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Effect of the structure of the board of directors on cash holdings of publicly traded companies

Efeito da estrutura do conselho de administração na retenção de caixa das companhias abertas

Efecto de la estructura del consejo de administración en la retención de efectivo de las empresas que cotizan en bolsa

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ABSTRACT
The board of directors is an important internal mechanism of corporate governance, since its primary function is to monitor the actions of the executive board, which reduces possible managerial failures. In this sense, this study aims to verify the effect of the structure of the board of directors on cash holdings of publicly traded companies in the period between 2010 and 2018. The data were analyzed by multiple and quantile regressions and the results showed that the board independence, CEO duality and the board size positively affect the amount of cash by publicly traded companies.
Keywords: cash holdings; board of directors; corporate governance; publicly traded companies; Agency Theory.

RESUMO
O conselho de administração é um importante mecanismo interno de governança corporativa, já que tem como função primordial monitorar as ações da diretoria executiva, o que reduz possíveis falhas gerenciais. Nesse sentido, este estudo objetiva verificar o efeito da estrutura do conselho de administração na retenção de caixa das companhias abertas no período entre 2010 e 2018. Os dados foram analisados por meio de regressões múltipla e quantílica e os resultados apontaram que a independência, a dualidade de papéis e o tamanho do conselho de administração afetam positivamente o montante de caixa retido pelas companhias abertas.
Palavras-chave: retenção de caixa; conselho de administração; governança corporativa; companhias abertas; Teoria da Agência.

RESUMEN
El consejo de administración es un mecanismo interno importante para el gobernancia corporativo, ya que tiene la función primaria de monitorear las acciones del directorio ejecutivo, lo que reduce posibles fallas gerenciales. En este sentido, este estudio tiene como objetivo verificar el efecto de la estructura del consejo de administración en la retención de efectivo de las empresas que cotizan en bolsa en el período comprendido entre 2010 y 2018. Los datos se analizaron mediante regresiones múltiples y cuantiles y los resultados mostraron que independencia, dualidad y el tamaño de la consejo de administración afecta positivamente la cantidad de efectivo en poder de las empresas que cotizan en bolsa.
Palabras clave: retención de efectivo; consejo administrativo; gobierno corporativo; empresas en bolsa; Teoría de la Agencia.

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1 INTRODUCTION

The decision about spending or holding cash in the company can be explained for several reasons such as corporate governance (Dittmar, Mahrt-Smith & Servaes, 2003; Harford, Mansi & Maxwell, 2008; Al-Najjar & Clark, 2017), discretion (Jensen, 1986; Ferreira & Vilela, 2004), tax incentives (Foley, Hartzell, Titman & Twite, 2007), precaution, transaction and speculation (Keynes, 1936; Bates, Kahle & Stulz, 2009; Davydova & Sokolov, 2014) and political uncertainty (Phan, Nguyen, Nguyen & Hegde, 2019; Zheng, 2019). Additionally, Denis and Sibilkov (2009) report that this decision may result from potential or actual agency problems.

Jensen and Meckling (1976) formalized agency problems, which occur when shareholders (principal) delegate decision making authority to managers (agents). According to Eisenhardt (1989), the Agency's Theory is dedicated to solving two problems, which usually affect this agency relationship. The first results from the conflict of interest between agent and principal, and the second results from the informational asymmetry between managers, shareholders and creditors. As the actions of the agents can not be fully observed by shareholders and creditors and as managers, in general, have privileged and detailed information about the company, corporate governance mechanisms must be adopted to mitigate these agency problems.

Coles, Daniel and Naveen (2008), Nisiyama and Nakamura (2018) and Moura, Bonetti, Mazzioni, Teixeira and Magro (2020) report that the board of directors is an important internal mechanism of corporate governance, since its primary function is to monitor the actions of the executive board, which reduces possible managerial failures (Chancharat, Krishnamurti & Tian, 2012). According to Jensen (1986) and Ferreira and Vilela (2004), as the cash holding increases the volume of assets held by management and, consequently, its discretion over investment decisions, the accumulation of cash may have the purpose of expropriating shareholder wealth by managers and, therefore, the structure of board of directors can impact the amount of cash held in companies.

Thus, companies that adopt best practices by the Brazilian Institute of Corporate Governance (IBGC) such as independence from the board of directors, occupation of the positions of chief executive officer (CEO) and Chairman of the board of directors by different individuals and adequate number of board members tend to hold cash, because shareholders do not need to limit the volume of cash available to managers to avoid wasting resources (Harford, Mansi & Maxwell, 2008).

In order to consider that the cash level may arise from potential or actual agency problems and that the board of directors is intended for the alignment of interests between principal-agent, the objective of this study is to verify the effect of board of directors structure, regarding the board independence, CEO duality and board size, on the cash holding of publicly traded companies in the period between 2010 and 2018. In total, 97 companies are analyzed by multiple and quantile regressions and the results indicate that the board independence, CEO duality and the board size positively affect the amount of cash by publicly traded companies.

The research is justified by the lack of consensus among the empirical papers that investigated the relationship between cash and governance (Al-Najjar & Clark, 2017) and the fundamental role that cash reserves and the board of directors represent. According to Al-Najjar and Clark (2017), companies keep cash to meet costs related to ongoing activities, as a way to prevent potential unforeseen events and uncertainties and not to waste advantageous investment opportunities, in order to avoid expensive external financing or forced liquidation of assets, and therefore the cashier reflects financial security to the company. Furthermore, Huang and Mazouz (2018) claim that excess cash reduces the cost of equity and the liquidity risk of market, and improves the continuity of trades, since this excess allows the financing of profitable investment opportunities and the survival of the company to economic crises and therefore can attract new traders.

The board of directors represents the central mechanism of corporate governance (Moura & Beuren, 2011; Moura et al., 2020) and deals with the defense of the interests of shareholders through practices that encourage managers to internalize the well-being of capital holders, that is, the purpose of this board is to align the different interests in an organization and, thus, enhance the market value of the company. Therefore, the structure of the board has a material impact on the decision to spend or hold cash, because it is the controllers and managers who manage the company's assets (Al-Najjar & Clark, 2017).

In addition, as the business environment is complex and the contracts between the parties are incomplete (Hart & Moore, 1988) the board of directors ensures that minority shareholders receive reliable information about their investments and facilitates the functioning of the stock market and the efficient flow of financial and human capital (Bushman & Smith, 2003), which makes companies more attractive. Thus, the present paper differs from the other ones by verifying different corporate governance practices (independence, CEO duality and board size) not yet related to the corporate liquidity literature, inasmuch, usually, research on cash holding uses as a proxy for corporate governance the differentiated levels listed in B^3 (Tortoli & Moraes, 2016). The use of these three practices provides a more complete analysis and allows to verify the effect from three distinct angles.

Another reason is the need to verify this effect in Brazilian companies. Brazil is an emerging country and, therefore, tends to present a different behavior in relation to other countries considered as more developed (Al-Najjar & Clark, 2017; Ermel & Medeiros, 2020; Moura et al., 2020). In general, according to La Porta, Lopez-de-Silanes, Shleifer and Vishny (2000) and Ermel and Do Monte (2018),

Brazilian companies are characterized by low legal protection to minority shareholders and high shareholding concentration, factors that highlight the importance of a well-structured board of directors, that is, independent, without CEO duality and of relatively adequate size. Following this logic, Terra (2003), Sheng and Saito (2008) and Loncan and Caldeira (2014) report that the cost of Brazilian capital is higher, credit is more restricted and the volume of daily trades is lower, aspects that directly or indirectly affect decisions about spend or hold cash.

Moreover, Silveira (2015) points out that, due to the specificities of each organization such as size, economic and strategic profile, stage of life and ownership structure, there is no ideal standard of governance practices to be adopted, which requires research that involve this theme and contribute to a better understanding of the structure of board of directors in Brazilian companies. The current study contributes by supporting managers, investors, regulators and credit institutions in the assessment of cash policies, seeing that the presence of financial frictions in the market, such as asymmetry information, transaction costs, taxes and interest rates, can result in costly fundraising and the cost of lack of cash can compromise the solvency of companies.

2 THEORETICAL REFERENCE AND RESEARCH HYPOTHESES

2.1 Cash Holding

According to Miglo (2010), the financial crisis of 2008-2009 resumes interest in the study of how companies manage their liquidity, given that the difficulties of several companies affected by this crisis are related to the financing policies adopted and the fact that there is asymmetric information between investors and managers.

From the perspective of the Trade-Off Theory, Ferreira and Vilela (2004) state that companies seek to maintain an optimal level of cash, represented by the equality between the benefits and marginal costs of maintaining cash balances. However, setting this level requires an analysis of several factors together, such as financing policies, dividend distribution and corporate governance (Koshio, 2005).

According to Keynes (1936), the reasons for precaution, transaction and speculation explain the need for companies to hold cash. The precautionary point is associated with the uncertain future and, therefore, can alleviate the possible lack of recourse (Keynes, 1936; Davydova & Sokolov, 2014; Al-Najjar & Clark, 2017; Zheng, 2019); the purpose of the transaction is to pay for the company's routine operations (Keynes, 1936; Bates, Kahle & Stulz, 2009; Al-Najjar & Clark, 2017) and speculation can ensure new investments and opportunities for value creation (Keynes, 1936; Al-Najjar & Clark, 2017). Foley et al. (2007) claim that multinational companies hold cash because they keep overseas earnings in cash form with the aim of not paying taxes.

Bates, Chang and Chi (2018) report that, on average, $1 (one dollar) of cash is valued at $0.61 in the 1980s, $1.04 in the 1990s and $1.12 in the 2000s. According to the authors, this increase is encouraged by several factors, such as investment opportunities, the volatility of cash flows, market competition and credit risk. Managers may hold cash for different reasons, such as to mitigate deficits in future cash flows (Bates, Kahle & Stulz, 2009), finance the company's growth and profitable investment opportunities (Faulkender & Wang, 2006; Denis & Sibilkov, 2009; Bates, Chang & Chi, 2018), invest in R&D (Brown& Petersen, 2011) and for the company to survive economic crises (Phan et al. , 2019; Zheng, 2019).

However, Ferreira and Vilela (2004) point out that the Agency Theory can also explain the management of corporate liquidity. According to Jensen and Meckeling (1976) new relationships arise from the separation between property and control, such as the relationship of agente (manager) and principal (shareholder). If there is maximizing utility between the parties, the agent will make decisions for his own benefit and not the company's. Thus, the accumulation of availence so may have the purpose of increasing the volume of assets in the management's power and, consequently, its discretion over investment decisions (Jensen, 1986; Ferreira & Vilela, 2004). This means that cash holding may be to end the expropriation of shareholders' wealth by managers, since financial resources can be used in projects not advantageous to the company because they are readily available in cash form.

And with companies with weaker corporate governance structures, it is possible that shareholders will set cash volume limits available to managers in order to avoid wasting resources and force managers to be eficient (Harford, Mansi & Maxwell, 2008). Therefore, best practices of corporate governance should be adopted to restrict the undesirable actions of managers (Moura et al., 2020) and thus ensure that cash reserves become used for the company's sake.

Chen (2008) examined the impact of the corporate governance structure on the cash holding of 1,500 U.S. companies between 2000 and 2004. The findings indicated that in technology companies the greater independence of the board of directors results in higher cash reserves. Generally speaking, this author argues that the independence of the board offers better protection to shareholders and consequently reduces agency costs. Therefore, if these costs are lower, shareholders are more willing to accept higher volumes of cash, because the expropriation of their wealth tends to be lower.

Harford, Mansi and Maxwell (2008) examined the relationship between cash holding and corporate governance structure in 1,872 U.S. companies from 1993 to 2004. Evidence has pointed out that in companies where the governance structure is considered weaker, cash reserves

are lower compared to companies where the governance structure is considered stronger.

Al-Najjar and Clark (2017) analyzed the impact of corporate governance practices on the cash holding of non-financial companies in the Middle East and North Africa from 2000 to 2009. The results indicated a negative relationship between the board size and cash holding and that companies that adopt corporate governance best practices retain more cash.

Aslan, Kalim and Fizza (2019) investigated the combined impact of cash holding and corporate governance on the performance of pakistan's non-financial companies from 2010 to 2014. The findings reveal that companies with weak governance structure spend cash reserves quickly, which dramatically reduces corporate performance. The authors report that in environments with weak governance cash holding drives the main agent conflict and therefore tends to be lower.

2.2 Corporate Governance

Corporate scandals involving accounting aspects resulted in reflections on the veracity and reliability of the information disclosed, as well as on the management and standard of corporate governance (Chancharat, Krishnamurti & Tian, 2012; Siam, Laili & Khairi, 2014). In response to the collapses characterized by manipulations of results in large and important companies, such as Enron, Xerox, Tyco, and WorldCom (Chancharat, Krishnamurti & Tian, 2012), corporate governance practices began to be considered with the objective of restricting the irregular action of the agent, that is, mitigating possible oportunisms. The adoption of these practices allows a more efficient management of resources, by aligning the interests between investors and managers and thus reducing both the expropriation of wealth of shareholders and the costs of agency and transaction (Bushman & Smith, 2003).

In Brazil, the creation of IBGC in 1999 marks the beginning of corporate governance policies and practices. The Code of Best Corporate Governance Practices launched by IBGC (2015) defines corporate governance as the system that directs, monitors and encourages the interests of the organization's agents, ensuring greater reliability of information and motivating the maximization of the firm's value.

However, the use of this Code is not mandatory, only serves as a reference/consultation for corporations and encourages the conscious use of governance instruments and, among best practices, the independence of the board of directors is emphasized; the occupation of the positions of CEO and Chairman of the board of directors by different individuals; and the appropriate number of members of the board of directors (IBGC, 2015).

The board of directors is one of the main internal corporate governance mechanisms and serves as supervisor of business activities, besides being responsible for helping investors to make decisions and minimize the irregular actions of managers, through the alignment of interests between investors, creditors and managers (Coles, Daniel & Naveen, 2008; Chancharat, Krishnamurti & Tian, 2012; Nisiyama & Nakamura, 2018; Einsweiller, Moura & Kruger, 2020; Moura et al., 2020).

However, the effectiveness of the board of directors is tied to its independence, both in relation to the controller and on the management itself (Muniandy & Hillier, 2015). In general, independent directors, i.e. external directors who do not have family relationships, business or any other type, are considered more effective in monitoring management, because they do not depend on internal directors (executives) for the promotion of positions and for the less likelihood of acting for the benefit of the controllers (Harford, Mansi & Maxwell,2008; Al-Najjar, 2015; Azeez, 2015; Einsweiller, Moura & Kruger, 2020).

According to Moura et al. (2020), independent members are more resistant to self-interest problems and are less subject to the intervention of controllers and managers, so companies that have a higher percentage of independent members on the board tend to better supervise the actions of managers. In addition, Fields, Fraser and Subrahmanyam (2012) argue that independent directors serve as substitutes in defending the interests of minority shareholders and creditors.

The decision on spending or holding cash may arise from potential or real agency problems, because in companies with weaker corporate governance structures shareholders can set cash volume limits available to managers to avoid resource waste (Harford, Mansi & Maxwell, 2008; Denis & Sibilkov, 2009), and that the independence of the board of directors allows a free judgment of the issues of strategy and performance (Azeez, 2015), the first hypothesis of this research is elaborated:

H_1: Cash holding is positively related to the board independence of directors.

Einsweiller, Moura and Kruger (2020) and Moura et al. (2020) point out that corporate governance ensures the principles of probity, clarity and ethics. Thus, according to IBGC (2015), the board of directors exercises the role of guardian of the principles, values, corporate object and governance system of the company and, therefore, the directors must act for the good of the company as a whole, complying with legal and ethical aspects. The IBGC (2015) also states that the board of directors is a collegiate body responsible for the strategic decision-making process in an organization and for the monitoring of the board, representing the bridge of linking between management and partners.

However, Ashbaugh-Skaife, Collins and LaFond (2006) point out that the monitoring potential of this board can be damaged if there is CEO duality in this organ. The duality of roles on the board of directors refers to the occupation of the positions of Chairman of the board of

directors and chief executive officer by a single person, which violates the separation between management and control of decisions and increases the power and locus of control of the CEO (Dahya, Lonie & Power, 2006; Harford, Mansi & Maxwell, 2008; Al-Najjar, 2015; Azeez, 2015; Brandão, Vasconcelos, Luca & Chrysostom, 2019).

According to Bruce and Skovoroda (2015), the filling of the positions of Chairman and CEO by a single individual weakens the corporate governance system, which can result in an unfavorable executive compensation process from the company's point of view and, consequently, negatively influence the company's performance. Besides, Moura et al. (2020) report that the Chairman of the board has the function of determining the agenda of the board and then of controlling the issues that will be addressed at the meetings, and that when the same person holds both positions, specific issues may not be discussed at meetings for personal interest.

Having said that, the second hypothesis of this research is elaborated:

H_2: Cash holding is negatively related to the duality of board of directors' roles.

The board of directors also represents an important part of the structure of the organizations, since the directors are the representatives of the shareholders within the company, have as their function the monitoring of management and assist in decision-making and control of activities (Nisiyama & Nakamura, 2018; Einsweiller, Moura & Kruger, 2020). According to the IBGC (2015), this board has the responsibility to discuss, approve and/or supervise issues involving strategy, remuneration, risk, independent audit, capital structure and people management policies.

Thus, dialogue between the members of the board of director and, according to Lipton and Lorsch (1992) and Conyon and He (2016), when the board of directors is composed of several members, communication and coordination problems arise from the difficulty of all directors expressing their ideas and opinions during the limited time of meetings, which ends up weakening the monitoring of executives. Due to the impass of reaching a consensus in decision-making when the board is composed of a high number of members (Harford, Mansi & Maxwell,2008; Al-Najjar, 2015; Azeez, 2015), the third hypothesis of this research is elaborated:

H_3: Cash holding is negatively related to the board size of directors.

It is expected, then, that companies that adopt corporate governance practices recommended to the board of directors, as board independence, non-duality of roles and smaller board size of directors, have greater cash reserves, since greater reliability and transparency in addition to decreasing agency conflicts and, consequently, reducing the chances of the agent using the availables in projects of negative net present value or for its own benefit, also reduces the cost of capital, allowing the capital to be available when profitable investment opportunities arise (Harford, Mansi & Maxwell,2008; Al-Najjar, 2015; Al-Najjar & Clark, 2017).

3 METHODOLOGY

3.1 Data Collection and Sampling

The sample comprises companies that traded shares in B[3] (Brazil, Stock Exchange, Over the Counter Market) in the period between 2010 and 2018, with the exception of the "Finance and Insurance", "Funds" and "Other" sectors. The companies classified by Economatica® in the "Finance and Insurance" and "Funds" sectors are unconsidered for presenting their own regulations, and those of the "Other" sector due to the fact that this group contains companies that also operate in the financial area, as is the case of Itau S. A.

The time window results from the availability of corporate governance data only possible after the year 2009, the year in which the reference form is introduced by the Brazilian Securities and Exchange Commission (CVM) through art. 21 of Normative Instruction 480/2009 (CVM, 2009). In addition, from 2010, international accounting standards have been adopted in Brazil significantly.

The data is collected at the Economatica database® and on the B[3] website, specified in items12.6/8 and 12.7 of each company's Reference Form each year. It opts for the class of higher volume of trades, for using the consolidated annual statements, for excluding companies that did not present continuous data during the period and for adjusting the data by the IPCA - National Index of Broad Consumer Prices - according to Economatica®. In total, 97 companies are analyzed in Stata software through a balanced panel composed of 873 company-year observations.

3.2 Dependent, Independent of Interest and Control Variables

Table 1 shows the variables and their measurement. The dependent variable, cash holding (ch), represents the cash and cash equivalents divided by the total asset (Bates, Kahle & Stulz, 2009; Al-Najjar, 2015; Chen, Dou, Rhee, Truong & Veeraraghavan, 2015; Al-Najjar & Clark, 2017), because according to Bates, Kahle and Stulz (2009) this is the most traditional measure among existing ones.

The independent variables of interest are: (1) board independence (independence), ratio between the number of independent members of the board of directors and the total number of members of the board of directors (Harford, Mansi & Maxwell, 2008; Al-Najjar, 2015; Azeez, 2015; Ghouma, Ben-Nasr & Yan, 2018; Einsweiller, Moura & Kruger, 2020; Moura et al. , 2020); (2) CEO duality (duality), represented by a dummy variable that assumes the value one (1) if the positions of Chairman of the board of directors

and CEO are held by the same individual and zero (0) otherwise (Dahya, Lonie & Power, 2006; Harford, Mansi & Maxwell, 2008; Al-Najjar, 2015; Azeez, 2015; Ghouma, Ben-Nasr & Yan, 2018; Einsweiller, Moura & Kruger 2020; Moura et al. , 2020); and (3) board size (boardsize), natural logarithm of the number of board members (Harford, Mansi & Maxwell, 2008; Al-Najjar, 2015; Azeez, 2015).

Table 1
Variables and their measurement

Dependent Variable			
Variable	**Measurement**	**Expected Signal**	**Source**
Cash holding (ch)	Represents the cash and cash equivalents divided by the total asset.	-	Bates, Kahle and Stulz (2009); Al-Najjar (2015); Chen et al. (2015); Al-Najjar and Clark (2017)
Independent Variables of Interest			
Variable	**Measurement**	**Expected Signal**	**Source**
Board independence (independence)	Ratio between the number of independent members of directors and the total number of members of the board of directors.	Positive	Harford, Mansi and Maxwell (2008); Al-Najjar (2015); Azeez (2015); Ghouma, Ben-Nasr and Yan (2018); Einsweiller, Moura and Kruger (2020); Moura et al. (2020)
CEO duality (duality)	Represents a dummy variable that assumes the value one (1) if the positions of Chairman of the board of directors and CEO are held by the same individual; and zero (0) otherwise.	Negative	Dahya, Lonie & Power (2006) Harford, Mansi and Maxwell (2008); Al-Najjar (2015); Azeez (2015); Ghouma, Ben-Nasr and Yan (2018); Einsweiller, Moura and Kruger (2020); Moura et al. (2020)
Board size (boardsize)	It represents the natural logarithm of the number of board members.	Negative	Harford, Mansi and Maxwell (2008); Al-Najjar (2015); Azeez (2015)
Control Variables			
Variable	**Measurement**	**Expected Signal**	**Source**
Net working capital (nwc)	Ratio between working capital minus cash and cash equivalents and total asset.	Negative	Opler et al. (1999); Harford, Mansi and Maxwell (2008); Bates, Kahle and Stulz (2009)
Financial leverage (leverage)	Ratio between the sum of short and long term debt and the total asset.	Positive	Opler et al. (1999); Pinkowitz and Williamson (2001); Ferreira and Vilela (2004); Bates, Kahle and Stulz (2009); Barros, Silva and Voese (2015)
Investment opportunities (tobin's q)	Represents the q of tobin calculated by summing the market value and debts divided by the total asset.	Positive	Opler et al. (1999); D'Mello et al. (2008); Portal, Zani and Silva (2012)
Profitability (roa)	Ratio between earnings before interest taxes, depreciation and amortization and the total assets.	Positive	Opler et al. (1999); Shyam-Sunder e Myers (1999); Acharya, Almeida and Campello (2007); Barros, Silva e Voese (2015); Einsweiller, Moura and Kruger (2020)
Firm size (firmsize)	Represents the natural logarithm of the total asset.	Negative	Opler et al. (1999); D'Mello et al. (2008); Portal, Zani and Silva (2012); Demonier, Almeida and Bortolon (2015); Ghouma, Ben-Nasr and Yan (2018); Einsweiller, Moura and Kruger (2020)
Cash Flow (cxf)	Ratio between the cash generated by operating activities and the total asset.	Positive	Opler et al. (1999); Ferreira and Vilela (2004); Harford, Mansi and Maxwell (2008); Bates, Kahle and Stulz (2009)

Source: Developed by the authors.

Control variables, based on previous research on cash holding, are considered in an attempt to avoid estimating skewed parameters. Among them:

i) Net working capital (nwc): when considering net working capital as a substitute asset of cash, it is expected that the higher the net working capital, the lower the cash holding, because if cash substitutes are used as collateral in loans, the need for cash may decrease due to increased indebtedness capacity (Custodio, Ferreira & Raposo, 2005; Bates, Kahle & Stulz, 2009). In this study, net working capital is measured by the ratio between working capital (current assets minus current liabilities) minus cash and cash equivalents and total assets (Opler, Pinkowitz, Stulz & Williamson, 1999; Harford, Mansi & Maxwell, 2008; Bates, Kahle & Stulz, 2009).

ii) Financial leverage (leverage): when considering that leverage increases the chances of insolvency due to the pressure that the costs of amortization plans exert on cash availence, it is expected that more leveraged companies retain more cash (Ferreira & Vilela, 2004; Bates, Kahle & Stulz, 2009; Barros, Silva & Voese, 2015). In this study, leverage represents the ratio between the sum of short and long-term debt (loans and financing and short and long-term debentures) and the total asset (Ferreira & Vilela, 2004; Bates, Kahle & Stulz, 2009; Barros, Silva & Voese, 2015).

iii) Investment opportunities (tobin's q): when considering that profitable investment opportunities may not

be taken advantage of due to lack of cash, it is expected that greater investment opportunities will result in higher cash reserves (Opler et al. , 1999; Faulkender & Wang, 2006; D'Mello, Krishnaswami & Larkin, 2008; Denis & Sibilkov, 2009). Utilize as a proxy of investment opportunities the tobin's q (Portal, Zani & Silva,2012), calculated by the sum of the market value (multiplication between the total number of shares and the share price) and debts (sum of current liabilities minus the current asset plus the short and long-term inventories plus the long-term chargeable) divided by the total asset (Chung & Pruitt, 1994; Nogueira, Lamounier & Colauto, 2010).

iv) Profitability (roa): more profitable companies are expected to have higher cash reserves because they rely less on external financing (Shyam-Sunder & Myers, 1999). Moreover, companies with higher returns have greater ease time paying off their loans (Boubakri & Ghouma, 2010) and then, as the cost of debt tends to be lower, the leftover cash tends to be higher. Return on asset, division of profit before interest, taxes, depreciation and amortization by total assets, as a proxy for profitability (Acharya, Almeida & Campello, 2007; Einsweiller, Moura & Kruger, 2020).

v) Firm size (firmsize): smaller companies are expected to have higher levels of cash because they are generally considered less diversified and less stable and because they are subject to higher transaction costs (Opler et al., 1999; Faulkender, 2002). In addition, smaller companies are less reliable, present greater risks of default and are subject to higher debt costs (Barros, Silva & Voese, 2015; Einsweiller, Moura & Kruger, 2020). In this study, the natural logarithm of the total asset corresponds to firm size (Demonier, Almeida & Bortolon, 2015; Ghouma, Ben-Nasr & Yan, 2018; Einsweiller, Moura & Kruger, 2020).

vi) Cash flow (cxf): when considering that companies with higher cash flows have better investment opportunities and less dependence on external resources, companies with higher cash flows are expected to retain more cash (Bates, Kahle & Stulz, 2009). In this study, the cash generated by operating activities divided by total assets represents cash flow (Ferreira & Vilela, 2004; Harford, Mansi & Maxwell, 2008; Bates, Kahle & Stulz, 2009).

3.3 Empirical Model and Statistical Approach

The present study uses the linear multiple regression model by Ordinary Least Squares (OLS), according to Equation (1), to verify the relationship between the structure of board of directors and cash holding.

Equation (1)

$$ch_{i,t} = \beta_0 + \beta_1 independence_{i,t} + \beta_2 duality_{i,t} + \beta_3 boardsize_{i,t} + \beta_4 nwc_{i,t} + \beta_5 leverage_{i,t} + \beta_6 tobin'sq_{i,t} + \beta_7 roa_{i,t} + \beta_8 firmsize_{i,t} + \beta_9 cxf_{i,t} + \varepsilon_{i,t}$$

In which:

- ch_{it} represents the cash holding of the company i at the end of the fiscal year t;
- $independence_{it}$ represents the board independence of the company i at the end of the fiscal year t;
- $duality_{it}$ represents the CEO duality – binary (0) and (1) – of the company i at the end of the fiscal year t;
- $boardsize_{it}$ represents the board size of the company i at the end of the fiscal year t;
- nwc_{it} represents the net working capital of company i at the end of the fiscal year t;
- $leverage_{it}$ represents the financial leverage of the company i at the end of the fiscal year t;
- $tobin'sq_{it}$ represents the investment opportunities of the company i at the end of the fiscal year t;
- roa_{it} represents the profitability of the company i at the end of the fiscal year t;
- $firmsize_{it}$ represents the size of the firm i at the end of the fiscal year t;
- cxf_{it} represents the cash flow of the company i at the end of the fiscal year t;
- ε_{it} represents the error term of the regression.

According to Fávero and Belfiore (2017) there are different models for panel data, so the F tests of Chow, Lagrangian Multiplier of Breusch-Pagan and Hausman are performed to define the most appropriate model for this research, whether POLS, Fixed Effects or Random Effects. The Jarque-Bera, Breusch-Pagan and Wooldridge tests are done to verify the normality, homoscedasticity and self-correlation of the residues. In addition, Pearson's correlation matrix is calculated to analyze whether the variables present high or perfect correlations and the Variance Inflation Factor (VIF) to identify whether or not there are multiconlinearity problems in the explanatory variables (Fávero & Belfiore, 2017). Moreover, the winsorization technique (except for the duality dummy) is used at the level of 1% with the purpose of smoothing the observations from the average, which makes the sample more conservative.

4 PRESENTATION AND DISCUSSION OF RESULTS

4.1 Presentation of Results

Table 2 shows the distribution of companies by Economatica® sector and absolute (Fi) and relative (fi) frequencies. It is observed that more than 50% of the sample belongs to the sectors of electricity (21.6%), construction (12.4%), trade (9.3%) and vehicles and parts (9.3%).

The descriptive statistics of the variables, except for the dummy of duality, after applying the winsorization technique, are evidenced in Table 3.

The results of Table 3 shows that four variables (cash holding; net working capital; return on assets and cash flow) have a standard deviation greater than the average. This means that these variables varied over time, since the average distance between the individual points of each variable and the overall average is greater than the overall

average. In addition, it is noticed that the average percentage of cash holding of the companies in the sample is 9.09%, close to the 10.1% of Sweden reported by Chen et al. (2015).

Table 2
Distribution of companies by sector and absolute (Fi) and relative (fi) frequencies

	Sector	Absolute Frequency (Fi)	Relative Frequency (fi)
1	Agro and Fishing	1	1.0%
2	Food and Drink	5	5.2%
3	Trade	9	9.3%
4	Construction	12	12.4%
5	Electronics	3	3.1%
6	Electricity	21	21.6%
7	Industrial Machines	3	3.1%
8	Mining	1	1.0%
9	Non-Metal Minerals	1	1.0%
10	Pulp and Paper	3	3.1%
11	Oil & Gas	2	2.1%
12	Chemical	3	3.1%
13	Steel and Metallurgy	8	8.2%
14	Software and Data	1	1.0%
15	Telecommunications	2	2.1%
16	Textile	7	7.2%
17	Transportation and Service	6	6.2%
18	Vehicles and Parts	9	9.3%
	Total	**97**	**100%**

Source: Developed by the authors.

Table 3
Descriptive statistics of variables after the winsorization technique

Variables	Average	Standard deviation	Minimum	Maximum
ch	0.0909	0.0953	0.0005	0.6776
independence	0.2625	0.2362	0	0.8750
duality			0	1
boardsize	1.9543	0.3536	0	2.8332
nwc	0.0908	0.1748	-0.3441	0.5959
leverage	0.3800	0.2270	0	1.0973
qtobin	1.0850	0.6799	0.2926	4.1915
roa	3.5536	6.9872	-23.0317	22.2666
firmsize	15.7177	1.6106	10.6860	20.7212
cxf	0.0675	0.0725	-0.1504	0.2456

Source: Developed by the authors.

In general, it is noted that companies have different behaviors, because the intervals between the minimum and the maximum are discrepant. For example, when comparing the minimum and maximum of the variable tobin's q, it is observed that the maximum is 15 times greater than the minimum. Another example is in relation to board size, since some companies have 15 effective members of the board, such as Cemig, Coelce, Pão de Açúcar, Taesa and Telefônica Brasil, while others have only 1 or 2 members, such as Cristal and Energisa. According to Jensen (2003), boards made up of more than seven or eight members are less likely to function effectively, which increases the likelihood of itand control is based on the CEO.

Table 3 also shows that most directors are not independent, as the average percentage of the independent members on the board of directors is 26.25%. This value is close to that found by Einsweiller, Moura and Kruger (2020), which show that in 2017 the average percentage of board independence is 26%, and by Moura et al. (2020), which report that in 2016 this average percentage corresponds to 24%.

After performing the F tests of Chow and Lagrangian Multiplier of Breusch-Pagan, it is observed that the most indicated model for this research is the POLS (p-value > 0.05 in both tests). The Jarque-Bera, Breusch-Pagan and Wooldridge tests indicate that the residues do not follow normal distribution, do not present constant variance and are self-correlated, and therefore applies the method of robust variance-covariance matrices of Newey-West to obtain the standard errors of estimators by OLS and thus correct the heteroscedasticity and self-correlation of the residuals (Greene, 1996). The non-normality of residues is not a problem, since the violation of this assumption is frequent in economic and finance models and irrelevant in studies that investigate large amounts of observations, due to the asynotic properties of estimators obtained by OLS (Brooks, 2014; Wooldridge, 2016).

Pearson's correlation matrix represented in Table 4 shows that the variables do not present high or perfect correlations.

Table 4
Pearson's correlation matrix

	ch	independence	duality	boardsize	nwc	leverage	*tobin'sq*	roa	firmsize	cxf
ch	1									
independence	-0.0272	1								
duality	0.1458*	-0.0314	1							
boardsize	-0.1048*	0.1177*	-0.1888*	1						
nwc	-0.1089*	0.0696*	0.1696*	-0.2652*	1					
leverage	-0.0660	0.1305*	-0.1124*	0.2181*	-0.3588*	1				
tobin'sq	0.1277*	0.1163*	-0.0460	0.0474	0.0193	0.1758*	1			
roa	0.1813*	-0.1031*	0.0154	0.0273	0.2008*	-0.2136*	0.5197*	1		
firmsize	-0.1650*	0.1074*	-0.0777*	0.5850*	-0.3271*	0.3186*	-0.0277	-0.0427	1	
cxf	-0.0414	-0.0997*	-0.0455	0.2295*	-0.1193*	-0.0274	-0.0563	0.0066	0.5108*	1

Note: *statistically significant at the level of 5% (p-value < 0.05).
Source: Developed by the authors.

Additionally, the results of the VIF calculation indicate that the explanatory variables do not present multicolinearity problems, because the maximum percentage of variance shared between the explanatory variables is 57%. For Fávero and Belfiore (2017), VIF values above 4 can be considered high, because the VIF equal to 4 corresponds to a *Tolerance* of 0.25 and this represents 75% of the shared variance between a given explanatory variable and the others.

The results of multiple regression demonstrated in Table 5 indicate that the relationship between the variables cash holding and board independence is positive and statistically significant at the level of 5% (p-value = 0.048) and, therefore hypothesis 1 (H_1) of this study is confirmed.

Table 5
Multiple Regression Results (POLS Estimation)

Dependent variable: cash holding (ch)	
Independent of interest and control variables	
Board independence (independence)	0.0213198** (1.97)
CEO Duality (duality)	0.0496253*** (3.22)
Board size (board size)	-0.0048909 (-0.39)
Net working capital (nwc)	-0.1480216*** (-6.62)
Financial leverage (leverage)	-0.0119095 (-0.82)
Investment opportunities (tobin'sq)	0.004047 (0.70)
Profitability (roa)	0.0028187*** (4.91)
Firm size (firmsize)	-0.015328*** (-4.48)
Cash flow (cxf)	0.107541*** (3.44)
Constant	0.3320675*** (5.74)
R^2	0.08856

Legend: ***statistically significant at the level of 1% (p-value < 0.01); **statistically significant at the level of 5% (p-value < 0.05); and *statistically significant at the level of 10% (p -value < 0.10). Values of the t statistic in parenthesis.
Source: Developed by the authors.

The variable CEO duality has a positive and statistically significant association at the level of 1% (p-value = 0.001) with cash holding. However, when comparing the expected sign (negative) with that obtained in Table 5 (positive), it is noted that this interest variable has a contrary sign and, therefore, Hypothesis 2 (H_2) of this study is not confirmed.

The coefficients of the variables profitability and cash flow are positive, as expected, and statistically significant at the level of 1%. While the coefficients of net working capital and firm size are negative, also as expected, with statistical significance of 1%. It is observed that the other variables do not present statistical significance and, therefore, Hypothesis 3 (H_3) that cash holding is negatively related to board size is not confirmed. Additionally, it is verified that the explanatory variables explain cash holding by approximately 9%.

4.2 Discussion of Results

The results of Table 5 confirm Hypothesis 1 of this study. This means that, on average, companies that have the largest number of independent members on the board proportionally retain more cash. This result corroborates the study by Tortoli and Moraes (2016), which also shows a positive and statistically significant relationship at the level of 5% between the differentiated levels of governance (proxy corporate governance) and cash balances, and Al-Najjar and Clark (2017), which indicates that companies that adopt corporate governance best practices retain more cash. Thus, as the independence of the board of directors strengthens the corporate governance structure, as stronger the governance structure of the company is, the greater the cash holding will be, since it will be lower the chance of expropriation of the shareholder by the manager (Harford, Mansi & Maxwell, 2008).

The studies by Weisbach (1988) and Sonza and Kloeckner (2014) indicate that organizations with boards independent are more favorable to unblock poorly performing CEOs and Beasley (1996) reveals that the occurrence of accounting fraud is lower in companies where the board of directors is independent. Therefore, when the member of the board of directors is not independent, that is, when the functions as a director and in management, the monitoring of both the board and management is less active and effective, due to the employment relationship that this internal professional has and the consequent influence of controllers and managers (Moura et al. , 2020) .

On Hypothesis 2, the intention was to find a negative relationship between the CEO duality and cash holding. Thus, if the same person occupies the position of Chairman of the board of directors and CEO, the cash holding tends to be lower, because the weaker the governance structure is and then the greater is the probability of the manager expropriate the wealth of the shareholder (Harford, Mansi & Maxwell, 2008; Bruce & Skovoroda, 2015). Furthermore, according to Muniandy and Hillier (2015) and Ghouma, Ben-Nasr and Yan (2018), the filling of these positions by a single individual elevates the power of the CEO, which can reduce the disciplinary role that the board has on management.

However, a positive association is observed, which ultimately does not confirm Hypothesis 2 of this study. Fama (1980) and Jensen (1993) report that when some qualities of the board are combined, such as specialized knowledge, composition and legitimacy, the efficiency of corporate management may be higher. Despite the association found between the CEO duality and cash holding is positive, which suggests a more vulnerable governance structure, it is verified that, in general, the sample companies present board and board members with diverse qualifications and experiences and have an audit committee that, in addition to being important for the management of internal activities, contributes to the quality of financial reports and greater transparency of information (Santos, Schmeider & Cunha, 2017). Still on this aspect, Fama (1980) highlights that managers have a substantial portion of their financial and

intellectual capital invested in the company, while shareholders are usually more diversified and therefore run a lower risk of losses. Therefore, according to Al-Najjar and Clark (2017),) decision-making about spending or holding cash can be influenced if managers are sub-diversified and risk-averse, facts that tend to decrease the principal-agent conflict.

Regarding the rejection of Hypothesis 3, it is emphasized that the adequate board size is uncertain in the literature and that, still, there are doubts as to the most appropriate number of directors. Boone et al. (2007), Coles, Daniel and Naveen (2008) and Linck, Netter and Yang (2008) state that there is no consensus about the board size. These authors claim that oversized or large boards are not beneficial and are related to worse governance. For Vafeas (2000) if, in a way, the smallersized advice may be more effective and result in better monitoring of the quality of reports, otherwise may be unable to properly supervise management. On this subject, Silveira (2015) says that, although there are several recommendations in the governance codes, there is no ideal standard of practices to be adopted by all companies, since the specificities of each company can result in different behaviors and results.

In order to perform a more robust analysis, quantile regression is used to verify whether the results of the variables of interest remain constant. Quantile regression estimation tends to be more efficient than multiple regression by OLS, as it presents the results for each quantile. The division of quantitians is considered in 25, 50 (median) and 75.

Table 6
Quantile regression results

Dependent variable: cash holding (ch)				
Independent of interest and control variables	***POLS***	**Quantil 25**	**Quantil 50**	**Quantil 75**
independence	0.0213**	0.0278***	0.0501***	0.0372
(p-value)	(0.0484)	(0.0063)	(0.0001)	(0.1014)
duality	0.0496***	0.0080	0.0120	0.0178
(p-value)	(0.0013)	(0.2677)	(0.1718)	(0.2693)
boardsize	-0.0048	-0.0042	0.0035	0.0349*
(p-value)	(0.6959)	(0.6025)	(0.7202)	(0.0542)
nwc	-0.1480***	-0.0535***	-0.0862***	-0.1231***
(p-value)	(0.0000)	(0.0003)	(0.0000)	(0.0002)
leverage	-0.0119	-0.0056	-0.0047	0.0071
(p-value)	(0.4145)	(0.6458)	(0.6458)	(0.7919)
tobin'sq	0.0040	0.0033	0.0113**	0.0133
(p-value)	(0.4832)	(0.4340)	(0.0294)	(0.1611)
roa	0.0028***	0.0011***	0.0021***	0.0028***
(p-value)	(0.0000)	(0.0072)	(0.0000)	(0.0024)
size	-0.0153***	0.0013	-0.0042	-0.0148***
(p-value)	(0.0000)	(0.5336)	(0.1050)	(0.0019)
cxf	0.1075***	0.5812	0.1159**	0.1460*
(p-value)	(0.0006)	(0.1044)	(0.0165)	(0.0751)
_cons	0.3320***	0.0102	0.1023***	0.2614***
(p-value)	(0.0000)	(0.7169)	(0.0031)	(0.0000)

Legend: ***statistically significant at the level of 1% (p-value < 0.01); **statistically significant at the level of 5% (p-value < 0.05); and *statistically significant at the level of 10% (p -value < 0.10). P-value in parenthesis.
Source: Developed by the authors.

The coefficients of the board independence variable are positive and significant, now at the level of 1%, for quantiles 25 and 50, demonstrating that for cash balances up to the median independence is significant. However, unlike that obtained by multiple regression, the coefficient of the CEO duality variable is no longer significant and the coefficient of the board size variable becomes statistically significant at the level of 10% (p-value = 0.0542) for quantile 75. This means that for greater cash balances than the median the board size is significant and positive, a contrary result to what is expected and divergent from that obtained by Al-Najjar and Clark (2017). A possible explanation for this positive effect would be the presence of a larger number of experts who have diverse experiences in larger boards (Coles, Daniel & Naveen, 2008).

Figure 1 exposes the behavior of the intercept and the board size variable. Regarding the variable, the dashed black line evidences the coefficient of multiple regression and, therefore, is constant along the quantiles. The continuous black line shows the quantile regression coefficient and even quantile 40 resembles that of multiple regression. From quantile 40 the coefficient grows substantially, becoming significant in quantile 75. This means that the larger the board size of directors, the greater is the amount of cash held by companies.

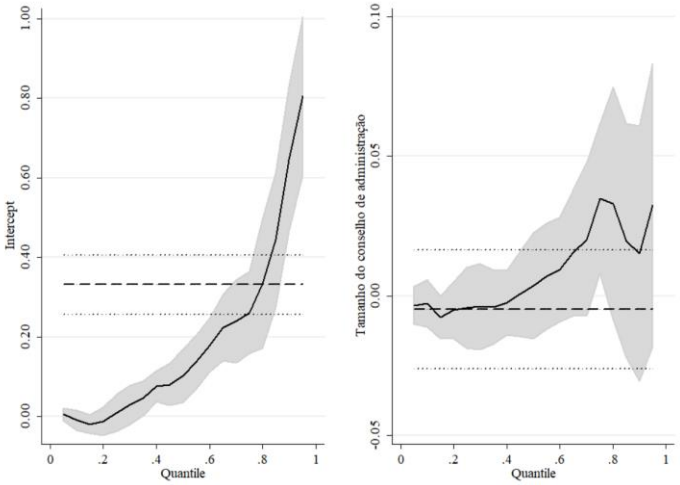

Figure 1. Chart of board size of directors variable.
Source: Developed by the authors.

Even after estimating quantile regression, Hypotheses 2 and 3 (H_2 and H_3) are not confirmed, since the coefficient of the CEO duality variable is no longer significant and the board size variable is positive, contrary to the negative sign defined previously.

5 FINAL CONSIDERATIONS

This study analyzes whether cash reserves are influenced by the structure of the board of directors. Using a sample of 97 publicly traded companies between 2010 and 2018, there is a positive and statistically significant association at the level of 5% (multiple regression) and 1% (quantile regression) between cash holding and the board independence, which confirms Hypothesis 1 raised and

corroborates the studies by Tortoli and Moraes (2016), Al-Najjar and Clark (2017) and Aslan, Kalim and Fizza (2019). The evidence shows that, on average, companies that have the largest number of independent members on the board proportionally retain more cash. This means that increased participation of independent directors, that is, external individuals who can bring different experiences and judgments, results in higher cash balances, which can hinder the entry of competitors into the market and discourage competition between companies. Fama and Jensen (1983) report that for reputational reasons, independent advisors are encouraged to monitor management.

Hypotheses 2 and 3, on the other hand, are not confirmed because they show a signal contrary to the expected or because they do not present statistical significance. About the rejection of H_2, the significant and positive effect (contrary to what is expected in multiple regression) of the CEO duality can be explained by the fact that the command in the same person can increase the responsiveness and action of a company, especially if the company is young and if agency problems can be controlled by other means. In addition, other studies use the CEO duality as a proxy for corporate governance and also do not find statistical significance of this variable (quantile regression) with the dependent variable (Moura et al., 2020). As a justification, these authors point out that Brazil is a developing stock market and that most companies have a high concentration of ownership. Therefore, it is believed that due to the existence of independent members on the board, the dual role of the CEO can bring some benefits in specific cases, such as when the business environment is unstable and constantly changes.

Regarding the non-confirmation of H_3 due to lack of statistical significance (multiple regression) or the significant and positive impact (contrary to what is expected in quantile regression) of the board size in cash holding, the lack of consensus on the ideal size of the board stands out. For Vafeas (2000) if, on the one hand, the smaller sized advice may be more effective and result in better monitoring of the report's effectiveness, on the other, may be unable to properly supervise management. Given the positive result obtained by quantile regression, it is assumed that communication and coordination problems, arising from the difficulty of all counselors expressing their ideas and opinions during the limited time of meetings, in larger boards do not impair management monitoring.

The sample companies present board and board members with diverse qualifications and experiences such as mathematicians, statisticians, lawyers, accountants, administrators, engineers, economists, which may justify the positive relationship found between the CEO duality and cash holding, since, according to Fama (1980) and Jensen (1993), when some opinions of the board are combined, such as specialized knowledge, composition and legitimacy, the efficiency of corporate management can be higher, and have different committees, such as auditing, risk, people management, sustainability. Furthermore, it is relevant to inform that in some companies such as Bardella, Energias BR, Energisa, Helbor, Light S/A, Metisa, Profarma and Trisul, although there is no CEO duality, the positions of Vice-Chairman of the board and CEO are occupied by the same individual, which can result in conflicts of interest and failures of management monitoring.

In general, if there is maximizing the usefulness on the part of the agent, he will make decisions for his own benefit and not for the company's benefit, and then the cash accumulation may have the purpose of increasing the volume of assets in the management's power and, consequently, its discretion over investment decisions (Jensen,1986; Ferreira & Vilela, 2004). This means that cash holding may be to end the expropriation of shareholders' wealth by managers, since financial resources can be used in projects that are not advantageous/profitable to the company because they are readily available in cash form. Thus, given that empirical evidence indicates that the CEO duality and the board size positively affect the corporate amount of retained cash, the present study shows that cash management in publicly traded companies should be a constant and inevitable concern.

As a limitation, when considering the sample selection criteria, the results can not be generalized because the sample is non-probabilistic. Another limitation refers to potential endogeneity problems among independent variables, despite the application of the method of robust variance-covariance matrices of Newey-West to obtain the standard errors of estimators by OLS. This study aims to arouse interest in the subject and for future research it would be appropriate to test other attributes that may impact the decision on spending or holding cash, such as the type of guarantee present in debenture issuing deeds.

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