

# RELATIVE PERFORMANCE EVALUATION IN EXECUTIVE PECUNIARY COMPENSATION: EMPIRICAL EVIDENCES IN BRAZIL

## *AVALIAÇÃO RELATIVA DE DESEMPENHO NA COMPENSAÇÃO PECUNIÁRIA DE EXECUTIVOS: EVIDÊNCIAS EMPÍRICAS NO BRASIL*

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### ABSTRACT

The objective of this study was to analyze the implicit use of relative performance evaluation in BM&FBovespa listed companies as a way to measure the remuneration of its executives. To define the sample, we sought to identify companies that disclosed information about the compensation of their executives between 2009 and 2012, totaling the sample size in 67 companies, totaling 112 observations. They were then categorized in order to capture risk sharing as predicted by the theory of relative performance evaluation. The results of this research indicate a strong asymmetry in the distribution of the compensation, mainly due to the long-term compensation, which caused the occurrence of outliers. As a result of this situation, and following studies already developed, it was decided to test the model through quantile regression. Even with the use of the median regression it was not possible to identify statistically significant evidences of the occurrence of relative performance evaluation, therefore, there is no evidence that the variation of the result of the sector reduces the impacts that the results obtained by the organizations exercise on the executive remuneration.

**Keywords:** Remuneration to Executives; Relative Performance Evaluation; Conflict of Agency.

JEL Codes: M12, L25, D74

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# RESUMO

*O objetivo deste estudo foi analisar o uso implícito de avaliação relativa de desempenho em empresas listadas na BM&FBovespa como forma de aferir a remuneração de seus executivos. Para definição da amostra buscou-se identificar empresas que divulgaram as informações acerca da remuneração de seus executivos entre os anos de 2009 a 2012, totalizando o tamanho da amostra em 67 empresas, totalizando 112 observações. Em seguida, elas foram classificadas setorialmente de forma a capturar o compartilhamento do risco conforme prediz a teoria da avaliação relativa de desempenho. Os resultados desta pesquisa indicam uma forte assimetria da distribuição da compensação decorrente, principalmente, da compensação de longo-prazo, o que ocasionou a ocorrência de outliers. Como decorrência de tal situação, e seguindo estudos já desenvolvidos, optou-se por testar o modelo por meio de regressão quantílica. Mesmo com o uso da regressão mediana não foi possível identificar evidências estatisticamente significativas da ocorrência de avaliação relativa de desempenho, logo, não há evidências de que a variação do resultado do setor reduza os impactos que os resultados auferidos pelas organizações exercem sobre a remuneração executiva.*

**Palavras-chave:** Remuneração a Executivos; Avaliação Relativa de Desempenho; Conflito de Agência.  
Códigos JEL: M12, L25, D74

## 1 INTRODUCTION

Studies in Finance (AGGARWAL; SANWICK, 1999; LIU; STARK, 2009; ALBUQUERQUE, 2009; ALBUQUERQUE; DE FRANCO; VERDI, 2013) point out that the market looks for ways to evaluate executives as a way for obtain firms organizational performance information. This evaluation would make the investment decisions more robust, besides allowing a better perception about the information production by the firms. (SCOTT, 2009).

Discussions about the form and types of executive compensation have gained momentum since the 1980s (MURPHY, 1999) and have intensified after economic scandals involving insider trading in recent decades (GAO, 2010). Financial crises, such as that of 2008, ended up drawing attention to the value of the compensation paid to key executives and the lack of information to the market. Murphy (1999; 2012) also highlights some of the factors that stimulated interest in the topic: (i) the median amount paid in cash to Chief Executive Officers (CEO) more than doubled between the 1970s and 1990s; (ii) the median of its total remunerations in this same period almost quadrupled; (iii) the so-called “excesses of the 1980s” with the perception of high wages associated with layoffs, closures and reductions in operations; and (iv) evidence of the linkage of the CEO’s compensation to the firm’s market performance. Murphy (1999; 2012) believes that this scenario provided a broad academic interest, as well as the outrage generated in society due to the high remunerations of executives of financial institutions involved in the crisis of 2008.

In treating remuneration as an agency problem, Lambert (2001) argues that the definition of manager incentives should be understood as a way of sharing risks between principal(s) and agent(s). What is expected is that the principal is protected from non-optimal choices of the agent, and that the agent, on the other hand, also has protection against industry risks and investor actions (such as non-investment decisions).

The idea of risk sharing was explored by Holmstrom (1982) when discussing the problem of moral hazard in teams. The author addresses the problem by focusing on two aspects: free riding and competition. Based on these aspects, Holmstrom (1982) develops the concept of Relative Performance Evaluation (RPE), discussing the role of aggregate measures and concluding that RPE provides better risk sharing. This concept states that risk can be better shared by considering the performance of the industry, together with the individual.

Aggarwal and Samwick (1999) are among the pioneers to extend the concept of RPE to firms and to identify the existence of a relationship between executive compensation and the performance of rival firms. Similar results were also identified by Asseburg and Hoffman (2010) and Farmer, Archbold and Alexandrou (2013).

Although most of the research on the subject has analyzed the US market, it is possible to highlight the works of Joh (1999) and Liu and Stark (2009) who found evidence of the occurrence of RPE in Japan and the United Kingdom, respectively. In Brazil, despite more than two decades of the study of Holmstrom (1982), no study with the same objective has yet been found, consequently there is still a lack of investigation of the hypothesis of the relative performance evaluation in the Brazilian market.

It is believed that this lack of research is due to the non-disclosure of data on the remuneration of executives of companies registered in the Brazilian market, which only came to occur from the CVM Instruction 480/09, which requires the annual disclosure of information about the remuneration of directors. So it is possible to notice that the Brazilian academy still has little evidence on the relations that the executives incentive formulas have with organizational and market variables, including the influence of the performance of the sector in the performance of the firm.

The approval of CVM Instruction 480/09 generated repercussion in the Brazilian business environment. Based on statements by a specific group of executives linked to the Brazilian Institute of Finance Executives, Rio de Janeiro branch, (IBEF-RJ), some companies sought in court the right not to disclose the amounts paid to their executives, nor the structure of its remuneration packages, in accordance with said Instruction. According to such companies, the disclosure of this information would pose a threat to the safety of their executives.

According to IBGC (2013), in 2012, about 55 companies refused to disclose such information. In addition, several others present "inconsistent" information, such as: annual values that are zero or very low (annual compensation of the board is very low), absence of statutory board of directors, filling errors, among others. On the other hand, the Brazilian Securities and Exchange Commission (CVM) seeks means and partners to force the market to disclose this information and provide greater transparency for shareholders.

This scenario contributes to the current lack of research in Brazil on this topic. Therefore, this study is still justified by allowing a better understanding of the practices for defining optimal contracts with executives. The relative performance evaluation makes possible to exclude from the evaluation of the organizational result situations of luck or setback by which an economic sector may have experienced in a certain period. In this sense, it is believed that this brings greater confidence to the market, reducing risk, adjusting the remuneration paid as an incentive to executives and, as a consequence of all these factors, providing greater liquidity to the market.

Based on this scenario, the following research problem was elaborated: What evidence of the implicit use of relative performance evaluation in companies listed on the BM&FBovespa can be observed from profit, market return and cash flow?

## 2 LITERATURE REVIEW

According to Scott (2009), much of executive compensation theory derives from Agency Theory, which in turn is a derivation of Contract Theory. For Lambert (2001), during the 1980s and 1990s, accounting research showed greater interest in these discussions about the Agency Theory, since it allows explicit incorporation of conflicts of interest, incentive problems and mechanisms to control incentive problems in the developed models by researchers. For Scott

(2009), accounting research in this area has two basic questions: 1) how information, accounting, and compensation systems impact incentive problems; and 2) how the existence of incentive problems impact the structure and design of information, accounting and compensation systems.

The Agency Theory has been discussed in different areas, but always under the same aspect: the conflict of interest between two or more parties. These discussions intensified with the separation of control and ownership. Agency conflicts arise when a party (principal) who owns the property delegates to another individual (agent) the role of acting in pursuit of their interests. (ROSS, 1973; JENSEN & MECKLING, 1976).

The principal expects the agent to maximize his wealth and will look for ways to ensure that the agent behaves in a way that ensures the achievement of this goal. Despite the existence of controls, Jensen and Meckling (1976) argue that if both seek to maximize their wealth, there are reasons to believe that the agent will not always act in the best interests of the principal. Lambert (2001) states that the principal problem is based on maximizing the utility expected by it, subject to the agent's acceptance of the restriction of utility and incentive compatibilities.

Ross (1973) argues that agency problems would theoretically be solved through a payment structure that solved the principal problem and led to Pareto efficiency for every utility pair (U, G) of the individuals involved in the conflict. However, Ross (1973) states that this can not be achieved because the participants should be in a perfect information environment where the principal would be aware of the price of each agent's action.

Jensen and Murphy (1990) agree that the definition of an optimal contract could remedy agency conflicts, but other authors disagree that this definition is possible. Merchant and Stede (2012) argue that there will always be variables that are not controllable (at least in part) in the incentive formulas and this alone would already give rise to conflicts of interest. Bebchuk and Fried (2003) also criticize the fact that the market (or even the state) does not regulate the payment of bonuses, which allows the opportunity for extraordinary gains by the managers, and argue that managers can influence the definition of their own remuneration, which is also sufficient to believe that there is no optimum situation for all participants.

Executive compensation would then be the result of a contract between the parties seeking to maximize their profits. Healy (1985) gives a description of the reward trying to exclude situations of good or bad luck, as follows:

$$B_t^u = p \{ \min \{ U^u, \max \{ (E_t - L), 0 \} \} \} \quad (1)$$

Where:  $B_t^u$  = Bonus;  $p$  = Percentage of payment defined in the bonus agreement;  $U^u$  = upper limit on excess earnings over projected results;  $E_t$  = Results disclosed;  $L$  = Lower earnings limit.

In this way, the manager will receive  $p(E_t - L)$  in bonuses, if the gains exceed the lower limit and are smaller than the upper limit of the plan,  $U^u$ . Bonuses are set at  $pU^u$  when gains exceed the upper limit.

It can be seen that equation (1) presents a generalization for risk sharing, where the lower limit represents the risk aversion of the manager, while the upper limit would be the risk aversion of the principal. In this sense, Holmstrom (1982) developed the Relative Performance Evaluation hypothesis (RPE) for which the attribution of incentives relative to the average performance of other firms in the sector would filter the systematic risk out of the incentive plan. Given that sectorial risks are probably uncontrollable and void of information about the agent's effort, linking incentives to the difference between individual and industry performance would strengthen the relationship between effort and the desired performance measure in an optimal

contract. Thus, the RPE would be giving a positive weight to individual performance, and negative to sector performance. (AGGARWAL; SAMWICK, 1999; SCOTT, 2009)

Aggarwal and Samwick (1999) pioneered the extrapolation of the hypothesis proposed by Holmstrom (1982), applying it to executives. These authors explain a scenario among companies that share a strategic competition environment, which for the authors is not captured in the common agency model. The work of Aggarwal and Samwick (1999) is developed based on market competition and its implications for the definition of incentive plans. For this, market competition was modeled in two ways: (i) as strategic complements; or (ii) as strategic substitutes.

Joh (1999) tested how industry performance affects manager incentive contracts at 796 firms during the years 1968-92. Their results show that compensation would be positively related to industry profitability, and that this effect is greater in sectors more competitive firms and in slower growing firms.

Liu and Stark (2009) investigated the evidence of relative performance evaluation in the UK. The authors analyzed 169 'non-financial' companies in the period 1971-1998. The measures used for performance were pre-tax accounting earnings and market return, while the incentive proxy was the cash remuneration and assumed the linearity between the variables of the model. Liu and Stark (2009) found evidences of positive relations with individual and negative profits with the sectorial one.

Albuquerque (2009) argues that the use of relative performance evaluation in the executive compensation structure provides security against uncontrollable factors, as well as being a more informative measure of CEO actions. For the author the differences in the results of the empirical studies that tested the RPE in the North American market are due to problems in the specification of the pairs. The author estimated a model similar to that of Aggarwal and Samwick (1999), using as dependent variable the executive's total remuneration for the year, and as independent the return on assets (ROA), ROA variation, and market return (individual and peer-weighted performance measures) and control variables such as firm size, growth options and market regulation. The study concludes by indicating the existence of the RPE in the North American market.

Angelis and Grinstein (2011) developed a cross-sectional study with companies listed in the S&P500 in 2007. The authors identified the use of RPE in more than a third of their sample, where on average 49% of remuneration was linked to RPE. However, not all companies used industry or market indexes because they were not sure what was the best benchmark. Therefore, the lack of use of the RPE is due to uncertainty about the appropriate sectoral measure. This would leave the agent exposed to uncontrollable risks and this would reduce the effectiveness of the measure.

Gong, Li, and Shin (2011) investigated the explicit use of RPE in 1,419 listed firms in the US market in 2006. Twenty-five percent of the firms in the sample made such use, and a strong negative relationship was identified between CEO compensation and market performance for the industry. The study also shows that the main variable used as metrics in RPE is the market return (73.68% of firms in the sample) and return on the PL (13.85%).

Albuquerque, De Franco and Verdi (2013) start from the proposition of Aggarwal and Samwick (1999) in the development of their research, stating that the choice in the definition of the pairs, in order to perform the relative evaluation of performance, would represent a talent assessment not observed by executives. The authors tested for the years 2006-2008 a model that made the distinction between components of unobserved talents and self remuneration. A probit model was used to identify the probability of choosing a particular "pair" to perform the relative assessment. The article concludes by confirming that firms tend to choose as benchmark companies whose executives are highly remunerated and that this is due to a need to remunerate talents not observed in the management of complex firms.

The recurrence of work addressing the relative performance evaluation of executives in other markets may be influenced by the fact that the UK Secretary of State (2002) and the U.S. Securities Exchange Commission (SEC) (2006) indicate that relative performance evaluation is an important practice in the definition of the relations between the performance of the firm and the incentives granted to executives.

During the elaboration of this work, the existence of works involving the relative evaluation of performance and compensation of executives in Brazil was not identified. On the other hand, there are studies that deal with the sensitivity of executive compensation to factors such as organizational performance and managers' temporal orientation. Vasconcelos and Monte (2013) analyzed the relationship between executive compensation and financial performance of firms. The authors analyzed separately the average compensation of the board of directors and the executive board, identifying significant relationships with Return on Assets, Return on Shareholders' Equity and Dividends per Share.

The objective of the study by Silva, Ribeiro and Matias (2013) was to examine the remuneration model of Brazilian financial institutions, as described in the Reference Form. The authors verified that the net profit is the measure of performance most used in the institutions that composed their sample, followed by the return on the equity (ROE) and by qualitative measures. In addition, only 5 individuals in the sample remunerate their executives through stock option programs. According to Silva, Ribeiro and Matias (2013), net profit and ROE are goals commonly used in executive incentive plans.

Krauter (2013) investigated the relationship between executive compensation and the financial performance of Brazilian companies. The author investigated the motivational effects that different types of remuneration cause on performance. Her work innovates by creating benefits and career aid indexes for non-pecuniary compensation.<sup>5</sup> The results of the research reveal a statistically significant relationship between the types of remuneration (pecuniary or non-pecuniary) and financial performance.

In the research by Silva and Chien (2013), the return on assets (ROA) and the sales variation did not present statistically significant relationships with the remuneration, contrary to the market value of the firm. Ferreira (2012) performed several tests to analyze relations between firm size and remuneration and did not find significant relationships. Ventura (2013) found a significant relationship between compensation and firm size, market value and ROE, but did not find evidence of significant remuneration relationships with BM&FBOVESPA's corporate governance levels.

Aguiar (2009) also brings this discussion in his study exposing a position that the relationship of causality, in models that consider a gap between performance evaluation and compensation, would be that the remuneration in year t would motivate the agent to perform better in year t + 1, because he rationally wishes to increase his usefulness and knows what actions he must choose for it. Therefore, the performance in t influences the remuneration in t, which in turn influences the performance in t + 1 and so on.

Board 1 presents a summary of the variables used in the surveys that constitute the theoretical support of this article.

Authors	Dependent Variable	Independent Variables
Internationals		

<sup>5</sup> Watts & Zimmerman (1986) call these types of incentives of perquisite. Its disclosure is not regulated, which creates difficulty in obtaining similar data.

Aggarwall & Samwick (1999)	Short-term remuneration (salary, bonuses and others) Long-term compensation (shares, stock options, benefit plans, indemnities and others)	Value of the firm (discounted future cash flow) and weighted average of the return to shareholders that the other firms in the industry provided.
Joh (1999)	Variation of the executive's total pecuniary remuneration from t -1 to t	ROA, weighted ROA, market return, weighted market return, time dummy.
Liu & Stark (2009)	Variation of total compensation from t - 1 to t.	Time Dummies, market return of the firm, weighted average return provided by other firms in the industry, profit before income tax, profit before the weighted average income tax of other firms in the sector, size (billing).
Angelis & Gristein (2011)	Total compensation	Sector Dummies, daily turnover of firm, daily turnover of firm, size of firm (total assets), Tobin's Q, proportion of new executives in the firm vs. sector and proportion of internal directors in the Board of Directors.
Gong, Li e Shin (2011)	Total compensation	Stock returns, ROE, Growth of earnings, earnings, Growth of sales, ROA, Cash flow.
Nationals*		
Silva & Chien (2013)	Price-to-Book ROA Annual average sales growth	Total and average remuneration, level of governance, percentage of voting capital of the controlling shareholder, percentage of the total capital of the controlling shareholder, leverage, size (total assets), tangible assets.
Ferreira (2012)	Percentage change in total compensation	Size (total asset)
Ventura (2013)	Total average remuneration	Size (total assets), dummy for share payment, bonus payment dummy, statutory board member amount, share price, earnings per share, ROE and ROA.
Vasconcelos & Monte (2013)	Total compensation	ROA, ROE, net margin, EBITDA margin, earnings per share, share price and dividends per share.
Krauter (2013)	Sales growth, ROE, ROA.	Average monthly salary, average variable salary, access index to benefits, career support index, education incentive index.

**Board 1** – Variables used in studies already developed.

Source: Self elaboration.

Thus, the hypothesis of the research was defined as a consequence of the hypothesis of the relative performance evaluation proposed by Holmstrom (1982) and the discussions of the later studies, especially that of Aggarwal and Samwick (1999):

- H1: The greater the performance of the sector, the lower the sensitivity of executive compensation to the firm's unique performance.

## 3 METHODOLOGICAL PROCEDURES

### 3.1 Specification of the model

Based on the literature review, the model described in Eq. 2 was proposed:

$$\Delta Comp_{i,t} = \alpha + \sum_{t=2009}^{2012} \beta_0 \psi_t + \beta_1 Lair_{i,t} + \beta_2 LairP_{i,t} + \beta_3 CxOp_{i,t} + \beta_4 CxOpP_{i,t} + \beta_5 RM_{i,t} + \beta_6 RMP_{i,t} + \beta_7 Tam_{i,t} + u_{i,t} \quad (2)$$

Where:  $\Delta Comp_{i,t}$  = average change in the total compensation of the executive board between period t-1 and period t;  $\psi_t$  = dummy variable for each year from 2009 to 2012;  $Lair_{i,t}$  = Value of earnings before income tax of company i in period t;  $LairP_{i,t}$  = Weighted value by sector of profit before income tax without considering company i in period t;  $CxOp_{i,t}$  = operating cash of company i in period t;  $CxOpP_{i,t}$  = weighted value by sector of operating cash without considering company i in period t;  $RM_{i,t}$  = market return of firm i in period t;  $RMP_{i,t}$  = Weighted value of the return of the sector without considering the company i in period t;  $Tam_{i,t}$  = Company size measured by the natural logarithm of the total assets of company i in period t;  $u_{i,t}$  = stochastic error term.

The proxy for incentives was the change in the natural logarithms of the total average incentives of the statutory board between periods t-1 and t, which indicates how much the compensation based on the results received by the executive between two periods varied. Therefore, it represents a measure for the reward granted to the CEO, resulting from the effort exerted by him to achieve the pre-established organizational goals. This methodology is consistent with the work of Aggarwal and Samwick (1999).

The explanatory variables encompass accounting measures and market measures of performance. Similar to that developed by Liu and Stark (2009), this research selected the pre-tax accounting earnings ( $Lair_{i,t}$ ) and the cash stock market return ( $RM_{i,t}$ ), and then a weighting of both measures was made for the sector including only the rival companies ( $LairP_{i,t}$  and  $RMP_{i,t}$ ). To ensure that the cash stock market return is owned by a normal distribution, varying from  $-\infty$  to  $+\infty$ , its natural logarithm was calculated for the purpose of maintaining this property. A second accounting variable of performance was inserted: operational cash flow ( $CxOp_{i,t}$  and  $CxOpP_{i,t}$ ). The intention is to verify if a measure based on the cash basis would increase the robustness to the model.

The Weighted Stock Market Return was calculated as follows (as developed by Liu and Stark, 2009):

$$RMP_{i,t} = P_{i,t-1} \times \left( \frac{\sum_{k \in IND-i} RM_{k,t}}{\sum_{k \in IND-i} P_{k,t-1}} \right) \quad (3)$$

Where:  $RMP_{i,t}$  represents the weighted average return for firm i in period t;  $P_{i,t-1}$  is the share price of company i in period t-1;  $RM_{k,t}$  is the market return of hypothetical company k in year t; and  $P_{k,t-1}$  is the share price of company k at the beginning of year t.

Weighted pre-tax accounting earnings was calculated as follows (as developed by Liu and Stark, 2009):

$$LairP_{i,t} = PL_{i,t-1} \times \left( \frac{\sum_{k \in IND-i} LAIR_{k,t}}{\sum_{k \in IND-i} PL_{k,t-1}} \right) \quad (4)$$

Where:  $LairP_{i,t}$  represents the weighted pre-tax accounting earnings for company i in period t;  $PL_{i,t-1}$  is the book value of firm i in period t-1;  $LAIR_{k,t}$  is the pre-tax accounting earnings of hypothetical firm k in period t; and  $PL_{k,t-1}$  is the book value of the hypothetical firm k in period t-1.



The Weighted Operational Cash Flow for company  $i$  was measured by the average of the operating boxes of the firms that make up the sector in which the company  $i$  is inserted, but disregarding the firm  $i$ .

We also included time dummies and a control variable for size ( $Tam_{i,t}$ ) with the objective of absorbing the correlation between the measures of performance derived from unspecified factors. Thus, the estimators will be non-biased (AGGARWAL; SAMWICK, 1999; LIU; STARK, 2009). It should be noted that the use of individual variables and their weighted equivalents for the sector is consistent with the studies of Aggarwal and Samwick (1999) and Liu and Stark (2009).

The variables  $\Delta Comp_{i,t}$ ;  $Lair_{i,t}$ ,  $LairP_{i,t}$ ,  $CxOp_{i,t}$ ,  $CxOpP_{i,t}$ ,  $RM_{i,t}$ ,  $RMP_{i,t}$ , and  $Tam_{i,t}$  were divided by 1,000,000 due to computational issues. If this measure were not taken, some algorithms may produce non-exact results. (HAYASHI, 2000)

Based on the proposed model, three regressions were tested, alternating some of the proposed variables, in order to investigate if there would be any difference in the fit of the model resulting from the chosen performance measure. For each regression the application of stacked data was initially tested. The regressions followed this sequence:

- The first analysis considered all the performance variables described in equation 4;
- The second analysis excluded the cash flow analysis, so that the regression uses only the performance variables proposed by Liu and Stark (2009); and
- The third regression replaces the LAIR accounting variable (which is influenced by the accrual basis) by Operational Cash Flow (which is influenced by the cash basis).

As in the study by Aggarwal and Samwick (1999), there was a large difference between the options paid individually and the value added generating an asymmetry in the distribution of long-term compensation among executives. Which generates the expectation of the presence of outliers. The tests for normality of residues confirmed this expectation and will be presented in the analysis of the results, which impacted the estimation of the model by Ordinary Least Squares (OLS).

In order to correct the problems inherent to the model, the same solution was used by Aggarwal and Samwick (1999): application of a robust medium quantile regression, which discards the assumption of the residues normality. In addition, the Hubber-White matrix was used for robust standard error. After such measurements, it was verified that the variance of the errors is homocedastic, allowing the continuity of the analysis.

The quantile estimation separated the sample based on the variable of interest (COMP), whose median in the sample was COPEL, with a value of 0.1161, in the year of 2011.

The OLS estimated values,  $\hat{y}_i = X_i \hat{\beta}$ , represent the conditional average of the dependent variable. In the quantile regression, or median regression, the estimated values represent conditional medians of the dependent variable, presenting groups of parameters to be estimated in each quantile, within which the parts of the conditional distribution show different behaviors. This technique reduces the sum of absolute residues and generates a greater amount of information, providing greater robustness in the analysis.

According to Koenker and Bassett (1978), since the errors do not have an ex ante definite normal distribution, the regression estimators can be more efficient than the OLS estimators. This paper follows a linear regression model with panel data of type:

$$y_{i,t} = x'_{i,t} \beta + \varepsilon_{i,t}, \text{ to } i=1, \dots, n \text{ and } \tau [0,1] \quad (5)$$

Where,  $y_{i,t}$  is the dependent variable,  $x_{i,t}$  is a matrix  $n \times k$  of covariate variables,  $\beta$  is the vector  $k \times 1$  of parameters to be estimated,  $\varepsilon_{i,t}$  is the error with a distribution that is not necessarily known and  $\tau$  is the value of the  $\tau$ -th conditional quantile of  $y$  given  $x$ . In this work, equation (4) was estimated, discretionally, for  $\tau = \{0.5\}$ .

### 3.2 Sample definition and data collection

The sample refers to the companies listed on the BM&FBovespa and that disclosed information about executive compensation in the Reference Form between 2009 and 2012. The data were collected from the website of the Brazilian Securities and Exchange Commission (CVM) with the use of the EmpresasNet software. Initially, 150 companies were randomly selected, but the availability of compensation data reduced the sample to 67 firms. Performance data (Pre-Tax Accounting Earnings, Operatinal Cash Flow and Market Returns) were collected at Economatica®.

## 4 PRESENTATION AND ANALYSIS OF RESULTS

### 4.1 Descriptive analysis of data

Table 1 shows the summary of the analyzed sample. According to Farmer, Archbold and Alexandrou (2013), the classification only in sectors facing similar risks would already be enough to test the hypothesis of relative performance evaluation. However, the failure to classify some firms into specific groups may bias the model, since its operations may not be competitive, which would mean that firms would not be facing the same systemic risk.

**Table 1 – Concentration of sample companies by sector in 2012**

SECTOR	COMPANIES
Food and drinks	06
Non-cyclical consumption	05
Construction	07
Electric energy	08
Financial and others	07
Cyclical consumption	04
Comerce	06
Industrial goods	05
Basic materials	09
Textile	05
Transport and services	05

According to Homlstrom (1982) and Aggarwal and Samwick (1999), the greater the number of firms in the same industry, the more robust the hypothesis of relative performance evaluation. However, the limitation of available data (both transversally and longitudinally) is another aspect that may bias the results and also configures itself as a limiting factor of the results of this study.

With regard to data on remuneration, Table 2 presents a descriptive summary of the data collected. For this table the data were weighted by the size of the company (Total Asset). All the maximum values are from the same company of the civil construction sector (Eternit). All minimum values are from the same company in the basic materials sector (Gerdau Metalúrgica). The mean and median values showed the opposite behavior in the period. While the average has

a tendency to decrease, the median has a slight growth tendency. On the other hand, the maximum values have been decreasing with the passage of time, while the minimums have increased, which explains the behaviors of the average and the median. The standard deviation confirms this analysis by assuming values that reduce systematically between the years 2010 - 2012.

**Table 2** - Summary of data on the remuneration of companies belonging to the sample in R \$

	<b>2012</b>	<b>2011</b>	<b>2010</b>
Maximum	14,7274	18,6174	20,5059
Minimum.	0,0018	0,0013	0,0022
Mean	3,1730	3,3700	3,8888
Median	2,4601	2,3454	2,3308
Std. Devation	3,1172	3,6811	4,3301

## 4.2 Analysis of the proposed theoretical model

### All performance variables

Table 3 presents the results of the median regression tested. It is observed in this analysis that only the Weighted Market Return (RMP) and the constant were significant, all others variables presented non-significant results. On the other hand, despite being statistically significant, RMP showed a negative result and an absolute value close to zero, which indicates that there is no relation between changes in executive compensation and the performance of the weighted market return. This result is consistent with the findings of Liu and Stark (2009) and may be due to the lack of recommendation by the capital market regulator in Brazil, similarly to what happens in the United Kingdom.

It can be affirmed, therefore, that the compensation formula of executives does not contemplate the weighted market return, contrary to the expectation that the compensation to the efforts of the executives takes into account the market performance of the sector. Consequently, executives' remuneration may contain a load of random factors that do not arise from the agent's actual effort and do not exert the effect of controlling the behavior of these managers, as criticized by Aggarwal and Samwick (1999).

Model fit was low ( $R^2 = 0,0212$ ), and less than the value presented in the model of Liu and Stark (2009) ( $R^2 = 0,1130$ ), but resembles some of the values found by Aggarwal and Samwick (1999).

**Table 3** – Test of the relative performance evaluation model considering profit, operating cash and market return

	<b>Coefficient</b>	<b>VIF</b>	<b>Std. Error</b>	<b>T</b>	<b>P &gt; t</b>	<b>Confidence interval 95%</b>	
RM	0.0043	1,24	0.0828	0.05	0.958	-0.1589	0.1676
RMP	-0.0000	1,02	0.0000	-3.07	0.002	-0.0001	-0.0000
LAIR	-0.0062	6,5	0.0311	-0.20	0.841	-0.0676	0.0551
LAIRP	-0.0002	3,94	0.0029	-0.08	0.939	-0.0059	0.0055
CxOp	-0.0253	5,96	0.0228	-1.11	0.268	-0.0703	0.0197
CxOpP	0.0051	2,22	0.0086	0.59	0.554	-0.0118	0.0220
Tam	0.0015	3,9	0.0015	0.96	0.341	-0.0016	0.0045
D_2012	0.0068	1,24	0.0707	0.10	0.923	-0.1326	0.1462
D_2011	-0.1067	1,22	0.0707	-1.51	0.133	-0.2462	0.0329
Constant	0.1332		0.0539	2.47	0.014	0.0269	0.2395

R<sup>2</sup> = 0,0212 | Number of observations = 201 | Objective function = 0,1396

Subtitle: RM = Market return; RMP market-weighted return; LAIR = income before income tax and social contribution; LAIRP = income before income tax and social contribution weighted by sector; Cxop = operational cash; CxopP = operating box weighted by sector; Tam = size; D\_2012: time dummy which assumes value 1 in 2012 and zero in other years; D\_2011 = time dummy which assumes value 1 in 2011 in 0 in other years.

From the results obtained in Table 4, it is suggested that, in Brazil, risk sharing between Executives and Investors would not be explained by the organizational performance variables used in this study. This occurs in a different way in England and the United States, according to the studies of Aggarwal and Samwick (1999) and Liu and Stark (2009).

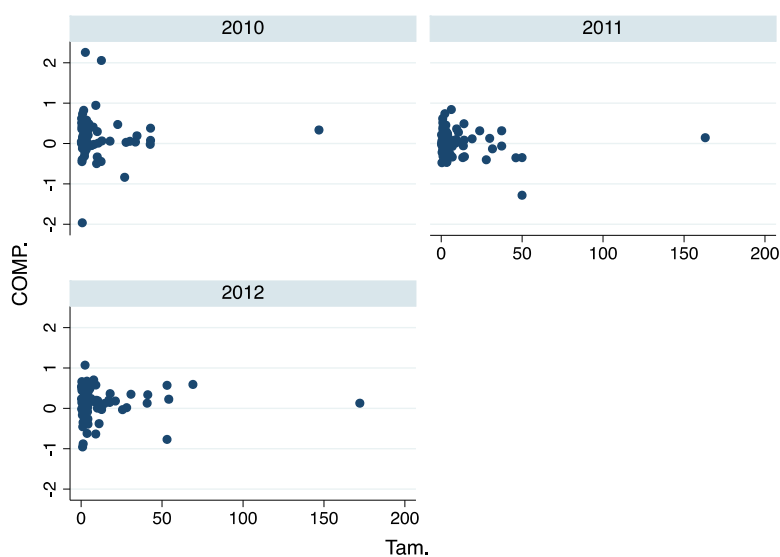
The non-sharing of risk would imply higher fixed remuneration, reducing the weight that the organizational performance would have on the variation of the total compensation of the executives of the companies listed on BM&FBOVESPA. It can be inferred that these companies choose not to use the RPE, disregarding the impacts that non-controllable effects may have on executive compensation elements and, consequently, on the organization's cash flow, unlike the results obtained by Angelis and Gristein (2011).

The results of the time dummies allow us to infer that there were no events in the time interval analyzed that had any significant impact on executive compensation.

In addition, the expectation that size would influence the variation in remuneration has also not been confirmed. In order for this hypothesis to be validated, the remuneration weighting for the size of the company should generate stationary results. However, when analyzing the results presented in Table 4, with those of Table 2, it is verified the occurrence of extreme values that impact the calculated standard deviation, and influences the results obtained.

Figure 1 shows the annual charts for the relationship between COMP and TAM. The largest size values refer to Eletrobras. It can be seen that, as previously mentioned, the relationship between size and variation of executive compensation is not maintained in the Brazilian market. One explanation for this may be the regulation of the largest companies that are part of the Brazilian market, as is the case of Eletrobras itself.

On the other hand, smaller companies show greater volatility in the variation of the remuneration. This may be due to factors such as not being in regulated sectors, and greater risk assumption of managers in these entities. Another argument that may help in understanding these results is that smaller firms do not have the financial capacity to compete with the level of compensation paid by the larger ones, so they end up incorporating greater risk in their incentive formulas in order to attract and retain better-known executives in the market (SEEMAN, 2014).



**Figure 1** - Relation between Compensation and Size per year

### No cash-related variables

Initial tests for residue normality and heteroscedasticity were repeated at this time. The Shapiro-Wilk test again indicated the non-normality of residues ( $v = 14.236$  and  $p\text{-value} = 0.0000$ ), as expected. In addition, 1% heteroscedasticity was also found. The same previous procedures were performed to solve these problems.

Table 4 presents the results for the sample without the cash variables, and again, only the Weighted Market Return (RMP) presents a negative coefficient and statistically significant ( $p\text{-value} = 0.0020$ ), evidencing that it does not influence the compensation of executives.

Although we did not identify differences in the estimators when comparing with the previous analysis, it should be noted that there was a reduction in the explanatory power of the model. It is expected that this model has a better fit than the one that changes the measure of organizational profit-to-cash performance, due to the discretionary profitability. Specifically, the Pre-Tax Accounting Earnings (LAIR), as well as the Weighted Pre-Tax Accounting Earnings (LAIRP), do not present a statistically significant relationship with the change in executive compensation.

In the study of Liu and Stark (2009), although the relationship of these variables with the executives' remuneration was statistically significant, the value of the estimator was not significant, evidencing that the impact of accounting results was insignificant. In the same study was verified that the LAIRP was negatively related to the remuneration, evidence inverse to that identified in this research.

The fact that there is no significant relationship between the variation in the compensation and the accounting result can be due to the high proportionality of the fixed remuneration component of the incentive formulas for executives in companies listed on BM&FBovespa. This confirms the fact that companies can not share the risk of achieving results with their executives.

The consistency of the results of this study with that of Liu and Stark (2009) and Joh (1999) shows that firms, in defining the remuneration formulas of their executives, do not take into account the conclusions of Holmstrom (1982) and Aggarwal and Samwick (1999) who predicted profit as a good measure of performance. The main objection that the literature points to the use of profit is the possibility of being influenced by management decisions that do not necessarily represent a better result (SCOTT, 2009).

**Table 4** - Test of the relative performance evaluation model considering profit and market return

Variable	Coefficient	VIF	Std. Error	T	P > t	Confidence interval 95%	
RM	-0.0069	1,23	0.0830	-0.08	0.934	-0.1706	0.1568
RMP	-0.0000	1,02	0.0000	-3.07	0.002	-0.0001	-0.0000
LAIR	-0.0069	3,24	0.0204	-0.34	0.734	-0.047	0.0333
LAIRP	0.0011	3,01	0.0017	0.61	0.539	-0.0023	0.0044
Tam	0.0003	1,37	0.0008	0.32	0.746	-0.0013	0.0018
D_2012	0.0147	1,22	0.0658	0.22	0.824	-0.1151	0.1445
D_2011	-0.0931	1,17	0.0673	-1.38	0.168	-0.2258	0.0396
Constante	0.1334		0.0523	2.55	0.012	0.0302	0.2366

R<sup>2</sup> = 0,0164 | Number of observations = 201 | Objective function = 0,1401

Subtitle: RM = Market return; RMP market-weighted return; LAIR = income before income tax and social contribution; LAIRP = income before income tax and social contribution weighted by sector; Cxop = operational cash; CxopP = operating box weighted by sector; Tam = size; D\_2012: time dummy which assumes value 1 in 2012 and zero in other years; D\_2011 = time dummy which assumes value 1 in 2011 in 0 in other years.

### No profit-related variables

In the third test, we again identified problems with normality of residues (Shapiro-Wilk test = 14.308 with p-value = 0.0000), and heteroscedasticity. The use of medium and robust regression to outliers corrected both problems.

No change was identified regarding the statistically significant variables compared to previous tests. From the performance variables used in the model, only the Weighted Market Return (RMP) was significant at 1%, but with a negative sign. Despite the assertion by Aggarwal and Samwick (1999) that it is unclear how peer performance should be used in defining the executive incentive formula, this result indicates that the incentives paid to executives in the period analyzed in this study may have been adjusted to market results as explained by Liu and Stark (2009). However, no evidence has been found that this occurs explicitly in the incentive formulas.

In addition, the fit of the model improved versus the model that considered the LAIR / LAIRP and excluded the CXOP CXOPP, but once again the value was low.

**Table 5** - Test of the relative performance evaluation model considering cash and market return

	Coefficient	VIF	Std. Error	T	P > t	Confidence Interval 95%	
RM	-0.0054	1,16	0.0789	-0.07	0.946	-0.1610	0.1503
RMP	-0.0000	1,02	0.0000	-3.16	0.002	-0.0001	-0.0000
CxOp	-0.0121	3,53	0.0174	-0.69	0.488	-0.0463	0.0222
CxOpP	0.0047	1,92	0.0087	0.54	0.592	-0.012	0.0218
Tam	0.0008	2,85	0.0014	0.54	0.589	-0.0020	0.0035
D_2012	0.0111	1,19	0.0665	0.17	0.868	-0.1201	0.1423
D_2011	-0.0937	1,13	0.0694	-1.35	0.179	-0.2306	0.0432
Constante	0.1322		0.0517	2.56	0.011	0.0303	0.2341

R<sup>2</sup> = 0,0200 | Number of observations = 201 | Objective function = 0,1399

Subtitle: RM = Market return; RMP market-weighted return; LAIR = income before income tax and social contribution; LAIRP = income before income tax and social contribution weighted by sector; Cxop = operational cash; CxopP = operating box weighted by sector; Tam = size; D\_2012: time dummy which assumes value 1 in 2012 and zero in other years; D\_2011 = time dummy which assumes value 1 in 2011 in 0 in other years.

According to Holmstrom (1982), the increase in the average result of a group or sector should reduce the impact that the result obtained in an organization exerts on the remuneration of its executives. This reduction would be a consequence of the expectation that the average of the group is high represents that part of the individual results obtained are not due to the effort of the executive, but a contingency that collaborated with the performance of all the organizations of that sector. Therefore, the results found for this variable do not corroborate with the theory of relative performance evaluation, indicating that the companies listed on the BM&F-Bovespa did not exclude non-controllable factors in rewarding their executives for organizational performance in the period studied.

The variables of earnings (LAIR and LAIRP) were not significant in any period, unlike the findings of Liu and Stark (2009) and Joh (1999). The behavior of the CXOP and CXOPP variables did not change in each analysis performed. In all analyzes, the cash variables representing the individual performance of each firm presented a negative correlation, contrary to the expected results.

The market return (RM) was not relevant in any test performed similarly to the study by Liu and Stark (2009). Its weighting for the sector (RMP) was statistically significant at 1%, but with the opposite sign expected.

The control variable for size (TAM) was not statistically significant in any test. An explanation for the result may be the use of quantile regression, since the separation of firms into quantiles would be canceling the expected effect of this variable. The temporal dummies were not significant, indicating that there were no exogenous effects that impacted executive compensation at different times.

It was also tested the exclusion of the "Financial and other" sector, but there was no statistically significant change in the model. The low statistical significance of the variables and the low value found for their coefficients do not allow to confirm the research hypothesis that the sectoral and individual performance variables would have inverse directions.

It is also noticed that the non-existence of a relative performance evaluation invalidates, for this sample, the reaction functions of Bertrand and Cournot in the forms presented by Aggarwal and Samwick (1999). This implies that firms would not be reacting to market competition in defining their executives' compensation formulas or that their reactions are ineffective. In this way, they enable a greater conflict of interests between principal and agent, which culminates in lower quality information for investors about the performance of executives.

## 5 FINAL CONSIDERATIONS

The main objective of this work was to highlight the implicit use of relative performance evaluation in BM&FBovespa listed companies, as a way of assessing the remuneration of its executives.

In general, it was possible to observe that only the weighted average return indicates signs of a relative performance evaluation, but the other variables used were not sufficient to capture evidence of the implicit occurrence of the phenomenon investigated in the period analyzed (2009 - 2012). This may be due to the non-formal recommendation by the CVM itself, and consequent lack of knowledge of incentive policies with explicit use of the RPE by Brazilian publicly traded companies.

Specifically, the use of cash-based performance variables (CXOP and CXOPP) increased the explanatory power of the model when compared to the analysis performed by replacing them with performance-related variables (LAIR and LAIRP). However, there was no statistically significant evidence of the occurrence of the relative performance evaluation. This fact leads to the conclusion that if there is a relative performance evaluation in the incentive formulas for the

executives of the firms analyzed, it only occurs through the observation of the market return that the sectors have earned.

The market-related performance variable (RM) was also not statistically relevant in any analysis, but the Weighted Market Return (RMP) was relevant at 1% and with negative correlation. However, since the value of the RMP estimator was not numerically significant, it is not possible to say that a relative performance evaluation was identified.

Thus, it is not possible to attest to the implicit use of the Relative Results Assessment in the sample companies. Since the CVM does not make a formal recommendation for its use, this factor may be the main determinant of this finding. Research in other countries considers the explicit use of the RPE as a consequence of the recommendation of the SEC and the U.K. Secretary of State itself, which may bring about differences between their results and those found in the screen survey.

It should be noted that, due to the size of the sample itself, which has a small number of firms and time intervals, such results can not be generalized, which is a limitation of this research. In addition, there is the possibility of selection bias arising from the possibility that companies that choose not to disclose their information about executive compensation, are precisely those that the compensation would have greater sensitivity to the performance of the organization or the sector. Another limitation to the study is the fact that it is considerably difficult to verify the sensitivity of the remuneration to the performance with short periods of time. However, this study can contribute to discussions about the impact of the implementation of RPE on incentive formulas for executives of listed companies in the Brazilian market.

As a suggestion for future research it is recommended to increase the size of the sample in order to increase the number of companies by sector and to make more specific sectoral classifications. Another recommendation is to remove from the dependent variable the long-term and non-pecuniary incentives, so it is expected to be able to use other estimation methods of the model.

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