The Relation Between The Board Of Directors, Performance, Work And Risk In The Brazilian Stock Market

Abstract

Among the Corporate Governance mechanisms, the Board of Directors is mentioned in academic research as fundamental in company performance and values in different countries. The important role in defense of the stockholders' rights, preventing the managers from using the company in defense of their own interests, makes this a relevant mechanism in empirical research, even more when its relations with financial indicators is analyzed. In this study, the main objective was to analyze the relation between this mechanism and the value, performance and risk of Brazilian companies in 2012 and 2013, using panel data regression. Therefore, a Board of Directors index was created, based on binary questions, adapted from Silva, Santos and Almeida (2011), to be used as an independent variable in econometric models. A positive statistical relation was found between the proposed inedex and the variable Volatility, against expectations. The research also indicated relevant relations between the dependent and control variables. Among other results, it was concluded that: a positive relation exists between the company size and its performance; a positive relation exists between the growth of sales and the company value; a position relation between the risk variables beta and volatility; and belonging to the distinguished corporate governance levels on the stock exchange reduces the volatility of company stocks.

Key Words: Board of Directors, Value, Performance, Risk, Corporate Governance Index

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1. Introduction

The development of the capital market triggered the growth of companies, to the extent that it offered a funding channel for these companies to enhance technologies and invest in greater productivity. In this growth process of the so-called "big modern corporations", as from the XXth century, and as a result of the entry of new controlling stockholders, the company manager and owner increasingly dissociated and, in this separation of roles inside the company, conflicts of interest gradually emerged, in which the manager sidestepped the maximization of stockholder wealth, giving rise to the "classical agency conflict" (Silveira, 2002). In their study, Berle and Means (1932) already appointed the dissociation of roles and the conflicts resulting from this separation between managers and stockholders, showing the increasing relevance of the theme in the course of the capital market development.

This conflict of interests between the economic agents raises the issue of one of the Corporate Governance (CG) mechanisms, the Board of Directors, in view of the company value, performance and risk in the stock market. In other words, there exist doubts about the board of directors' activities and their benefits for the investors and the company, such as the increase in the company value and performance and the consequent reduction of the investors' perception of company risk. In that sense, this study's practical contribution ot the market is also appointed, as yet another tool to allow investors to assess the effect of the board of directors on the company value, performance and risk in the capital market.

In addition, the difference in objectives between managers and stockholders has also been appointed in other studies, including the seminal work by Jensen and Meckling (1976), who describe the agency costs inside the companies. In this context, the incentive and monitoring mechanisms underlying the CG offered ways to reduce the agency costs, through the alignment between the administrators and the managers' objectives (Silveira, Barros, & Famá, 2003).

Among the internal CG mechanisms, the board of directors plays an important role, monitoring the company administrators' management and aiming to maximize the wealth for the shareholders. The ideal constitution of the board of directors is still being studied, considering its composition and the origin of the members, in the same way as the relation, although disseminated, and not yet fully agreed upon among researchers, about the influence of the board structure on the company value (Silveira *et al. 2003.*; Andrade, Salazar, Calegário, & Silva, 2009).

In that context, the objective in this study is to assess the relation between boards of directors and the companies' value/performance and risk. The research question is: **What is the effect of the board of directors on the performance, value and risk of the companies listed on BMF&FBOVESPA?** The theme addressed is justified by theincreasing importance of this CG mechanism. Also, no studies were found in Brazil that focus on "risk" and its relation with the board of directors when compared to the number of studies about the board of directors, performance and value, like the study by *et al.* (2009).

Through this study, the researchers hope to evidence the positive influence of the board of directors on the increase in company value and performance, as well as on the reduction of its risk, due to the board members' monitoring and control over the managers, thus avoiding the expropriation of the minority stockholders. Among the studies used for reference, some will serve as the base for this research, including Andrade *et al.* (2009), Silva, Santos and Almeida (2011), Peixoto (2012) and Lameira (2012).

Concerning the research method, this paper used panel regression, based on data collected in the database EconFinanceática and on the websites of the companies listed on BM&FBOVESPA, except for financial and insurance companies and funds, due to their particularities, in 2012 and 2013. As regards the Board variables, these data were collected on the website of the Brazilian Securities and Exchange Commission (CVM) and in the Annual Information the companies publish at year-end.

After the regressions, the proposed board index showed a positive relation with the volatility, going against the literature. In addition, relevant relations were found between some dependent and control variables. One example is the positive relation between the company size and the performance, the positive relation between the volatility and beta (these two variables are associated with the risk and one

of the differentials of this research) and the fact that belonging to the distinguished CG levels reduces the volatility of the company stock.

After this introduction, the theoretical framework is presented, including the Brazilian and international literature on the themes addressed. Next, the method used, the analysis of the results and the financial conclusions on this study. Finally, the references used in the article are displayed.

2. Theoretical Framework

Silveira (2002, p. 1) defines Corporate Governance (CG) as a "set of internal and external mechanisms aimed at harmonizing the relationship between managers and stockholders, given the separation between power and property". Hence, one may say that the CG involves the managers' control and monitoring and is developed with a view to aligning the managers and stockholders' interests with a view to maximizing the return on investments. In their study, Shleifer and Vishny (1997) appointed that the CG offers guarantees that the value invested in companies will be returned to the stockholders, in addition to the return on the investment.

Shleifer and Vishny (1997) also investigated the importance of CG in some countries around the world to guarantee the return on investments to the investors and the concerns with expropriation by the managers. In this study, the development stages of CG are assessed in the following countries: Italy, Russia, Germany, United Kingdom, United States and Japan.

Before the term "Corporate Governance" emerged as such in the literature, studies already analyzed the relation between managers and controlling stockholders, such as the studies by Jensen and Meckling (1976) and, before them, the study by Berle and Means (1932). In their study, the first authors appointed the conflict of interests between stockholders and managers, who represented them, and the defense of the stockholders' interests inside the company. According to Berle and Means (1932), the dissociation between property and control gave rise to the so-called agency cost although, at the time, the term "agency cost" was not used yet in the North American context.

In that context, it is important to situate the Transaction Cost Economics. TCE is concerned with the opportunistic actions in the corporate world. Rodrigues (2003, p.8) emphasizes that "the economics of transaction costs consists in the study of the mechanisms the companies adopt to minimize the effects of the risks involved in the network of contracts established among the different agents". In that sense, in line with the Agency Theory, CG mechanisms like the Board of Directors could therefore contribute to the TCE.

The agency costs appointed in Berle and Means (1932) are related to the transaction costs conceptualized in Coase (1937). According to this author, these costs include the costs of the transactions and contracts of the economic agents involved in the company, such as stockholders, agents, employees, suppliers, etc.

When discussing the Transaction Costs Economics (TCE), it is important to rescue the studies by Alchian and Demsetz (1972) and Williamson (1985). In his research, Peixoto (2012) appoints that the first authors, Alchian and Demsetz (1972), identified the "property right", in which the firms maintain a contract with the agents, and raised the impossibility of elaborating complete contracts between agents that cannot be violated. Williamson (1985), in turn, investigated the transaction costs after closing contracts, that is, the cost to maintain these contracts in force. Thus, it can be inferred that these authors assessed the financial impact of complying with the contracts closed for the company and, consequently, for the stockholders. One of the CG mechanisms, the board of directors, can be an important tool to reduce these transaction costs.

Returning the focus to governance research, various studies exist on the effect of CG on company performance, some of which are theoretical and others more empirical, involving econometric studies. Among the former, the study by Lipton and Lorsch (1992, p.4) describes the importance of CG in companies from the USA, especially for those that are unable to achieve the desired performance, as follows: "for companies with a low performance due to poor management or who insist on using an inefficient strategy, good corporate governance is the safest valve to provide the means to cope with this problem and improve the performance".

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In this research, Lipton and Lorsch (1992) analyze the role, the importance and possible changes in the shape of the boards of directors. Among these, the authors suggest that the defense of stockholder and company interests can be achieved with less members on the board, permitting all of them to participate in company debates; more frequent meetings, at least every two months, and rewards according to the challenges each company director assumes and the results achieved.

Lipton and Lorsch (1992) also cite the difficulty to distinguish between the roles of the CEO and the chairman of the board, which used to be more common at that time in European companies, and not in North American ones.

Next, some studies on corporate governance in the USA, Asia and Europe will be discussed, followed by some articles in which CG is related with the other variables studied in this paper in Brazil.

The theoretical study by Hermalin and Weisbach (2001) develops a bibliographic survey of themes related to the boards of directors, including: the size of the board, its composition, the characteristics of the board and its independence. Other issues raised in the article are the CEO turnover in the companies and the dispute between the CEO and the board members for their interests. Among other conclusions, the survey did not allow the authors to appoint policies to adapt the size and composition of the board with a view to enhancing its independence. They mention the problem of conflicts among board members and the CEO's influence in that sense.

Studies on the theme "board of directors" have been published with different approaches and in different countries. They analyzed, among other variables, the effect of the presence of female board members on company performance in the USA (Carter, Simkins, & Simpson, 2013) and in Germany (Joecks, Pull, & Vetter, 2013); the number of members on the board of directors in the USA (Coles, Daniel & Naveen, 2008); the presence of external members in the boards of directors of Indian companies (Kumar & Singh, 2012); and the presence of company employees on the boards of companies in Germany (Fauver & Fuerst, 2006), particularly relating these variable to company value and performance.

Other studies measured the relation among these variables through the construction of CG índices. In that sense, Beiner, Drobetz, Schimid and Zimmermann (2004) developed an index to analyze the relation between CG and the value of companies listed on the Swiss stock exchange. Therefore, the authors used the board size and the presence of external board members, among other variables, to build the index. They concluded that a positive relation exists between CG and performance.

In Germany, Fauver and Fuerst (2006) analyzed if the presence of employees on the boards of directors would increase the value of German companies and if these employees' influence, in defense of the workers' interests, would indirectly protect the minority stockholders' interests. In that country, the boards are divided in two groups (supervision and management). The first is responsible for activities inherent in the board of directors, as adopted in the USA. The second group is responsible for the company's operational management. The authors concluded that, to a certain extent, the presence of workers has a positive influence on company value but that, beyond that point, agency problems may occur, in which the employees-board members themselves cause the expropriation (relation between employees and performance in the shape of an inverted U).

In Asia, Shakir (2008) analyzed the relation between the composition of the board of directors and the performance of companies on the Kuala Lumpur stock exchange in Malaysia. The final results of the article were inconclusive about the benefits of external board members' participation, but appointed that a smaller number of board members would be better to reduce the information asymmetry and permit the board's centralized leadership.

In another article, Velnampy (2013) investigated companies' performance in the capital Market of Sri Lanka, using a sample of 28 industrial companies between 2007 and 2011. Using multiple regression, the study attempted to relate the variables board structure, presence of executive committees, frequency of board member meetings, independence of board members and internal and external members with the company performance, using ROA and ROE. The author concluded that no significant relation exists between company performance and the board measures used as independent variables.

In the USA, the study of companies' performance and value and their possible relation with the board of directors also became common, mainly after the enactment of the Sarbanes-Oxley Act (SOX) in 2002 when, after corruption and bad company management scandals, stricter laws were elaborated and implemented for North American company managers. One example is the study by Bhagat and Bolton (2009), which analyzed the relation between the performance of companies in the USA and CG variables before and after the act. Among the authors' conclusions, no significant association was found between board independence and company performance in what they called the precrisis period, until 2002, and a positive relation after 2002, called the "post-crisis period".

In Brazil, some studies also found relations between factors of the board of directors and company performance, value and risk. Next, some of these studies will be discussed.

Silveira *et al.* (2003), in an analysis of governance mechanisms, including the board of directors, considered three variables: separation between the functions of chief executive officer and chairman of the board (DE), size of the Board (TOT) and Independence level of the Board (Indep). The authors' results suggest that, on average, companies with distinct people serving as CEO and chairman of the board are better valued in the market.

Through multiple hierarchical regression, Andrade *et al.* (2009) investigated the influence of the board of directors on the value and performance of Brazilian non-financial companies between 2004 and 2006. They found that a positive relation exists between the number of board members and the company value and that the composition of the boards is more strongly related to company value than to performance.

Silva *et al.* (2011) verified the influence of the board of directors on the indebtedness of companies that adhered to the distinguished CG levels in 2008, using the Ordinary Least Squares (OLS) method. For this study, the authors used a questionnaire with six binary and objective questions as a proxy of the board, which were worth one point each. The questionnaire used in this research is displayed in Table 1. Silva *et al.* (2011) appointed that the elaboration of this questionnaire took into account the best practices recommended by the IBGC, CVM, BM&FBOVESPA and the studies by Carvalhal da Silva and Leal (2006) and Santos and Leal (2007).

Table 1
Questions for proxy of the board

Questions for proxy of the board
1 – Are the Chairman of the Board and the CEO different people?
2 – Does the company have monitoring committees, like a remuneration and/or nomination and/or audit committee?
3 – Does the Board clearly consist of external and possibly independent board members (not linked to the controlling stockholders) ?
4 – Does the Board contain between 5 and 9 members, in accordance with the IBGC code?
5 – Do the Board members serve on a one-year mandate, in accordance with the IBGC code?
6 – Does the company have a permanent Tax Code?

Source: Silva *et al.* (2011)

The authors found a positive and significant relation with short-term indebtedness only, and a negative relation with total and long-term indebtedness. They concluded that the board of directors is aligned with the controlling stockholder's interest in the indebtedness, and that the short-term debt can discipline the managers.

Fraga and Silva (2012) investigated the relation between the diversity of the board members and the company performance. Using 71 observations between 2005 and 2009, diversity indices were constructed with board member characteristics: sex, age, years of schooling and formal education. Using regression, the authors concluded that a positive relation exists between years of education and performance, and a negative relation between formal education and performance. Finally, they indicated a positive and strong relation between the presence of women on the board and company performance.

Gondrige, Clemente and Espejo (2012) analyzed the relation between company value and the number of board members (NMembros), independence (Indep) and the accumulation of the functions of chairman of the board and CEO by the same person (*CeoPowerful*). Therefore, they used a sample of 208 Brazilian companies in 2008, applying multiple linear regression. The result found indicated a positive and significant relationship between the number of board members and the company value, indicating that the presence of larger boards leads to an increase in company value.

Although not directly discussing the board of directors, some governance studies inspired this research in the selection of the control variables for the econometric models, among which the following can be mentioned: Lameira (2012), Peixoto (2012) and Guimarães, Marques and Peixoto (2014).

Lameira (2012) analyzed the relation between CG and risk, using linear regression and structural equations in a sample of Brazilian non-financial companies, between 2002 and 2006. To analyze this relation, the author elaborated a CG quality index with the answers to 20 binary questions. An association was expected between better CG levels and lower risks, in line with the findings of the present study.

Por sua vez, Peixoto (2012) e Guimarães *et al.* (2014), in turn, related CG mechanisms with the variables risk, performance and value of Brazilian companies.

In the study by Peixoto (2012), the relation between CG and performance, value and risk of Brazilian companies was analyzed between 2000 and 2009. A CG quality index was elaborated through the main components analysis method. Next, using panel data regression, the relation between the index and the variables performance, value and risk was verified. Among other conclusions, no significant relations were found between accounting performance and CG and between the risk measures and CG. Nevertheless, the study found a positive relation between the value and CG at times of economic crisis.

Using panel data, the second study analyzed a possible relation between the property and control structure and the performance, value and risk of non-financial companies between 2004 and 2012. Among other results, the study concluded that the stockholder concentration did not significantly affect the variables risk and performance, and that a negative relation existed between voting right concentration and market value.

Holtz, Vargas, Macedo and Bortolon (2013) analyzed accounting and financial variables that influenced the number of board members of 315 companies listed on BM&FBOVESPA, using information collected from the reference form for 2012. The authors concluded that companies with higher indebtedness and intangible assets had larger boards due to the need for counseling and monitoring, and also that companies with a greater operational cash flow had smaller boards, which the authors justified by the need to reduce the conflicts due to the surplus cash in the company.

In this study, an index will be elaborated to measure the Board of Directors variables, according to methods used in Silva *et al.* (2011) and Lameira (2012), so as to consolidate the measures that make the Board of Directors more coherent with the IBGC recommendations in a single indicator.

In view of the studies mentioned, the importance of studying the variables risk, performance and value in relation to the board of directors is shown. No articles were found about the relation of the combination of these variables with the CG mechanisms under analysis, in Brazil or abroad, showing the relevance of this research. Next, the hypotheses are presented that will be tested in this study:

H1:   *A positive relation exists between the Board of Directors index developed in this research and the company performance and value.*

H2:   *A negative relation exists between the Board of Directors index developed in this research and the risk.*

Therefore, through this study, a positive relation is expected between the board of directors, the company value and performance, showing that the board of directors influences the company's performance. Similarly, a negative association is expected between the board of directors and the risk for investors.

3. Methodological Aspects

3.1. Data, Sample and Method Used

This study can be characterized as descriptive and quantitative. The sample constituted un unbalanced panel of companies listed on BM&FBOVESPA, excluding financial and insurance companies and funds, covering the years 2012 and 2013. Secondary data were used that were collected from the website of the above stock exchange, from the annual reports and websites of companies, from the database Economática and from the website of the Securities and Exchange Commission (CVM).

The companies listed were selected based on the liquidity filter proposed by Silveira (2002). Companies with significant liquidity were considered as the companies with an annual liquidity index calculated by Economática over 0.001% of the index corresponding to the company with more liquid actions over the total research period, necessarily including 2013, the final year of the data collection. Silveira (2002, p.75) justifies this option as follows: "companies with a very low liquidity have a lesser probability of having their stock adapted to the market value".

The econometric method used was the regression with panel data, using the software Stata®. Initially, the VIF (Variance Infalation Factor) test was applied to verify if any of the variables should be taken from the model. The VIF result for all individual variables was inferior to 10, as well as the test for all variables in the model. Therefore, none of the variables needed to be removed from the model.

The Breusch-Pagan test was adopted to determine between the pooled or the random-effect model, that is, whether the cross-section units were homogeneous, reaching the result that the pooled model was not appropriate to any of the models proposed in this study. Finally, the Hausman test indicated whether the fixed or random-effect model adjusted better. For the models whose dependent variables are ROA, Tobin's Q and BETA, the fixed-effect model showed to be more appropriate; for the dependent variable VOLAT, the random-effect model adapted better.

The definition of the dependent, independent and control variables in this study was based on the studies by Andrade *et al.* (2009), Silva *et al.* (2011), Peixoto (2012), Lameira (2012), and Guimarães *et al.* (2014), among others.

The proxy variable to characterize the board of directors was developed according to the model by Silva *et al.* (2011), in which the authors used six binary questions to construct the variable, called the Board of Directors Index (BDI) in this study. The third question in the original questionnaire was replaced due to possibilities of subjective answers and questions regarding its interpretation. Aiming for greater impartiality and objectivity in the data collection and in the analysis of the results, the decision was made to change the questionnaire. The questions are displayed in Table 2

The answers collected resulted in an index to measure the board of directors variables (bDI), according to the IBGC recommendations for the composition and structuring of boards. The proposed index was the independent variable tested in the econometric models.

Table 2
Questions for proxy of the board

Questions for proxy of the board
1 – Are the Chairman of the Board and the CEO different people?
2 – Does the company have monitoring committees, like a remuneration and/or nomination and/or audit committee?
3 – Does the Board clearly consist of external and possibly independent board members (not linked to the controlling stockholders) ?
4 – Does the Board contain between 5 and 9 members, in accordance with the IBGC code?
5 – Do the Board members serve on a one-year mandate, in accordance with the IBGC code?
6 – Does the company have a permanent Tax Code?

Source: adapted from Silva *et al.* (2011)

The positive answers obtained on the questionnaire add one point for the company, so each company can reach six points at most. On the opposite, the negative answers do not add any points. Therefore, each company's score ranged between zero and six.

3.2. Variables Selected for the Study

3.2.1. Dependent Variables

Performance

The company performance can be measured in different ways, including the use of ROA (return on assets) used in Carvalhal da Silva and Leal (2006), Guimarães *et al.* (2014), Silva *et al.* (2011), Beiner *et al.* (2004) and Velnampy (2013). The configuration recommended by the IBCG for the board of directors is expected to positively affect the companies' performance.

To calculate the ROA, the index of the company's net income and the company's total assets was used.

Value

One of the proxies for the company value is Tobin's Q, according to studies by Carvalhal da Silva (2004), Carvalhal da Silva and Leal (2006), Guimarães *et al.* (2014), Peixoto (2012), Shakir (2008), among others. The analysis of the index between the market value of the company stock plus its indebtedness, and the total assets as proposed by Chung and Pruitt (1994), a positive relation between this variable and the board of directors is also expected.

To measure Tobin's Q, the sum of the market value of the stock and the total indebtedness was calculated, divided by its total indebtedness was calculated, divided by its total assets.

Risk

To measure the risk, two variables were chosen: the Beta and the Volatility. Both were used in the work by Peixoto (2012) and Lameira (2012). Guimarães *et al.* (2014), in turn, also used the variable Volatility to measure the risk of the stock. A reduction of the risk is expected in the companies that adopt the IBGC recommendations regarding the board of directors.

The formula to calculate the variables is as follows: for the Beta, the regression of the monthly stock return is calculated against the monthly return of Ibovespa, considering the previous 60 months. And, for the Volatility, the calculation uses the natural logarithm of the stock price of the day over the stock price of the previous day.

3.2.2. Control Variables

The control variables were as follows: a) the natural logarithm of the company value (LNVM); b) the logarithm of the total assets (LNAT); c) financial leverage (AF); d) operational leverage (AO); e) sales growth (CRESC_VEND); f) return on equity (ROE); g) indebtedness (ENDIV); h) logarithm between the equity per share and its price (LOGVPAP); i) the trade volume of the share (LIQBOL); and j) the dummy NGOV, related to the level of CG the company adhered to (1 if Levels 2 or New Market, 0 if not). The theoretical foundations (studies) to support the choice of each variable are shown in Table 3.

Table 3

List of Variables

		Dependent Variables		
	Calculation	**Measures:**	**Expected sign**	**Authors**
ROA	Net Income/Total Assets	Performance	+	Carvalhal da Silva e Leal (2006) Guimarães et al. (2014) Silva et al. (2011); Beiner et al (2004); Velnampy (2013)
TOBIN'S Q	Defined as market value of stocks plus book value of debts or third-party capital, divided by total assets.	Value	+	Peixoto (2012); Shakir (2008); Guimarães et al. (2014); Fauver e Fuerst (2006); Beiner et al. (2004)
BETA	Regression of mean monthly Return of stock against monthly return of Ibovespa, considering the previous 60 months. Collected from Economática	Risk	-	Lameira (2007); Peixoto (2012); Guimarães et al. (2014); Beiner et al. (2004)
VOLAT	Ln between closing value of the stock in period t and period t-1. (Economática)	Risk	-/+	Guimarães et al. (2014); Peixoto (2012)
		Control variables		
	Calculation	**Measures:**	**Expected sign**	**Authors**
LNVM	Logaritmo of Firm Value: indicator provided by Economática	Value	+	Andrade et al. (2009)
LNAT	Neperian logarithm of total assets.	Value	+	Guimarães et al. (2014); Lameira (2012); Andrade et al. (2009)
AF	$Af = \dfrac{(LL/PL)}{\dfrac{(LL - res\ fin)}{AT}}$	Risk	-	Peixoto (2012); Lameira (2012)
CRESC_VEND	Percentage variation of total net operational income between one year and the nex.	Performance	+	Peixoto (2012); Guimarães et al. (2014)
ROE	Net income over book value of equity.	Performance	+	Lameira, Júnior, da Silva, da Mota e Klötzle (2010) Peixoto (2012); Velnampy (2013);
AO	$Ao = \dfrac{(RLO - CPV)}{(RLO - CPV - DV - DA)}$	Risk	+	Peixoto (2012); Lameira (2012)
ENDIV	Total Liabilities/Total Assets	Risk	-	Andrade et al. (2009)
LGOVPAP	Natural logarithm of equity per share/price index, which is the net equity per share divided by its price.	Value	+	Peixoto (2012)
LIQBOL	Trade volume of stock	Performance	+	Peixoto (2012)
NGOV	Dummy 1 for companies at Levels 2 and New market, and 0 for companies on other Corporate Governance levels of Bovespa and traditional market.	Value	+	Holtz et al. (2013); Lameira (2012)

Source: elaborated by the authors

Based on the selection of the variables, below, the econometric models to analyze the relation between board of directors and performance/value/risk are presented:

Performance:

$$\mathbf{ROA}_{it} = \beta_0 + \beta_1 BDI_{i,t} + \beta_2 LNAT_{it} + \beta_3 ENDIV_{it} + \beta_4 LOGVPAP_{it} + \beta_5 NGOV_{it} + \varepsilon_i \qquad \text{(Model 1)}$$

Value:

$$\mathbf{Tobin's\ Q}_{it} = \beta_0 + \beta_1 BDI_{i,t} + \beta_2 LNAT_{it} + \beta_3 ENDIV_{it} + \beta_4 AF_{it} + \beta_5 CRESC\_VEND_{it} + \beta_6 ROE_{i,t} + \beta_7 LIQBOL_t + \beta_8 NGOV_{it} + \varepsilon_i \qquad \text{(Model 2)}$$

Risk:

$$\mathbf{Beta}_{it} = \beta_0 + \beta_1 BDI_{i,t} + \beta_2 VOLAT_{it} + \beta_3 LOGVPAP_{it} + \beta_4 LOGVM_{it} + \beta_5 LIQBOL_{it} + \beta_6 AO_{i,t} + \beta_7 AF_t + \beta_8 CRESC\_VEND_{it} + \beta_9 NGOV_{it} + \varepsilon_i \qquad \text{(Model 3)}$$

$$\mathbf{Volat}_{it} = \beta_0 + \beta_1 BDI_{i,t} + \beta_2 BETA_{it} + \beta_3 LOGVPAP_{it} + \beta_4 LOGVM_{it} + \beta_5 LIQBOL_{it} + \beta_6 AO_{i,t} + \beta_7 AF_t + \beta_8 CRESC\_VEND_{it} + \beta_9 NGOV_{it} + \varepsilon_i \qquad \text{(Model 4)}$$

4. Analysis Of The Results

In this item, the descriptive statistics of the research variables investigated are presented, as well as the correlations among the variables and the regression results of the estimated models, as well as the results of the tests of differences of means between the answers to the questionnaire and the dependent variables in this study.

4.1 Descriptive Analysis

The Variance Inflation Factor (VIF) test for each variable, as well as the mean VIF, indicated that there are no multicollinearity problems (VIF inferior to 10). Thus, none of the variables needs to be excluded from the model. The next step involved the diagnostic tests of the models and their estimation, involving the presentation of the regression results of the variables of interest. Finally, all models used *robust* to avoid possible multicollinearity problems, even if these had not been identified by the VIF test and/or self-correction.

To create the Board of Directors Index (BDI), six questions were used that were scored as 0 or 1, as mentioned in the method. It should be highlighted, however, that some difficulties emerged in the data collection regarding the availability of the information needed. Hence, the companies did not score the questions for which the answers were not found in their reports.

The descriptive analysis of the variables with the number of observations, mean, standard error, minimum and maximum is shown in Table 4. To treat the outliers found, the winsorization technique was used.

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Table 4

Descriptive analysis of variables

Variable	Observations	Mean	SE	Minimum	Maximum
Q1	425	0.7835	0.4123	0	1
Q2	365	0.5233	0.5001	0	1
Q3	167	0.8292	0.3033	0	1
Q4	243	0.7407	0.4391	0	1
Q5	293	0.2935	0.4562	0	1
Q6	439	0.2756	0.4473	0	1
NGOV	473	0.5455	0.4985	0	1
ROA	469	0.0199	0.0686	-0.1200	0.1200
BDI	459	2.3072	1.4062	0	6
LNAT	469	14.8216	1.6509	11.1400	17.9000
ENDIV	469	0.6224	0.2422	0.25000	1.1700
LOGVPAP	428	23.8666	0.8442	22.500	24.9000
Q_TOBIN	456	1.4586	0.6651	0.7962	2.9502
AF	469	1.5021	1.3432	-0.6000	3.6000
CRESC_VEND	451	0.0473	0.1735	-0.2900	0.3900
ROE	469	0.0716	0.1606	-0.2600	0.3500
LIQBOL	473	0.1938	0.2660	0.0005	0.7702
BETA	376	0.8193	0.4500	0.1000	1.9400
VOLAT	358	37.1913	13.1830	22.8900	66.2800
LOGVM	468	21.0421	2.0592	16.3226	24.4323
AO	469	2.0045	1.9519	-1.4000	5.8000

Q1: question 1 of BDI. Q2: question 2 of BDI. Q3: question 3 of BDI. Q4: question 4 of BDI. Q5: question 5 of BDI. Q6: question 6 of BDI. NGOV: governance level. ROA – return on assets; BDI – proposed index to measure characteristics of boards of directors – LNAT – natural logarithm of total assets – ENDIV – total liabilities / total assets – LOGVPAP – logarithm of equity value per share/price –TOBIN's Q –market value of stocks plus debt value divided by total assets - AF – financial leverage – CRESC_VEND – percentage variation in net operational income between one year and the other – ROE – return on net equity – LIQBOL – relative trade volume of stock – BETA – regression of monthly stock return against monthly Ibovespa return, considering the previous 60 months – VOLAT – logarithm of closing price of stock over closing price of stock the day before – LOGVM – logarithm of firm value – AO – operational leverage

Source: research results

In the descriptive analysis of Table 4, the mean result of the BDI, the index proposed in this study, was 2.3072, indicating low adherence to the IBGC recommendations with regard to the composition of the boards of directors, considering that the maximum score is 6.

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Table 5

Test of difference of means between dependent variables and questions about the Board

ROA			Tobin's Q			Beta			Volatility		
Group	Obs	Mean	Group	Obs	Mean	Group	Obs	Mean	Group	Obs	Mean
Q1			Q1			Q1			Q1		
0	92	0.0110	0	87	1.5121	0	80	0.9038	0	55	40.5449
1	331	0.257	1	326	1.4466	1	260	0.7830	1	270	36.1040
Q2			Q2			Q2			Q2		
0	172	0.0226	0	168	1.4227	0	137	0.7245	0	111	38.1231
1	191	0.0323	1	185	1.5120	1	149	0.8734	1	174	35.7453
Q3			Q3			Q3			Q3		
0	17	0.0024	0	17	1.2921	0	14	0.5521	0	7	27.9943
1	150	0.0243	1	147	1.4126	1	99	0.9884	1	133	36.2243
Q4			Q4			Q4			Q4		
0	63	0.0154	0	63	1.3533	0	49	0.7731	0	45	34.4258
1	180	0.0261	1	177	1.4747	1	137	0.9004	1	147	36.6799
Q5			Q5			Q5			Q5		
0	207	0.0244	0	204	1.4033	0	158	0.8383	0	162	36.1217
1	86	0.0094	1	85	1.3989	1	70	0.9214	1	70	39.9961
Q6			Q6			Q6			Q6		
0	316	0.0226	0	308	1.4861	0	237	0.8591	0	243	37.3468
1	121	0.0255	1	121	1.3004	1	112	0.7221	1	98	35.0803

Source: research results

The difference of means tests showed the relation between the answers of the adapted questionnaire and the dependent variables of performance/value/risk. Among the relations shown in Table 5, the answers to the third question are highlighted, which showed a greater difference among the answers and observations regarding each question. This question, which was adapted from the original questionnaire, as mentioned, showed that companies with more than 20% of external members are more associated with the variables value/performance/risk than companies with less external board members.

In the correlation analysis between the variables, a low correlation is observed, as presented in Table 6, except for the variables LOGVM and LNAT, which showed a correlation superior to 0.8 (0.8548), but this does not represent a problem for the models used, as they are not present in the same model.

Table 6
Analysis of correlation between variables

	ROA	BDI	LNAT	ENDIV	LOGVPAP	TOBIN'S Q	AF	CRESC_VEND	ROE	LIQBOL	BETA	VOLAT	LOGVM	AO
ROA	1													
BDI	0.0954*	1												
LNAT	0.2189*	0.4004*	1											
ENDIV	-0.5084*	-0.1768*	-0.2226*	1										
LOGVPAP	0.0631	0.0417	0.0978*	-0.1626*	1									
Q DE TOBIN	0.3107*	-0.0352	-0.2051	0.0813	-0.0092	1								
AF	0.1526*	0.1005*	0.1212*	-0.1050*	-0.0117	0.0074	1							
CRESC_VEND	0.1500*	-0.0523	0.0732	-0.0786	0.0022	0.2026*	-0.0496	1						
ROE	0.5600*	-0.0516	0.0356	-0.0628	0.0298	0.4799*	0.1400*	0.1155*	1					
LIQBOL	0.1169*	0.3562*	0.6475*	-0.0878	0.1154*	0.0514	0.0554	-0.0284	0.0811	1				
BETA	-0.2234*	0.1108*	0.0828	0.0995	0.0808	-0.1074*	-0.0551	-0.0394	-0.2497*	0.2463*	1			
VOLAT	-0.6103*	-0.0973	-0.3561*	0.5078*	-0.0786	-0.2607*	-0.1203*	-0.1809*	-0.4363*	-0.0647	0.3614*	1		
LOGVM	0.5052*	0.4121*	0.8548*	-0.4486*	0.0888	0.1449*	0.1575*	0.1997*	0.2644*	0.6085*	-0.0138	-0.6354*	1	
AO	0.1634*	-0.0105	0.0128	-0.0228	0.1109*	0.0829	-0.1491*	0.1683*	0.0512*	-0.0094	0.0343	-0.2083*	0.0832	1

Legend: * presents correlation coefficients statistically significant at 10%. ** presents correlation coefficients statistically significant at 5%. *** presents correlation coefficients statistically significant at 1%. ROA – return on assets. BDI – proposed index to measure characteristics of boards of directors. LNAT – natural logarithm of total assets. ENDIV – total liabilities/total assets. LOGVPAP – logarithm of equity value per share/price. TOBIN's Q – market value of stocks plus debt value divided by total assets. AF – financial leverage. CRESC_VEND – percentage variation in net operational income between one year and the other. ROE – return on net equity. LIQBOL – relative trade volume of stock. BETA – regression of monthly stock return against monthly Ibovespa return, considering the previous 60 months. VOLAT – logarithm of closing price of stock over closing price of stock the day before. LOGVM – logarithm of firm value. AO – operational leverage.

Source: research results

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4.2. Regression Results

The Hausman Test revealed that the fixed-effect model was the most appropriate for the first three models (ROA, Tobin's Q and BETA). When the VOLAT is used as the dependent variable, the random-effect model showed to be the most appropriate.

In sum, the results identified a positive relation between the board of directors index (BDI) proposed in this study and the risk variable VOLAT, against expectations, in line with Lameira (2012) and similar to the findings when using the index proposed in the study by Beiner *et al.* (2004) as the risk for investors is expected to be reduced by the adherence of the CG mechanisms. The statistical relations also showed significance between the performance/value/risk variables and the control variables, as presented next.

Tables 7 and 8 present the regression results of the models proposed in this study. Table 7 corresponds to the regressions of the dependent variables ROA, aiming to measure the performance, and the variable Tobin's Q to measure the value. Table 8 shows the relations between the dependent variables Beta and Volatility, both of which measure the risk.

Table 7

Analysis of relation between dependent variables ROA and Tobin's Q and Board of Directors

ROA	Coefficient	P>|t|	TOBIN_Q	Coefficient	P>|t|
BDI	0.0021	0.441	BDI	-0.0226	0.283
LNAT	0.0395	0.004***	LNAT	-0.4091	0.001***
ENDIV	-0.2080	0.0000***	ENDIV	-0.2937	0.0401
LOGVPAP	0.0011	0.731	AF	0.0062	0.518
NGOV	0	(omitted)	CRESC_VEND	0.2172	0.03**
			ROE	0.4215	0.001***
			LIQBOL	-0.0882	0.484
			NGOV	0	(omitted)

Legend: ROA – return on assets. BDI – proposed index to measure characteristics of boards of directors. LNAT – natural logarithm of total assets. ENDIV – total liabilities/total assets. LOGVPAP – logarithm of equity value per share/ price. TOBIN's Q – market value of stocks plus debt value divided by total assets. AF – financial leverage. CRESC_VEND – percentage variation in net operational income between one year and the other. ROE – return on net equity. LIQBOL – relative trade volume of stock. BETA – regression of monthly stock return against monthly Ibovespa return, considering the previous 60 months. VOLAT – logarithm of closing price of stock over closing price of stock the day before. LOGVM – logarithm of firm value. AO – operational leverage.

Source: research results

In the regression of the model with the dependent variable ROA, two variables were significant. The natural logarithm of the assets (LNAT) showed a positive relation with the ROA at 1%, indicating that larger companies performed better, and Indebtedness (ENDIV) presented a negative association at 1% as well, indicating in this case that, the higher the company's indebtedness, the lower its performance will be.

The results support the findings by Andrade *et al.* (2009), in which established companies in the market, i.e. larger companies in terms of assets, are considered as preferred investment targets. As a possible justification, Lameira *et al.* (2010) also cited the power of larger companies to negotiate with suppliers, as a way to preserve their market value. In the case of indebtedness, a negative relation was expected, as mentioned in Andrade *et al.* (2009), in which companies with a greater share of capital from third parties are seen as more risky, also due to the fact that the third parties require, in some cases even by contract, the right to participate in investment decisions inside the company.

The results of the economic model for the company value showed a positive and significant association between sales growth (CRESC_VEND) and value at 5%, that is, based on these results, it is inferred that, the larger the sales growth, the higher the company value will be; the same happened with the return on equity (ROE), significant at 1%, indicating that, the higher the return, the higher the company value will be.

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For the variable LNAT, the result indicated a negative relation, i.e. the larger the company, the lower its value will be. It was expected that, the larger the firm, the higher its market value would be, in line with Lameira *et al.* (2010). The result found differed from the literature though. Lameira *et al.* (2010) also concluded in their study that this result is due to the fact that the market sees a greater potential value and gains in companies that are not consolidated or mature yet. In addition, the authors commented that larger companies are able to offer better returns if they are able to get cheaper resources, while smaller companies manage to increase their value faster through the adoption of better management practices.

Table 8

Analysis of relation between dependent variables Beta and Volatility and Board of Directors

BETA	Coefficient	P>|t|	VOLAT	Coefficient	P>|z|
BDI	0.0039	0.9310	BDI	0.7448	0.099*
VOLAT	0.0134	0.001***	BETA	7.8662	0.0000***
LOGVPAP	-0.0460	0.1470	LOGVPAP	-0.5565	0.365
LOGVM	0.2385	0.006***	LOGVM	-5.7046	0.0000***
LIQBOL	-0.6034	0.002***	LIQBOL	17.5990	0.0000***
AO	0.0162	0.3450	AO	-0.7123	0.01**
AF	-0.0015	0.9410	AF	0.0211	0.0958
CRESC_VEND	0.0173	0.8900	CRESC_VEN	4.3344	0.164
NGOV	0	(omitted)	NGOV	-4.9158	0.000***

Legend: ROA – return on assets. BDI – proposed index to measure characteristics of boards of directors. LNAT – natural logarithm of total assets. ENDIV – total liabilities/total assets. LOGVPAP – logarithm of equity value per share/price. TOBIN's Q – market value of stocks plus debt value divided by total assets. AF – financial leverage. CRESC_VEND – percentage variation in net operational income between one year and the other. ROE – return on net equity. LIQBOL – relative trade volume of stock. BETA – regression of monthly stock return against monthly Ibovespa return, considering the previous 60 months. VOLAT – logarithm of closing price of stock over closing price of stock the day before. LOGVM – logarithm of firm value. AO – operational leverage.

Source: research results

The regressions between the dependent variables BETA and VOLAT and the board of directors index (BDI) were aimed at identifying a possible relation between having a board that follows the IBGC recommendations and reductions in the companies' systematic and total risk, respectively. The results were shown in Table 8 and are interpreted next.

Concerning the model whose dependent variable was the Beta, the variables volatility (VOLAT) and company size (LOGVM) showed a positive and significant relation with the systematic risk. Based on the first relation, it is inferred that, the greater the volatility of the company stock in the market, the higher its systematic risk will be. Similarly, the higher the LOGVM, which is a proxy of company size in this case, the higher the investor risk will be, in line with the study by Peixoto (2012) in this case. The variable stock liquidity (LIQBOL) in turn, showed a negative and significant relation with the beta, indicating that, the larger the trade value of the company stock, the lower its risk will be.

The model that used VOLAT as the dependent variable found a positive and significant relation at 10% between the proposed index BDI and the dependent variable, as well as positive and negative relations with the control variables. The variables BETA and LIQBOL fit into the first group and LOGVM, AO and NGOV in the second.

In the case of the proposed index, the greater the company's adherence to the IBGC recommendations concerning the board of directors mechanism, the greater its volatility will be. The opposite was expected in the literature, as one of the objectives of the mechanism is to reduce the risk of the company stock for the investors, as found in Lameira (2012). For the first group, based on the regression, it is inferred that, the higher the company's Beta, the greater the volatility of the stock in the market and, the higher the company's liquidity, the greater its volatility will be.

For the second group, it is inferred that, the higher the company's market value, the lower the stock price volatility will be; the higher the company's operational leverage, the lower the volatility will be, or the stock price variation in the market and belonging to the distinguished CG levels on the stock exchange reduces the volatility of the company's stock prices.

5. Final Considerations

The main goal in this study was to verify the influence of one of the CG mechanisms, the board of directors, on the performance/value/risk of Brazilian publicly-traded companies in 2012 and 2013. Therefore, initially, a board of directors index was developed. This index was called BDI and was based on the answers of a questionnaire with six binary questions, adapted from the study by Silva *et al.* (2011). After the creation of the BDI, the variables of interest were related through regression models with panel data, mainly using the fixed-effect model.

The results found were expected to indicate a positive relation between this mechanism and the dependent variables value and performance and a negative relation with the risk, showing the importance of adopting the IBGC recommendations in the structure of the board of directors, similar to the study by Beiner *et al.* (2004), in which a CG index was proposed for Swiss companies. The BDI showed a positive relation with the variable VOLAT though, differently from the findings by Lameira (2012). Thus, it is concluded that the adoption of the board of directors does not reduce the risk for the shareholders.

This research result regarding the effect of the board of directors on the company's performance and value was similar to other international studies, like Shakir (2008), which found inconclusive results regarding the board composition in the performance of companies in Malaysia, as well as the study by Velnampy (2013), which found no relation between CG and performance in Sri Lanka.

Significant relations were found between the dependent variables and some control variables. The variable LNAT showed a positive relation with the variable ROA, as expected, indicating that larger companies, that is, companies that are more consolidated in the market, in line with Andrade *et al.* (2009), perform better. On the opposite, the variable ENDIV presented a negative relation with the performance variable, in line with Andrade *et al.* (2009) and Silva *et al.* (2011). The indebtedness can be interpreted as a possible interference of creditors in the companies' strategic planning, simply aiming for the return on the investment, without any alignment with the interest in maximizing the shareholders' wealth, and therefore influencing their performance.

In the relation between the variables and Tobin's Q, against expectations, the variable LNAT was negatively related with the value. The sales growth measured by means of CRESC_VEND and the return on equity measured by the ROE showed a positive relation, as expected. Companies with increasing sales perform better and, in most cases, show better financial results. Therefore, they can offer higher returns to the stockholders.

The dependent risk variables (BETA and VOLAT) showed a positive relation, sometimes with VOLAT, sometimes with BETA, proving what was expected – the beta and volatility move together in the stock market. The market value measured by its natural logarithm showed a positive relation with the BETA, against expectations, possibly indicating that companies with a higher market value face a greater risk of losing value and investments for the shareholders. The variable LIQBOL showed a negative relation with the BETA. Based on this relation, it is inferred that more liquid, i.e. more traded companies have a lower risk, as expected.

In the case of the model with VOLAT as the dependent variable, its relation with the variable LIQBOL was positive, as opposed to the relation between this variable and the Beta, mentioned in the previous paragraph. A positive relation was expected, as more traded companies also have more volatile stock prices. The variables LOGVM, AO and NGOV, in turn, showed negative relations with the volatility. The increased market value, as well as the higher operational leverage, reflect established companies in the market, which presented evolving income indicators, such as the gross revenues, operating margin and net profit. Hence, it was expected that these control variables would show a positive relation with

the volatility, as investors use them to make decisions on where to allocate their capital. That is, investors look more for companies with better financial results. On the other hand, it is inferred in this study that belonging to the distinguished CG levels on the stock exchange can reduce the stock price volatility, as expected and concluded in Lameira *et al.* (2010).

As suggestions for future research, a larger analysis period, larger sample and more questions in the questionnaire on the board of directors are recommended, so as to include a larger number of characteristics of this important corporate governance mechanism.

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