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Pension Funds: The Importance of Corporate Governance

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ABSTRACT

This study analyzed whether the level of corporate governance of companies listed on the Brazilian capital market is related to the investment decisions of Brazilian pension funds. We start from the assumption that the corporate governance system mitigates the moral risk, that may arise in the relationship between corporate managers and investors and respective shareholders, Brazilian pension funds. Shareholding dispersion would enable opportunism for corporate managers, making decisions focused on their interests to the detriment of shareholders or investors. The governance system would signal that this behavior would be controlled, signaling safer behavior for investors. Thus, the hypothesis is that the level of corporate governance would attract pension funds that would understand this system as reducing investment risk. To test this, we used panel data, with a sample of 1,582 observations of companies listed on the Brazilian Stock Exchange (B3) from 2010 to 2017. The statistical results show that corporate governance positively correlates with investment in pension funds. This leads to the conclusion that, for Brazilian pension funds, companies' signaling about their corporate governance practices is a risk-mitigating factor. Furthermore, these results allow us to infer that the company's governance level associated with leverage is a differentiating signaling element as the evidence points to a positive relationship.

KEYWORDS

pension funds; corporate governance; emerging markets; debt

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1. Introduction

Pension funds are a distinct class of investors insofar as they not only aim to guarantee future returns to their participants but also because their investments bring vast resources and long-term orientations (H.F. Amaral, Vilaça, Barbosa, & Bressan, 2004; Bushee, 2004; Gospel et al., 2011; Lima & Aquino, 2019; Teixeira, Macagnan, Simon & Vancin, 2020; Thamtheram & Wildsmith, 2007). Pension funds are pension plan operators who invest their resources to guarantee the future income of their members (Del Guercio & Hawkins, 1999; PREVIC, 2021; Wahal, 1996). Pension funds are investors with a social security feature, which differs from other investors. Participants in pension funds, over the years, expect to receive a pension or benefit corresponding to the amounts they contributed (Gospel et al., 2011; Teixeira et al., 2020). Therefore, the long-term perspective of pension funds is more relevant to capital market companies than the perspective of short-term target investors. The pension funds need to consider the long-term investment risk too.

We start from the assumption that the corporate governance system mitigates the management opportunism, that may arise in the relationship between corporate managers and investors and respective shareholders, Brazilian pension funds. Shareholding dispersion would enable opportunism for corporate managers, making decisions focused on their interests to the detriment of shareholders or investors. Thus, the hypothesis is that the level of corporate governance would attract pension funds, as they would understand this system as reducing investment risk.

Pension funds can monitor investment risk based on the company's financial and non-financial information (Almeida, 2011; Blake, Lehmann & Timmermann, 1999; Pensuvo, 2006). Financial information, such as debt and profitability variability, is essential but insufficient. Therefore, non-financial information can help mitigate investment risk, especially in emerging capital markets, where families control most firms. As in the Brazilian market, non-financial information can make a difference in strategically choosing the firm to invest in. Furthermore, in capital markets with weak protection for minority shareholders, disclosure of non-financial information can be a strategy for effectiveness and understanding investment risks (Boyko & Derun, 2016).

The corporate governance system is one of the non-financial types of information that pension funds can consider as an indicator of management quality and level of risk (Almeida, 2011; Boyko & Derun, 2016; Pensuvo, 2006). Pension funds can monitor investment risk based on the company's financial and non-financial information (Almeida, 2011; Blake, Lehmann & Timmermann, 1999; Pensuvo, 2006). Financial information, such as debt variability and profitability, is essential but insufficient. Therefore, non-financial information can help to mitigate investment risk, especially in emerging capital markets, where families control most companies, as in the Brazilian market.

It is worth noting that the context of this research's Brazilian capital market has grown significantly in Brazil in the last two decades. For example, revenue in the Brazilian capital market B3 was 2004 R$252 billion in 2020 and R$6.45 trillion, a growth of 24.595%. (B3, 2021). That growth may indicate the possibility of greater asset liquidity and differentiated opportunities for gains. As a result, it has become attractive to investors and companies looking for alternatives in the capital market in mapping their financial strategy.

On the other hand, it may also signal greater investment risk. The Brazilian market is characterized by weak protection for minority shareholders. From this perspective, disclosing non-financial information can be a strategy for effectiveness and understanding investment risks (Boyko & Derun, 2016). Its relevance is recognized by the Signaling theory, which assumes that the disclosure of non-financial information is a mitigating mechanism for information asymmetry between firms and investors. That enables a better understanding of the firm's reality, enabling investors to decide where to allocate their resources (Bae, Massud, Kaium & Kim, 2018; Connelly, Certo, Ireland and Reutzel, 2011; Fatma and Abdelwahed, 2010).

Therefore, this study analyzes whether the corporate governance of companies listed on the Brazilian capital

market is a strategic element of investment choice for Brazilian pension funds. In other words, we analyzed the hypothesis that the corporate governance practices of companies listed on the Brazilian capital market are likely positively related to the shareholding of Brazilian pension funds. In addition, we understood that the corporate governance system could be more strategic for leveraged companies, as they offer greater investment risk. Therefore, we formulate a second hypothesis that the corporate governance practices of companies with higher leverage listed in the Brazilian capital market are likely positively related to the shareholding of Brazilian pension funds.

A review of empirical literature made it possible to identify that part of the research published on the topic focuses on the analysis of pension fund activism to improve corporate governance or on the analysis of the economic and financial performance of corporations (Faccio & Lasfer, 2000; Clarke, Hebb & Pensuvo, 2006; Camargo, 2013; Ferreira & Matos (2006) analyzed the preference of institutional investors regarding their investments. Bushee (2001) analyzed the maintenance of institutional shares in corporations. Our research differs from the reviewed research by analyzing the Brazilian capital market and the behavior of Brazilian pension funds, characterized by the large participation of public authorities as sponsors (Bushee, 2001; Camargo, 2012; Clarke & Hebb, 2004; Faccio & Lasfer, 2000; Ferreira & Matos, 2008). Also, debt can be factor correlated to the level of corporate governance, which justifies this research and makes it relevant.

The relevance of this research is corporate governance system represents a cost. Costs that must be assumed as the corporate governance system contribute to reducing the cost of capital. In this sense, the literature review (Bae et al., 2018; Claessens et al., 2000; Gillan and Starks, 1998) does not confirm what factors explain the existence of a corporate governance system. From this perspective, our hypothesis that debt is a factor that contributes to explaining the level of corporate governance, adding to the existing literature, would make it possible to expand the understanding of this system. This would help regulators, as well as corporations, to strengthen investments in corporate governance more efficiently.

Our final sample comprises 1,582 observations of listed firms on the Brazilian stock exchange (B3) from 2010 to 2017. The database used to collect data was Economatica®. We use panel data with a probit model to develop our econometric model. Our variables of interest vary extraordinarily little over time. Therefore, we chose to use panel data with random effects because of this and the Hausman test result. The dependent variable is dichotomous: a group of publicly traded firms that has pension funds as their shareholders and another that does not; we are estimating the predicted probability of a firm having among their ownership structure a pension fund. Our approach also addressed outliers, which should receive attention when performing a multiple regression (Good & Hardin, 2012). To avoid this influence, we use the winsorizing method.

It is essential to say that all Brazilian pension funds were around US$ 223 billion (Teixeira et al., 2020) in 2019, representing 12.2% of the Brazilian Gross Domestic Product. Equity investments represent 21% of this amount, worth US$ 47 billion (PREVIC, 2020). That is the representation of pension funds for the sample. Like the Brazilian capital market, Brazilian pension funds have grown recently (PREVIC, 2020). Also, the changes in the retirement system established in the last decade for civil servants, by the reform of the public social retirement system, given the size of the Brazilian population, pension funds will grow much more in the coming years. That indicates the relevance of the theme of this study.

With statistically significant results, this research indicates that the corporate governance system is a strategic indicator when the company has higher leverage levels. Leverage could mean investments with future returns, and the corporate governance system would suggest effective control over them. On the other hand, our results also showed that corporate governance is not a strategic indicator for companies with lower financial risk in the investment decision process for pension funds. These results allow us to infer that nonfinancial information of companies, more specifically those that represent corporate governance practices, can help explain Brazilian

pension funds' decision-making process when companies indicate greater financial risk. It is essential to recognize that this result corresponds only to Brazilian pension funds. Brazil is a developing country. After the current privatization process of the pension system, Brazilian pension funds are growing in importance (PREVIC, 2020; Teixeira et al., 2020), which may mean an increase in companies' investment capacity.

Therefore, our study concludes that when companies are indebted and wish to capture pension fund investments, they should signal financial and financial information to the market, as the signaling theory assumes. That helps to mitigate the asymmetry of communication between the company and the market, establishing greater trust in its relationship with pension fund managers. This paper contributes to the literature in several ways. First, it explores a type of institutional investor, the "pension funds," in a developing market, which is not a common approach. Second, researchers could use our results to review their beliefs and improve the existing theories or create new ones. Third, it enables a better understanding of the decision-making process of institutional investors in emerging markets.

The paper is organized into the following sections: we present the theoretical framework and developed hypotheses in the second section. Then, in the third section, we present the empirical methodology (data collection, description of variables, and methodology). In the fourth section, we offer the results and analysis. Finally, we conclude the paper in section five.

2. Theoretical perspective and hypotheses

The separation between ownership and control of companies establishes the problem of information asymmetry. The information asymmetry creates the condition for opportunistic behavior on the part of managers. This means that managers make decisions focused on their interests to the detriment of shareholders' interests. From this perspective, the corporate governance system would be established to mitigate the opportunistic behavior of the corporation's managers or even company controllers. In other words, the different levels of information between the manager and the owner do not allow the second to observe all the actions of the first as well as the possibility of an emerging conflict of interest between the parties involved in a contract, which prevents a better assessment of the investment risk given the decisions of the company's management. (Berle & Means, 1932; Jensen & Meckling, 1976). That can have consequences such as a higher cost of capital and difficulty accessing market resources. The Brazilian capital market, with less shareholding dispersion, is characterized by the shareholding control being in the hands of a few shareholders. The problem of conflict of interest and information asymmetry is between majority and minority shareholders. (Correia, Amaral & Louvet, 2011; Silva & Martins, 2015; Leite & Martins, 2020).

In this sense, the Brazilian stock market, aiming to attract investors, has taken initiatives to increase credibility and trust in companies, such as publicly-traded companies' corporate governance levels. Creating a differentiated corporate governance listing system aims to stimulate investor interest and strengthen the credibility of companies and designers. B3 has six listing segments for companies listed as Bovespa Plus (Bovespa Mais), Bovespa Plus Level 2 (Bovespa Mais Level 2), Novo Mercado (Novo Mercado), Level 1 (Level 1), Level 2 (Level 2) and Basic. The corporate governance levels established by the capital markets in Brazil include Novo Mercado (100% adoption of governance rules), Level 1 (the lowest level of commitment to Corporate Governance rules), and Level 2 (an intermediate involvement). For a company to have its shares listed in one of these B3 categories, it is necessary to present documentation and information, which must meet the specific standards of these levels of corporate governance (B3, 2021). In addition, companies must meet all criteria, which implies a formal commitment.

All these levels need to disclose information such as cash flow, equity position, shares outstanding, and independent auditors' reports which differs from companies not listed in one of these segments. (B3, 2021; Schiehll et al., 2019). So, when companies adhere to one of these levels, there are advantages (Claessens, Klingebiel &

Lubrano, 2000; Pensuvo, 2006; Procianoy & Verdi, 2009; Vieira & Mendes, 2005), notably in attracting greater investor interest and more excellent value for money. market (Sousa, 2014; Steffen & Zanini, 2012). Furthermore, the clear rules at each level of corporate governance indicate an effort to build a more reliable and active capital market. Without this, investors could opt for other assets (Grün, 2003).

On another side, Institutional investors, also termed universal owners (Schiehll, Gerhard & Macagnan., 2019; Urwin, 2011), are becoming key drivers in the economic environment. They are large investor organizations prioritizing diversity of assets (Anderson, Fedenia, Hirschey & Skiba., 2011; Tihanyi, Johnson, Hoskinsson & Hitt., 2003). The institutional investors include investment funds, insurance firms, pension funds, and other entities (Gospel et al., 2011; Schiehll et al., 2019). They form a distinct group that develops discernible preferences to invest their resources better. These preferences may be based on their analysis of their investment return, frequency of trading, trading volume, and legal restrictions, which would affect the decision choice of the firms in which they wish to invest (Anderson et al., 2011; Bushee, 2004; Schiehll et al., 2019; Teixeira et al., 2020; Tihanyi et al., 2003). Around the world, these organizations are closely managing their participation in firms, being dynamic in seeking more information to have greater certainty about their investments, and this new assertiveness is contributing to the maintenance and growth of firms (Schiehll et al., 2019; Teixeira et al., 2020). The considerable investment power of these organizations can influence changes in the management policy of the firms in which they invest (Schiehll et al., 2019; Thamotheram & Wildsmith, 2007). This financial power can be a pivotal factor in changing strategy at the firm level, being a decisive point concerning investment decisions (Theurillat et al., 2008). In Brazil, this participation has grown and become increasingly active, influencing the management of firms, in which they maintain participation (Gerhard, 2013; Schiehll et al., 2019).

Among the leading institutional investors are pension funds, defined as managers of peoples' savings (Del Guercio & Hawkins, 1999; Wahal, 1996). Pension funds play an essential role in the financing needs of various firms in various sectors of the economy. Thus, they contribute to the economic development of a country and the enforcement of its financial system (Gurley & Shaw, 1955; Meng & Pfau, 2010; OECD, 2018; Pochinok, Andryushchenko, Savina, Spirina & Maloletko, 2015; Schiehll et al., 2019). Moreover, the magnitude of the sums invested by pension funds, as well as the long-term characteristics of their businesses, make them significant participants in emergent economics (H.F. Amaral et al., 2004; Bushee, 2004; Gospel et al., 2011; Teixeira et al., 2020; Thamotheram & Wildsmith, 2007).

The actuarial equilibrium requires that expenditures and other future disbursements correspond to incomes to cover the total spending (Bogentoft, Romeijn & Uryaser, 2001). Time is essential to observe strategic asset allocation (Perold & Sharpe, 1988). With pension funds, to guarantee the expected result in the future, the following may be adopted as alternatives: increasing the amount and the length of time for participants' contributions and reducing the payment length of time for pensions. Otherwise, if the invested resources do not provide enough financial returns, they may jeopardize the payment of pensions (F.V. Amaral, Giambiagi & Caetano, 2013). Therefore, the pension fund needs to manage risk beyond the actuarial balance and current payment capacity of a pension fund's current commitments (Bogentoft et al., 2001; Pereira, Miranda & Silva, 1997; Sharpe, 2002). The risk associated with these investments would be based on the global economy and the individual characteristics of the portfolios.

We can define these risks in eight groups (Guiotti, Costa & Botelho, 2020; Martins, 2010). 1) Governance Risk related to accountability, fairness, disclosure, and corporate responsibility (Van Asselt & Renn, 2011). 1) Credit Risk: related to the uncertainty of receiving payment (Faure, 2013). 3) Actuarial Risk related to the defined benefit plans (Goovaerts & Laeven, 2008). 4) Market Risk is defined as the fluctuation of the value of an asset about the expected result. For example, fluctuations in exchange rates and indexes can produce it or other economic changes (Crouhy, Galai & Mark, 2006; Jorion, 2007). 5) Liquidity risk is related to the financial risk of a possible loss of liquidity (Jorion,

2007). 6) Legal Risk arises in cases where there are poorly worded contracts and documents that may result in legal problems and non-compliance with legislation (Crouhy et al., 2006; Jorion, 2007). 7) Operational Risk caused by a lack of consistency and adequacy of systems, operational processes, internal control failures, and fraud (Crouhy et al., 2006; Jorion, 2007). 8) Systemic Risk is related to the degree of uncertainty in the system resulting from changes in the level of credit, interest rate and foreign exchange risk (Eisenberg & Noe, 2001).

Pension funds could mitigate risks by participating on the board of companies (Judge & Zeithaml, 1992; Tihanyi et al., 2003). That could help them to align their interests with the company's CEO, creating new control mechanisms and modifying strategies to guarantee their investments and profitability (Pensuvo, 2006; Tihanyi et al., 2003). The term' firm engagement' (Clark & Hebb, 2004) determines the influence of pension funds on business organizations. The shareholding of pension funds influences the corporate governance system of companies and would have an increasing impact on socially sustainable investments (Clark & Hebb, 2004; Sievänen, Rita & Scholtens, 2013). The revised empirical research indicates that when acquiring companies, pension funds improve the company's performance by restructuring the same (Gospel et al., 2011, p. 286). Furthermore, pension funds could work collectively, with "cost-effectiveness and profound impact, initiating changes that could increase long-term market returns by transforming the parts of the system that destroy value". (Thamotheram & Wildsmith, 2007, p. 440). However, when the investment is lower, which makes it impossible to integrate the board, pension funds must analyze the indicators of the companies.

That would apply to developing countries, characterized by family-controlled companies, where there is possibly low protection of minority interests. The Brazilian pension funds have a specific legal treatment mandating them to protect the financial security of their participants. The EFPCs are subject to government regulation (Article 21 of Brazil's federal constitution), namely: "It is the responsibility of the Federal Government to administer the country's foreign exchange reserves and to supervise operations of a financial nature, especially credit, exchange, and capitalization operations, as well as the insurance and private pension funds (Brasil, 2013). In the Brazilian normative system, pension funds can invest resources in the capital market until 70% of their resources are in a portfolio of firms to discourage concentration or takeover (Brasil, 2013).

Thus, the revised classical literature presents financial indicators as an option to analyze the risk of investing in listed companies. However, accounting does not record firms' economic resources, which may influence their results. Moreover, most intangible resources are not accounted for by the company (Macagnan, 2009; Fontana and Macagnan, 2016), which is information that establishes a strategic differential between one company and another (Macagnan, 2009). Therefore, from this perspective, the non-financial indicator is a strategic informational resource for analyzing investments.

Therefore, one hypothesis is that pension funds decide their investments by analyzing non-financial information and, among these, the quality of corporate governance of the companies in which they invest. In other words, the company's non-financial information can help explain the Brazilian pension fund's investment. In this way, the corporate governance of companies in the Brazilian capital markets helps to shape the opportunity to obtain financing from Brazilian pension funds. Thus, one hypothesis is that pension funds decide their investments by analyzing non-financial information and, among these, the quality of corporate governance of the companies in which they invest. In other words, the company's non-financial information can help explain the Brazilian pension fund's investment. In this way, the corporate governance of companies in the Brazilian capital markets helps to shape the opportunity to obtain financing from Brazilian pension funds.

Our literature review enabled us to identify studies, which analyze the activism of institutional investors and firms to improve corporate governance and examine the financial economic performance of these firms (Bushee, 2001; Camargo, 2012; Clarke & Hebb, 2004; Faccio & Lasfer, 2000; Ferreira & Matos, 2008; Gospel et al., 2011; Oliveira, Leal & Almeida, 2012; Pensuvo, 2006; Schiehll et al., 2019; Teixeira et al., 2020; Thamotheram & Wildsmith,

2007; Tilba & Mcnulty, 2013). Good corporate governance practices are recognized as an efficiency characteristic for pension funds. Those firms, that experience pension fund participation, reduce conflicts of interest between managers and shareholders (Stewart & Yermo, 2008; Teixeira et al., 2020).

The preference of institutional investors for short- and long-term results, keeping the same classification as in the previous study, was studied by Bushee (2001). He noted that pension funds have long-term choices and are stable in their investments. That indicates that pension fund investments do not exclusively focus on purely financial results variables but also good governance and sustainability. Pensuvo (2006) analyzed listed firms on the B3 in 2004 and 2005. He showed statistically that the participation of pension funds as business partners does not affect corporate governance levels. However, the study points out that pension funds invest favorably in firms with good corporate governance practices. Furthermore, there appears to be better corporate governance in firms in which pension funds participate, according to a study of B3-listed firms from 2002 to 2009 (Almeida, 2011).

Ferreira and Matos (2008) investigated institutional investors' preferences in 27 countries from 2000 to 2004. They found that these organizations prefer firm shares with good liquidity and elevated levels of corporate governance. More recently, along the same lines, Schiehll Gerhard e Macagnan (2018) found that, from 2002 to 2011, institutional investors paid more attention to listed firms in B3 that belonged to a differentiated level of corporate governance. Another study with Brazilian listed firms on the B3 from 2001 to 2005 concluded that firms that adhered to the new levels of corporate control of B3 increased their liquidity, which made them strategic to new investments (Procianoy & Verdi, 2009).

Concerning the disclosure of non-financial information, Andrade, Bressan, Iquiapaza, and Moreira (2013) found a positive relationship between adherence to the ISE index (Firm's Sustainable Index at Brazilian Stock Market "B3") and the profitability and size of firms listed on the B3 from 2006 to 2011. Coram, Mock, and Monroe (2011) conducted research involving an investor-behaviour survey of Australian financial analysts over eight years, analyzing whether they consider the use of financial or non-financial aspects strategic. They found that non-financial indicators are more relevant when financial indicators are well-rated. However, they found that when financial indicators present negative results, non-financial ones have little relevance. In his study of the PREVI pension fund, the largest pension fund in Latin America, Camargo (2012) concluded in interviews with fund managers that they adopt responsible investment principles.

In summary, we start from the assumption that there is information asymmetry and the possibility of conflict between control and ownership of the company. Conflict of interest is always a possibility when control and ownership are separated. Also, most of the intangible resources of companies are not accounted for. Failure to account for this information makes the investor depends on the company's disclosure of non-financial information. This nonfinancial information can contribute to an understanding of investment risks in the company. In this sense, we assume that pension fund managers choose equity investments by analyzing financial and non-financial information about the company. That is because they are not under direct management, even as part of the company's board of directors. From this perspective, the corporate governance system can mitigate information asymmetry and conflicts of interest between shareholders and control (Benson, Hutchinson & Sriram, 2011; Gillan & Starks, 1998; IFRS, 1994; Muthupandian, 2010; Stewart & Yermo, 2008). Thus, the governance system would signal to pension funds that the company is reliable for long-term investments.

Thus, we understand that pension funds choose to invest in companies with this characteristic that present financial and non-financial information to be considered in their investments (Stewart & Yermo, 2008; Teixeira et al., 2020). In this sense, and because the strategy of asset allocation was rarely studied in the Brazilian capital market for Brazilian pension funds, we propose the following hypothesis, identified throughout the text as H1 and H2:

H1 – The shareholding of pension funds has a positive statistical relationship with the corporate governance practices recognized by B3.

Companies need to raise funds for their investments. These amounts come from equity, retained earnings, capitalization, or third-party capital realized through debt (Brito, Corrar & Batistella, 2007). However, among the financing options in the Brazilian market, bank debt is a historically complicated option due to the high-interest rates charged. As a result, the Government subsidizes projects with higher interest rates, many of them through the National Bank for Social Development (BNDES), which remains an important financing option for companies (Valle & Albanez, 2012). Therefore, effective interest rates in the Brazilian market influence fundraising regardless of the banking source.

A high-interest rate is strategic to bring investors to the financial market, reducing direct investments in companies through the capital market (Freitas, 2011). The main financing instruments in the Brazilian capital market are shares and debentures (Hoji, 2012; Veiga & McCahery, 2019), which have become essential sources of corporate financing. Companies with growth expectations have projects that they need to develop and finance, encouraging them to seek the capital market (Steffen & Zanini, 2012). An IPO may not lead to the necessary fundraising. The company must signal opportunities to obtain positive results to attract/keep (new) investors strategically. The relationship between the expected return and the opportunity cost offered by the company will influence the investors' decisions. (Fazzari, Hubbard & Petersen, 1987).

Typically, leveraged firms suggest greater risk (Desai, Foley & Hines Jr., 2008; Paiva & Savoia, 2011). However, suppose the strategic asset allocations of pension funds did not disregard the financial aspects of the company. In that case, it is understood that corporate governance could be configured as an aspect to be considered in the most leveraged companies. Thus, more leveraged firms would receive investments from pension funds whenever they sign behaviors guided by the corporate governance system recognized by the stock exchange on which they are listed. In this way, aligning a company to corporate governance standards – benchmarks identified by regulators and organizations that incorporate sustainability practices – allows greater security for investors, which can be decisive in allocating pension funds' assets. In other words, leveraged companies could offer risk, which would be mitigated by corporate governance practices, which would lead to reliability for pension funds to invest in them. In summary, the higher the risk, given the company's leverage, the more strategic is expected, signalling corporate governance practices.

H2 – The shareholding of pension funds has a positive statistical relationship with the corporate governance practices recognized by B3 companies with the highest leverage.

The next item consists of the methodological description that supports this research, considering the two hypotheses presented.

3. Methodology

In our econometric model, we empirically test the drivers for the participation of pension funds in publicly traded companies listed on B3 using panel data. Panel data is characterized by having observations in two dimensions, allowing the analysis of several companies in different periods. Furthermore, the same unit is monitored over time (Chamberlain, 1984; Gujarati & Porter, 2012). With this technique, we could investigate the dynamics of changes in variables, making it possible to consider the effect of unobserved variables and increase the efficiency of econometric estimators. However, when applying the OLS model to panel data, the estimated regression does not consider the cross-section and time series nature. Therefore, the characteristics of other companies are irrelevant (Chamberlain, 1984; Gujarati & Porter, 2012).

Identifying which effect best fits the model panel data estimation is crucial. We can visualize a fixed effects model or a random effects model. For example, we control for the impact of omitted variables that change across individuals and remain constant over time with a fixed effect. In contrast, for a random effects model, the main difference is that the impact of omitted variables remains the same over time but continues to vary from individual

to individual (Bhargava & Sargan, 1983; Duarte, Lamounier & Takamatsu, 2007). Likewise, the fixed effects estimate eliminates the unobserved effect and captures the heterogeneity of companies, while the random product addresses the unobserved impact by including a random term (Chamberlain, 1984; Gujarati & Porter, 2012).

The use of the Hausman test will determine the use of a fixed versus random effect approach. This test determines whether random effects correlate with regressors. If the result is significant, it is preferable to use the fixed effect (Gujarati & Porter, 2012). However, our variables of interest vary remarkably little over time. So, we chose to use panel data with random effects because of that and the result of the Hausman test.

We chose to estimate panel data with a probit model. This model aims to estimate the probability that the observation with characteristics falls into one of the specific categories (Chamberlain, 1984; Greene, 2004). As our dependent variable is dichotomous – a group of publicly traded companies that have pension funds as shareholders and another that does not – we estimate the predicted probability of a company among its ownership structure, a pension fund.

Thus, considering the hypotheses formulated and the analysis technique described, we established the model, as shown below (equation 1):

$$\begin{aligned} \text{PARTPFit} = {} & \beta_0 + \beta_1 \text{IGOV i, t} + ß_2 \text{IGOV}_{\text{LEV}} \text{i, t} + ß_3 \text{LEV i. t} + ß_4 \text{DIV}_{\text{YIELD}}\text{. i, t} + ß_5 \text{SIZE i. t} + ß_6 \text{LIQ}_{\text{EXCHANGE}}\text{. i, t} \\ & + ß_7 \text{ MKTBOOK i, t} + ß_8 \text{ADR i, t} \\ & + \varepsilon \text{i, t} \end{aligned} \quad (1)$$

3.1. Dependent, interest, and control variables

The linear form and the other Probit developed the regression analysis. So, we used two different steps: (1) PARTPF, a dichotomous variable that receives the value of one when the company has at least one pension fund as a shareholder and zero otherwise; and (2) PARTPF_1, which is the percentage of participation in pension funds in Brazilian companies listed on B3. This percentage was obtained by adding the shares of each pension fund of the same company. For the data on the pension funds, the authors considered Closed Pension Plans (EFPC), described as pension funds, which they identified through consultation on the website of the National Supplementary Pension Authority from Brazil (PREVIC, 2021). Therefore, we use PARTPF for our probit model and PARTPF_1 for other analyses during the research. The independent variables include the following two variables and their variations: (1) Corporate Governance Indicator (IGOV) and (2) Corporate Governance Indicator – Leverage (IGOV_LEV) is the interaction term. They are the ones used to prove or not our hypotheses, as shown in Table 1. The coefficients β_1 and β_2 are expected to be positive and significant.

Table 1. Hypotheses, interest variables, and their expected relation.

Hypotheses	**Independent Variables**	**Expected relation**
H1 – governance	IGOV	+
H2 – governance + leverage	IGOV_LEV	+

Note: IGOV and IGOV_LEV are independent variables. IGOV represents the Corporate. Governance Indicator, and IGOV_LEV is the Corporate Governance Indicator for Leverage firms.

The Corporate Governance Indicator (IGOV) is a dichotomous variable (1 – yes; 0 – no) that indicates whether

the firm is in one of the levels of corporate governance (Novo Mercado, Nivel 1, Nivel 2) proposed by B3 (Procianoy & Verdi, 2009). We have also created a more restricted version of this variable – IGOV1. This dummy receives the value of 1 if the firm is listed only in the higher corporate governance segment (Novo Mercado) of B3 and 0 otherwise. The goal is to target only those firms committed to the best corporate governance practices. The interaction term is the corporate governance indicator for leverage firms (IGOV_LEV). This index makes it possible to test the second hypothesis of the research. For firms with high leverage, the sensitivity of the participation of pension funds to corporate governance is more significant than in firms with low leverage, that is, $\beta 2 > 0$. To estimate the sensitivity of pension fund participation to corporate governance, we use the derivative of our statistical model, as described in the equation 2 below:

$$\frac{\partial PARTFP\_PP}{\partial IGOV} = \beta_1 + \beta_2 \times \text{Lev} \quad (2)$$

The control variables were defined as a) Leverage (LEV): calculated as the ratio between total assets and the net equity at the end of the year, which suggests a higher risk stock (Desai, Foley & Hines Jr., 2008; Paiva & Savoia, 2011). b) Dividend-price ratio: (DIV_YIELD): A percentage index is measured by the dividend per share divided by the price per share. Firms that pay dividends interest investors, and it gives a strategic sign that indicates there are solid prospects. (Bushee, 2001; Ferreira & Matos, 2008; Gerhard, 2013). c) Firm's Size (SIZE): represented by the firm's total assets value. To mitigate the scale effect, the natural log is applied. Investors prefer larger firms to invest in because they feel more secure (Bushee, 2001; Ferreira & Matos, 2008; Pensuvo, 2006; Procianoy & Verdi, 2009). d) Return on Equity (ROE). This variable was based on the study of Ferreira and Matos (2008), who consider that in the investor's view, the profitability of the equity is fundamental for strategic asset allocation. The ratio between net profit and equity measures the variable annual liquidity in the stock market (LIQ_EXCHANGE): firms with a high volume of activity signal a lower risk for investors related to shares, suggesting that it can be traded quickly (Bushee, 2001; Ferreira & Matos, 2008; Pensuvo, 2006; Procianoy & Verdi, 2009). This variable takes into consideration the number of stock transactions in the period, the total number of transactions in the B3 during the period, the financial volume generated by the transaction of the stock in the period, the entire financial volume recorded in B3 in the period, the number of trading sessions in the year with at least one trade and the total number of B3 trading sessions in the period; f) American Depositary Receipt (ADR) at the end of the year. A dichotomous variable (1 – yes; 0 – no) indicates if the firm trades its shares in U.S. stock exchanges. Firms that sell their shares in other markets comply with more robust governance standards, improving information quality (Ferreira & Matos, 2008; Pensuvo, 2006; Procianoy & Verdi, 2009), g) Market to Book (MKTBOOK): the variation between the market value and the book value of the firm on the last day of the year. Market-to-book was chosen because its result indicates the participation of intangible assets in the firm structure (Ritta & Ensslin, 2010), which can be considered an opportunity for growth (Sousa, 2014).

3.2. Study design, data, and sampling

Our final sample comprises 1,582 observations of listed firms on the Brazilian stock exchange (B3) from 2010 to 2017. The database used to collect data was Economatica®. Our approach also addressed outliers, which should receive attention when performing a multiple regression. Extreme values, small and big, significantly differ from the observations (Good & Hardin, 2012; Papke & Wooldridge, 2008). To avoid this influence, the winsorizing method was performed. These outliers approach the extreme values (above or below the percentile minimum and maximum defined), replacing them with the most minor and most significant values remaining in the distribution. In this study, the upper and lower limits were set at 95% and 5%, respectively, allowing greater data analysis robustness.

Specifically, the pension funds, the subject of this study, started with creating the "Caixa Montepio dos

Funcionários do Banco da República do Brasil" in 1904. In 1967, it was called PREVI - Employee Pension Fund Bank of Brazil. In 1978, ABRAPP – the Brazilian Association of Closed Entities of Complementary Pension Plans – was created. In 1977, additional social security came into force with law 435 (Ely, 2008). Moreover, Brazilian pension funds have a specific legal treatment mandating them to protect the financial security of their participants. The EFPCs are subject to government regulation (Article 21 of Brazil's federal constitution), namely: "It is the responsibility of the Federal Government to administer the country's foreign exchange reserves and to supervise operations of a financial nature, especially credit, exchange and capitalization operations, as well as the insurance and private pension funds." (Brasil, 2013). The Complementary Law no. 109 (May 2001) underlines the role of the State concerning the Supplementary Pension Scheme. Its responsibility under Article 3 is to "establish minimum standards of economic, financial and actuarial security, with the specific purpose of preserving the liquidity, solvency, and balance of benefit plans" (Brasil, 2018).

The investment of pension-fund resources follows specific regulations to preserve participants' rights. Each country has its own rules, which, not surprisingly, influence how resources are allocated and, therefore, how investments are decided. In Brazil, pension funds may invest resources within limits established by law. According to the Brazilian normative system, pension funds may apply resources to firms according to the firms' level of governance. For example, the total value of pension-fund investments in B3-listed firms' shares is currently capped at 70% (B3, 2021). In addition to this limitation, other rules must be observed: a) Up to 70% of pension fund investments can be made in firms in the Novo Mercado; b) Up to 60% of pension fund investments can be made in firms in Nivel 2; c) Up to 50% of pension fund investments can be made in firms in Bovespa Mais; d) Up to 45% of pension fund investments can be made in firms in Nivel 1; e) Up to 35% in other listed firms.

By Brazilian law, a pension fund cannot hold more than 25% of its shares in the same firm (Brasil, 2018). Moreover, as occurred in other countries such as Canada (Béland, 2006), Swedish and France (Marier, 2005), Chile (Orenstein, 2013), and Eastern Europe (Naczyk &
Domonkos, 2016), the Brazilian pension system is reformulating from public to private (Law 12.618, 2012 and Law 14.750, 2015).

4. Results and discussions

The results of the descriptive analysis are presented in Table 2. In this table, the total sample is divided into two groups: companies that do not have pension funds between their shareholders (PARTPF = 0) and those that do (PARTFP = 1). Thus, the study contemplates a sample of 1,582 observations of Brazilian listed firms at B3 between 2010 and 2017. In this sample, 126 observations presented pension funds among their shareholders, 7.96% of the total.

The percentage of pension funds' participation in the firms listed on the B3 is represented by PARTPF_1. The average participation in our sample is 0.72%, and the standard deviation is 2.76. This result indicates the minor involvement of pension funds in listed firms on the Brazilian stock exchange. Furthermore, it corroborates with the results found by Freitas (2011), who showed that elevated interest rates could be a strategic factor in bringing investors to the financial market, reducing direct investments in firms through the capital market. However, the average share percentage *n* firms participating in pension funds is 9.07%.

Although the participation of funds is relatively low in the Brazilian capital market, it is shown to be constant over time, as shown in figure 1. In this, we can observe that the median of the variable PARTPF_1 (for only those that have funds as investors) oscillates between 12.87% (2010) and 7.25% (2013). One possible implication for this result is that pension funds have a long-term view of their investments and that decision-making for investing or divesting is not easily changed.

Table 2. Descriptive statistics of the analyzed variables. 2010-2017.

VARIABLES*	Expected sign	(1) Full Sample (n=1582)	(2) PARTPF = 0 (n=1456)	(3) PARTPF =1 (n=126)
PARTPF_1		0.72	0.00	9.07
		(2.76)	(0.00)	(4.49)
IGOV	+	0.60	0.61	0.50
		(0.49)	(0.49)	(0.50)
IGOV1	+	0.45	0.46	0.27
		(0.50)	(0.50)	(0.45)
DIV_YIELD	+	2.71	2.67	3.20
		(3.25)	(3.21)	(3.57)
Size	-	15.15	15.13	15.37
		(1.76)	(1.73)	(2.08)
ROE	+	6.08	6.21	4.52
		(24.51)	(24.57)	(23.89)
LIQ_EXCHANGE	+	0.21	0.21	0.31
		(0.38)	(0.36)	(0.52)
MkB	+	2.03	2.06	1.58
		(2.12)	(2.18)	(1.08)
Lev	-	3.78	3.76	4.05
		(3.41)	(3.36)	(4.00)
ADR	+	0.11	0.10	0.21
		(0.32)	(0.30)	(0.41)

Note: This table reports the descriptive statistics. The sample covers 1582 observations, of which 126 pension funds as investors from 2010 to 2017. PARTPF is a group of companies that do not have pension funds among their shareholders. PARTPF_1 is the group of companies that have pension funds between their shareholders. IGOV represents the Corporate Governance Indicator. IGOV1 represents the Corporate Governance Indicator only for firms at the Novo Mercado level. DIV_YIELD is a dividend-price ratio. SIZE is the Firm's Size. ROE is Return on Equity. LIQ_EXCHANGE represents the annual liquidity of firms in the stock market. MKB is for Market to Book value at the end of the year. LEV is for leverage firms. The ADR variable is American Depositary Receipt at the end of the year. For each variable presented, the average and standard deviation are in parentheses.

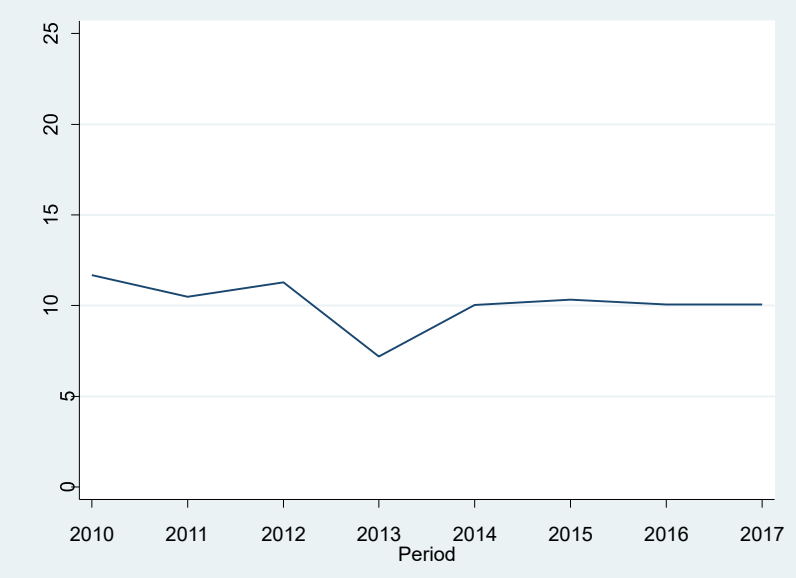

Figure 1. Participation of Pension Funds over time – for PARTPF = 1.

Our variable of interest (corporate governance – IGOV and IGOV1) averages 0.6 and 0.45, respectively. So, during the 2010-2017 period in Brazil, more than half of all Brazilian firms were listed segments of corporate governance, and 45% were listed in Novo Mercado (higher level of corporate governance). That is an indication of growing concern in Brazil about good practices in corporate governance.

Figure 2 crosses the data on the participation of pension funds and corporate governance. In this, we can observe, among the distinct levels of corporate governance, the percentage of shares held on average by pension funds – given only to those with more than zero participation, i.e., PARTFP = 1. By this figure, we can infer that the highest median of shares held by pension funds are among the firms listed in the Novo Mercado. But the difference observed for firms not listed in the segments (in the traditional one) is low.

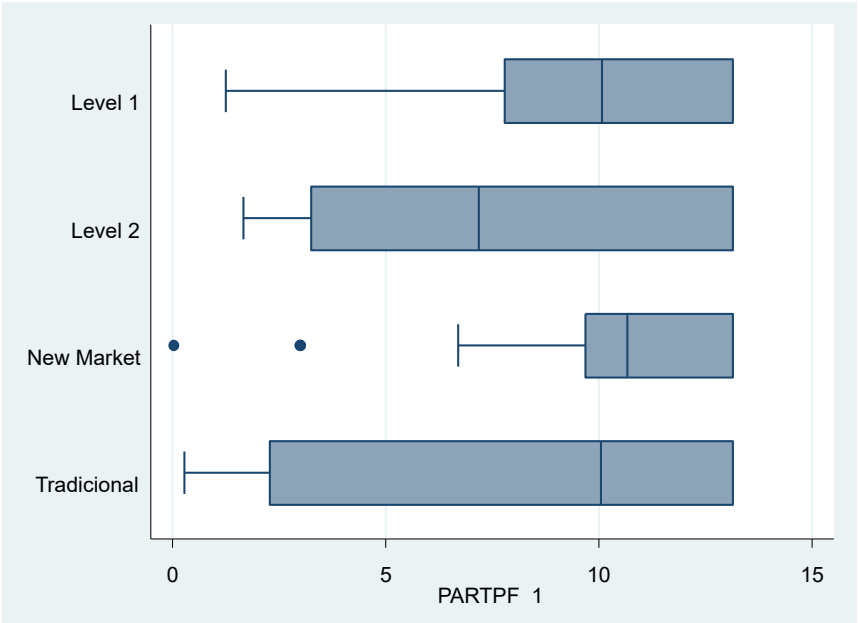

Figure 2. Participation of Pension Funds over time – for PARTPF = 1.

Table 3. Results for the Probit Model with Panel Data and random effects estimation – All variables.

VARIABLES	Expected sign	PARTPF (1)	PARTPF (2)	PARTPF_1 (3)	PARTPF _1 (4)
IGOV	+	-0.21**	-0.72***		
		(-2.12)	(-4.73)		
IGOV_Lev	+		0.13***		
			(4.25)		
IGOV1	+			-0.48***	-1.11***
				(-4.41)	(-6.88)
IGOV1_Lev	+				0.17***
					(5.62)
Lev	-	0.02	-0.06**	0.02	-0.04*
		(1.51)	(-2.13)	(1.48)	(-1.92)
DIVYIELD	+	0.02	0.02	0.02	0.01
		(1.41)	(1.19)	(1.29)	(0.88)
Size	-	-0.07*	-0.04	-0.08**	-0.06
		(-1.72)	(-0.94)	(-2.24)	(-1.60)
ROE	+	-0.00	-0.00	-0.00	-0.00
		(-0.23)	(-0.14)	(-0.35)	(-0.02)
LIQ_EXCHANGE	+	0.41***	0.32**	0.58***	0.40**
		(2.87)	(2.23)	(3.94)	(2.57)
MkB	+	-0.10***	-0.10***	-0.09***	-0.09***
		(-2.99)	(-2.91)	(-2.87)	(-2.73)
ADR	+	0.43***	0.35**	0.37**	0.46***
		(2.77)	(2.22)	(2.38)	(2.87)
Constant		-0.41	-0.51	-0.14	-0.22
		(-0.75)	(-0.92)	(-0.26)	(-0.41)
Observations		1,582	1,582	1,582	1,582

Note: The sample covers 1582 observations, of which 126 pension funds as investors from 2010 to 2017. PARTPF is a group of companies that do not have pension funds among their shareholders. PARTPF_1 is the group of companies that have pension funds between their shareholders. IGOV represents the Corporate Governance Indicator. IGOV_LEV is a

*Corporate Governance Indicator for Leverage firms. IGOV1 represents the Corporate Governance Indicator only for firms at the Novo Mercado level. IGOV1_LEV is the Corporate Governance Indicator for Leverage firms only for firms at the Novo Mercado level. DIV_YIELD is a dividend-price ratio. SIZE is the Firm's Size. ROE is Return on Equity. LIQ_EXCHANGE represents the annual liquidity of firms in the stock market. MKB is Market to Book value at the end of the year. LEV is for leverage firms. The ADR variable is American Depositary Receipt at the end of the year. For each variable are presented the average, and standard deviation are in parentheses. Z-statistics in parentheses - *** p<0.01, ** p<0.05, * p<0.1.*

Table 3 reports the results of our econometric model created to test H1 and H2, i.e., to test the possible influence of corporate governance on the participation of pension funds in the firms listed in the Brazilian stock market. We estimated models (1) and (3) without the interaction term (used to test H2) and models (2) and (4) with the term. For models 1 and 2, we use as a proxy for corporate governance the variable IGOV – a dichotomous variable (1 – yes; 0 – no) that indicates whether the firm is in one of the levels of corporate governance (Novo Mercado, Nivel 1, Nivel 2); and for models (3) and (4) we use IGOV1 – a dummy that receives the value of 1 if the firm is listed only in the higher corporate governance segment (Novo Mercado) of B3 and 0 otherwise.

We observe five variables with statistical significance in our first model using a Probit model, with panel data and random effects to estimate our econometric model. Additionally, the coefficient is statistically significant; that is, this result does not corroborate with the initial expectations of the researchers (H1 hypothesis) nor with the results found by Claessens et al. (2000), Vieira and Mendes (2005), Pensuvo (2006), Ferreira and Matos (2008) and Procianoy and Verdi (2009), that when firms decide to adhere to one of these levels, there are advantages, notably in garnering more investor interest and more excellent market value (Sousa, 2014; Steffen & Zanini, 2012). That allows us to infer that Brazilian pension funds do not value firms listed in one of the levels of corporate governance in the Brazilian capital market. To put it another way, pension fund managers do not consider the non-financial variable corporate governance a strategic element of asset allocation.

The second hypothesis tests if pension funds' equity participation in the B3-listed firms is positively related to firm governance, especially for firms presenting higher leverage. The goal is to test if corporate governance is more important in companies with greater risk (leverage), i.e., pension funds credit higher value than corporate governance in companies with a higher risk profile.

As shown in the methodology section, to estimate the sensitivity of pension fund participation to corporate governance, we use the derivative of our statistical model, as described in the equation 2.

In the second model, the interaction term (IGOV_LEV) has a positive and significant coefficient, i.e., the greater the leverage of a firm, the more critical the positive impact of its corporate governance for pension-fund investment in this firm. This result corroborates H2.

The variables MKTBOOK, LIQ_EXCHANGE, and ADR also presented meaningful results in all models, indicating that pension funds prefer companies with a smaller market-to-book value ratio and higher liquidity in and traded on the American stock exchange. However, other variables were not statistically significant.

Some interesting considerations can be made about the variable SIZE. First, in all models, it is negative – contrary to the initial expectations of the research. That is, Brazilian pension funds prefer to buy shares of smaller companies. Additionally, this variable is statistically significant in models (1) and (3) but not in (2) and (4).

As an alternative test of our hypotheses, we run our regressions on a paired sample of firms. Firms in any segments of corporate governance (we here also use the two variables separately: IGOV and IGOV1) are in the treatment group, and firms with similar characteristics not listed in these segments are in the control group. The matching of firms is based on the following continuous variables: SIZE, LEV (leverage), DIV_YIELD, ROE, LIQ_EXCHANGE (liquidity), and MKTBOOK (market-to-book). We also require an exact match of industry and year. Our objective is to test if the firms listed on levels of governance that are in the portfolio of pension funds are

significant through the paired sample. The results are shown in Table 4.

Table 4. Estimation model – Paired sample.

	Expected Sign	PARTPF (1)	PARTPF (2)	PARTPF_1 (3)	PARTPF_1 (4)
IGOV	+	-0.041		-0.059	
		(0.033)		(0.179)	
IGOV1	+		-0.054***		-0,413***
			(0.017)		(0.155)
Observations		1436	1436	1436	1436

*Note: The sample covers 1582 observations, of which 126 pension funds as investors from 2010 to 2017. PARTPF is a group of companies that do not have pension funds among their shareholders. PARTPF_1 is the group of companies that have pension funds between their shareholders. IGOV represents the Corporate Governance Indicator. IGOV1 represents the Corporate Governance Indicator only for firms at the Novo Mercado level. Z-statistics in parentheses - *** p<0.01, ** p<0.05, * p<0.1.*

In these regressions, as expected, the treatment indicator has negative and statistically significant coefficients. Firms in the treatment group defined by IGOV1 exhibit PARTPF and PARTPF_1, respectively 0.054 (0.017) and 0.413 (0.155) lower than the control group. When we move from the control group to the treatment group, these decreases in pension funds' participation suggest that corporate governance harms the pension funds' decision to invest in a listed firm. These additional results align with those obtained before; they support rejecting our first hypothesis and corroborating previous empirical findings.

The results of our study suggest that corporate governance does matter for pension funds to decide on asset allocation. In other words, when firms are leveraged, corporate governance is recognized as a positive non-financial characteristic for pension fund strategic asset allocations. However, when not leveraged, the indication is negative. In these firms, where the investment risk is significant, good governance practices can influence the investment decision of pension funds. On the other hand, in lower-risk firms, corporate governance is not a determining factor for applying these funds. Moreover, due to their probability monitoring structure, pension funds do not require different governance levels in firms with a moderate risk profile.

Although the objective of this study is to analyze "governance" as a critical factor in the asset allocation decision process for pension funds, our model also presents other variables that influence this process. For example, we could observe that firms in the high governance category have higher dividend yields, lower growth prospects, and higher leverage and are twice as likely to be listed as ADR.

5. Final considerations

This study analyses corporate governance as a critical factor that may signal the possibility of influencing the investment decision of Brazilian pension funds to invest in companies listed on the capital market. The results show that corporate governance is statistically significant and has a negative statistical relationship with pension fund asset allocation. This suggests that corporate governance, as a non-financial characteristic, would not be a relevant factor in pension funds' investment decisions if these companies do not signal risk information. However, when the

company is highly leveraged, corporate governance is a strategic factor for the pension fund to invest in. This leads us to conclude that Brazilian pension funds value the corporate governance system to minimise risk. Leveraged companies are preferred. Leverage could mean investments with future returns, and the corporate governance system would suggest effective control over them. This leads us to conclude that, in general, the level of corporate governance associated with leverage is a differentiating element in the Brazilian capital market. In other words, the investment decision of Brazilian pension funds valued the corporate governance of companies listed on the Brazilian capital market.

This suggests that the corporate governance system in the Brazilian capital market is credible to Brazilian pension funds. The results confirm a positive relationship between pension fund investment decisions and the corporate governance standards of leading companies.

In conclusion, corporate governance is a non-financial signal of B3-listed companies with greater leverage in the strategic asset allocation of Brazilian pension funds. Our findings are valuable for companies interested in pension fund investment resources, as they should also consider their non-financial information. Corporate governance practices are one of the characteristics valued by this category of investors in their investments.

These findings extend the existing literature, which argues that corporate governance levels are also designed to better understand agency problems in developing countries. We add to this literature that governance levels and leverage perspectives are crucial for institutional investors in their asset allocation decisions. Our findings also have many practical implications. They can help institutional investors in their investment decisions by clarifying this type of risky firm and by allowing them to identify attractive firms with these characteristics.

It is important to mention the limitations of our study and some implications for future research. Firstly, our results are derived from data collected from listed Brazilian companies and represent a largely Brazilian context, which limits generalisation at a global level. Furthermore, the credibility of the data is directly related to the credibility of the online database (Economatica®) from which we build our database. Finally, this model needs to be evaluated in other samples, taking into account the same variables of this study. For future research, it is recommended to analyse the profile of pension fund sponsors, both private and public. In addition, the inclusion of new variables and the expansion of the sample by comparing pension funds from other countries may provide new insights.

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Conflict of interest

All the authors claim that the manuscript is completely original. The authors also declare no conflict of interest.

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