = {} & b_{21} + b_{22}*\log(ASSETS)_{ij} + b_{23}*ASSETCHG_{ij} + b_{24}*ROA_{ij} + b_{25}*\ln(OIBD/ASSETS*100)_{ij} + \\ & b_{26}*\ln(SALES)_{ij} + b_{27}*\ln(NIBEX)_{ij} + b_{29}*SPCODE_{ij} + b_{20}*DHTECH_{ij} + b_{32}*\ln(COMMEQ)_{ij} + \\ & \sum_{2001}^{2010} \partial j*Yearj + v_{ij} \end{aligned} \quad (2)$$

where, i and j represent the year and the company, respectively. The coefficients b_{11} and b_{21} are constants denoting the base level from which the sum of the compensations of top executive varies according to the changes in performance variables.

The panel data model is used because it is the most suitable way of studying a large set of repeated observations and due to the fact that it assesses evolution over time. With panel data it is possible to simultaneously explore several variations over time and between different individuals. The use of such models has increased immensely and, in fact, combining time and cross-sectional data brings many advantages: it is possible to use a larger number of observations and the degree of freedom in estimates increases, thus making statistical inferences more credible. At the same time, the risk of multicollinearity is reduced since the data in companies present different structures. Moreover, this model provides access to further information and the efficiency and stability of the estimators increase, while enabling the introduction of dynamic adjustments (Green, 2002; Gujarati, 2000).

The system equation presented was estimated using the Seemingly Unrelated Regression (SUR) method. The SUR is a generalization of a linear regression model that consists of several regression equations, each having its own dependent variable and potentially different sets of exogenous explanatory variables. The main motivations for using the SUR are: improving estimation efficiency by combining information on different equations; and imposing and testing restrictions that involve parameters in different equations. The model can be estimated to each equation considering the interdependence of distribution (SUR). The SUR model can be further generalized into the multiple regressions, where the regressor on the right-hand side can also function as endogenous variables. The multiple-equation model is a system of equations where the assumptions made for the single-equation model apply to each equation. The regression coefficient, year, does not vary over time because the estimation was conducted using dummy variables for year, and assuming that the company's heterogeneity is captured in the constant part (Greene & William, 2002).

The first hypothesis for the positive influence of CEO compensation on firm performance is presented in appendix Table 3. As it is possible to observe the regressions are globally significant, with a 5% significance level. The following table presents the results of the estimation for the studied data.

Table 3. Results of the total compensation and cash compensation estimations using the SUR method (regressions with SIC code dummy (DHTECH) for high-technology companies – econometric models)

Ln (TOTAL_COMP)	Coefficient	Prob.	Ln (CASH)	Coefficient	Prob.
constant	6,022018	0.0000	constant	5.941700	0.0000
Ln(ASSETS)	0.072140	0.0000	Ln(ASSETS)	0.123158	0.0000
ASSETCHG	0.001383	0.0000	ASSETCHG	0.000403	0.0000
ROA	0.000859	0.1045	ROA	0.000798	0.0385
OIBD/ASSETS*100	0.007541	0.0000	OIBD/ASSETS*100	0.003945	0.0000
Ln(SALES)	0.143398	0.0000	Ln(SALES)	0.135561	0.0000
Ln(NIBEX)	0.111439	0.0000	Ln(NIBEX)	0.053986	0.0000
EPSEX	-0.000400	0.0000	-		
SPCODE=SP	0.057757	0.0001	SPCODE=SP	-0.046676	0.0000
SPCODE=SM	-0.167486	0.0000	SPCODE=SM	-0.016045	0.1047
DHTECH	0.313173	0.0000	DHTECH	0.011091	0.3353
Ln (COMMEQ)	0.112421	0.0000	-		
2001	0.010864	0.6572	2001	-0.028642	0.1061
2002	-0.045589	0.0611	2002	0.051824	0.0033
2003	-0.051240	0.0290	2003	0.107735	0.0000
2004	0.021421	0.3570	2004	0.152258	0.0000
2005	0.018350	0.4379	2005	0.134210	0.0000
2006	-0.007390	0.7480	2006	-0.242996	0.0000
2007	0.045311	0.0495	2007	-0.306410	0.0000
2008	0.051967	0.0328	2008	-0.301458	0.0000
2009	0.044238	0.0698	2009	-0.283819	0.0000
2010	0.151203	0.0000	2010	-0.304708	0.0000
R-squared	0.565742		R-squared	0.547052	
Adjusted R-squared	0.565137		Adjusted R-squared	0.546487	
S.E. of regression	0.624388		S.E. of regression	0.455708	
Durbin-Watson stat	0.950250		Durbin-Watson stat	0.682381	

The statistics are computed based on a panel data set of 1500 firm-year observations, a total of about 15625 companies that represent 14.415% of high-technology firms between 2000 and 2010, and represent around 31.31% in long-term compensation. Other financial performance measurements such as total assets, operating income before depreciation, net income before Extraordinary Items and Discontinued Operations, growth sales, as reported by this sample, are positive and significantly related to total executive and cash compensations. It is important to highlight that around 56.57% (R2 = 0.5657) and 54.7% (R2 = 0.547) of the variance in degree of CEO compensation for each equation, respectively, can be explained by the group of variables (see Table 3). These indicate that variables addressed here play a significant role in explaining executive compensation for short and long-term periods as stated by Chi-Square test (p-value = 0).

In the table 3, the coefficient signs are similar in both specifications. However, the magnitudes of the coefficients are sensitive to the specification. As expected, earnings per share are negative and significantly related to total compensation for the long-term. This indicates that there are no explicit contractual arrangements linking compensations and earnings per share. The performance ratio of firms measured by return has a negative influence on CEO Compensation (Young & Jing, 2011, Core, Guay, & Verrecchia, 2003a).

A positive and statistically significant relationship was found between sales, asset growth and return on assets and for adding the same level of total CEO compensation and cash compensation (Gabaix & Landier, 2008) also empirically test the relation between the level of pay and firm size. Log (assets), a variable proxy for firm size is positively related to pay with a coefficient total compensation and cash compensation in the regression. When the adjustment is performed for the long-term compensation, it is possible to understand that when firm sizes are compared using the denominated current S&P index membership, S&P500 firms have an increase around 5.7% and for the S&P small caps 600 there is a decrease around 16.7%, comparatively to the S&P Midcaps 400 firms. In terms of cash compensation, the S&P 500 firms are 4.7% below midcaps, and the S&P small caps 600 firms are 1.6% below, comparatively to the same group of S&P Midcaps 400 firms. Another finding is that the influences on CEO pay for the short-term between the year 2006 and 2008does not have the same meaning in long-term compensations. There is an increase around 5% for each year between 2007 and 2010, as opposed to the year 2000.Furthermore, there is a decrease of about 30% in short-term incentives for the same period comparatively to the year 2000, which was possibly influenced by the beginning of the financial crisis, and it is not reflected in the long-term incentives. As Henry *et al*. (2011) suggest, CEO compensation increases the probability of effective internal controls after the Sarbanes–Oxley Act of 2002 (Henry, Shon, & Weiss, 2011). Moreover, as expected, the increase in financial performance measurements such as operating income before depreciation/assets and net income have a double impact on the increase in long-term compensation that is more positive than the increase in short-term compensations.

5. Conclusion and future research

This paper will contribute to a better understanding on the relationship between compensation and performance in high-technology firms, something which is often discussed in the literature. The main purpose of this study was to examine whether the total compensation paid to CEOs in high-technology firms in the S&P 1500 is related in corporate finance. This work aims at contributing to explain the influence that performance has on CEO compensation for short and long-term periods in these group of companies. It was found that there is a strong and positive relation between CEO compensation and firm performance.

In conclusion, according to the results that were obtained there is empirical evidence to state that high-technology firms in the S&P1500, during the period between 2000 and 2010, have contributed to increases in total CEO compensation for short and long-term periods, together with accruals of financial performance measurements. Results suggest that high-tech firms tend to use more sophisticated performance measurements to determine CEO compensation. The method use here has potential implications in finance and accounting, for instance, where it is preferable to separately capture the specific effects of firm and performance.

However, this work is not without limitations. This study focuses only on high-technology firms in the S&P 1500 in the period between 2000 and 2010. The definition of high-technology used in this study can be extended as performed by Shim *et al.* (2009), and other important item measurements should be included, such as value of R&D expenditures, number of patents by firm and citation of patents (Gomez-Mejia, Gideon, & Balkin, 2000; Shim, Lee, & Joo, 2009). The level of R&D expenditures and new product introductions are viewed as proxies for innovation, risk-taking and long-term decision-making, which are crucial to characterize high-technology firms. Furthermore, innovation constitutes an indispensable component of corporate strategies. For these reasons, the results of this study may not be generalized by other sectors due the specificity of the high-tech firms.

In the future, it will be important to analyze other developments, such as the effect of managerial attributes for the short and long-term in executive compensation (Graham, Li, & Qiu, 2012). Furthermore, it will also be important to desegregate the data sample for the period between 2000 and 2010 in order to broaden the period of analysis and to investigate the effect of the USA financial crisis, which started in 2007, and to understand the effectiveness of internal control structures under Sarbanes–Oxley Act of 2002 (SOX, Section 404) before and after implementation.

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