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# Capital structure and firm performance moderated by information asymmetry

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## Abstract

We analyzed the influence of the capital structure, moderated by the information asymmetry, on the profitability of public companies in the Brazilian market. We analyzed 106 companies in quarterly periods from 2011 to 2020. We submitted this information to panel data analysis, indicating that the increase in indebtedness reduces the return on assets (ROA) and the return on equity (ROE). We found that information asymmetry acts as a potentializing factor in the negative effect of indebtedness on ROA and ROE. Our results corroborate and contribute to the pecking order theory since publicly traded companies in the Brazilian market have lower profitability as they increase their indebtedness. Also, the results help investors to understand the impact of indebtedness on the profitability of companies with different levels of information asymmetry.

**KEYWORDS:** Information asymmetry. Capital structure. Profitability.

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## Estrutura de capital e rentabilidade de empresas moderada pela assimetria informacional

### Resumo

Este trabalho analisa a influência da estrutura de capital, moderada pela assimetria informacional, na rentabilidade das empresas abertas do mercado brasileiro. A amostra foi composta por 106 empresas em períodos trimestrais de 2011 a 2020. A análise dos dados em painel indica que o aumento do endividamento geral diminui a rentabilidade do ativo (ROA) e do patrimônio líquido (ROE). A assimetria informacional atua como um fator potencializador do efeito negativo do endividamento no ROA e ROE. Esses resultados contribuem para a Teoria da Pecking Order, visto que, como proposto por esta teoria, companhias abertas do mercado brasileiro têm menor rentabilidade à medida que aumentam o endividamento. Além disso, a assimetria interfere nessa relação, o que pode contribuir para que os investidores entendam o impacto do endividamento na rentabilidade de companhias com diferentes níveis de assimetria informacional.

**PALAVRAS-CHAVE:** Assimetria informacional. Endividamento. Rentabilidade.

## Estructura de capital y rentabilidad de empresas moderadas por la asimetría informacional

### Resumen

Este trabajo analiza la influencia de la estructura de capital, moderada por la asimetría informativa, sobre la rentabilidad de las empresas que cotizan en bolsa en el mercado brasileño. La muestra estuvo conformada por 106 empresas en períodos trimestrales de 2011 a 2020. El análisis de datos de panel indica que el aumento del endeudamiento general disminuye el rendimiento de los activos (ROA) y del patrimonio neto (ROE). La asimetría de información actúa como un factor potenciador del efecto negativo del endeudamiento sobre el ROA y el ROE. Estos resultados contribuyen a la teoría del orden jerárquico, ya que, según lo propuesto por esta teoría, las empresas que cotizan en bolsa en el mercado brasileño tienen menor rentabilidad a medida que aumenta su endeudamiento. Además, la asimetría interfiere en esta relación, lo que puede ayudar a los inversores a comprender el impacto del endeudamiento en la rentabilidad de empresas con diferentes niveles de asimetría de información.

**PALABRAS CLAVE:** Asimetría informacional. Endeudamiento. Rentabilidad.

## INTRODUCTION

Capital structure is a core issue in finance, and it is being increasingly discussed after the launch of the irrelevance proposal by Modigliani and Miller (1958). Over time some discussion arose about the impact of structure capital on profitability and market value, resulting in the Trade-Off Theory as well as the Pecking Order Theory. Trade-Off Theory calls for the existence of an optimal capital structure set by the balance between indebtedness costs and benefits (MYERS, 1984). Pecking Order Theory advocates financing options based on a given hierarchy as it understands companies finance their own capital from a preset privileging the obtaining of resources by means of profitability retention (MYERS and MAJLUF, 1984).

It is known that one of the goals of managers who lead companies is economical-financial profitability, and Trade-Off and Pecking Order Theories state capital structure affects period profitability in a distinct way. Under the Trade-Off Theory logic, the increase on creditors' resources proportion when compared to equity generates an increase on profitability since companies search for external investments to potentiate their investments and, so, reach higher profitability levels (CORREA, BASSO and NAKAMURA, 2013). On the other way, Pecking Order Theory says when companies get more debts, they slow their profitability down (MYERS and MAJLUF, 1984; CORREA, BASSO and NAKAMURA, 2013).

In face of such antagonist approaches about capital structure on profitability, several studies are dedicated to comprehending which theory (ies) could better explain such relation. Fama and French (2002), and Lara and Mesquita (2008) express that several companies use corporative financing to get resources and improve their performance. Using financing via creditors aims at maximizing profitability and, thus, the value of the company (PROCIANOY and SCHNORRENBURGER, 2004). So, in these authors' perspective, the impact of capital structure on profitability follows the Trade-Off Theory logic.

Such findings raised even more studies across the world which aimed at investigating the relation between capital structure and profitability. It was shown in different countries, for example China (JING, 2017), Malaysia, and Indonesia (RAMLI, LATAN and SOLOVIDA, 2019), and Brazil, Chile, Mexico, and Peru (MARDONES and CUNEO, 2019) that managers chose financing from third parties to potentiate their corporations profitability. So, such studies support the Trade-Off Theory is more suitable to the discussion about the relation between capital structure and profitability.

Besides evidence, results from other studies pointed to a different direction. Correa, Basso and Nakamura (2013), Vuong, Quynh and Mitra (2017), Khémiri and Noubbigh (2018), and Li and Islam (2019) inferred the relation between financing from third parties and profitability is a negative one. It occurs because companies using their own resources for financing their activities are the more profitable ones. Such results come from interest rates on loans because such expenditures have a negative impact on net profit (KHÉMIRI and NOUBBIGH, 2018). So, these studies findings corroborate the Pecking Order Theory that increasing indebtedness results in slowing profitability down as stated by Correa, Basso and Nakamura (2013).

In this way, it is noticed that the impact of capital structure on profitability is still under discussion as far conflicting results from researches point out to different directions. It is believed that those divergences may come from institutional features and economical context of each country. In Brazil, for example, large companies can raise funds for financing internal projects easier than do the small ones. Such factor can turn into a competitive advantage for joint-stock companies and, in turn, increase companies' mark-up rate, favoring the Trade-Off Theory logic, as said by Mardones and Cuneo (2019). However, there is a history of heavy interest rate in Brazil (WORLD BANK, 2021), an aspect that brings an increase on the cost of financing from third parties and can be a factor decreasing the propensity of using resources from third parties (DURAN and STEPHEN, 2020).

Besides that, most companies in Brazilian market are close capital type and, very often, with massive family share possession (MONTEIRO, GAPARETTO and LUNKES, 2019). According to Prencipe, Bar-Yosef and Dekker (2014), and Yousaf and Hassan (2016) those companies tend to prefer using retained earnings instead of capital from third parties because in case of not paying for the debts members can lose the control over the company. All these reasons contribute for managers trend to prioritize financing with their own retained resources before adding to debts, reinforcing the Pecking Order Theory and Correa, Basso and Nakamura (2013) findings. That is, managers firstly use retained earnings for financing themselves and, secondly, they look for resources from third parties, so that opening the company's capital for share negotiation is the last option.

Although there is a discussion about how capital structure can influence profitability, studies on that issue have a limitation since they do not consider companies' specific features that can both interact with indebtedness and potentiate the effect on profitability. Information asymmetry is among companies' specific features. Asymmetric information cause accounting information to be poorer in quality (KAO and WEI, 2014) since it is linked to lower levels of transparency about providing companies' information (COELHO, NIYAMA and RODRIGUES, 2011). Also, when the company profitability is low, managers tend to force information to be more asymmetrical, and thus the evaluation of a company's economical-financial health is undermined (SCOTT, 2015).

Information asymmetry is not only linked to profitability but also to capital structure (BERGER et al., 2005; BHARATH, PASQUARIELLO and WU, 2009; AGARWAL and O'HARA, 2011). As long as information asymmetry increases so does the issuing of debts and search for financing from third parties (AGARWAL and O'HARA, 2011). In this sense, information asymmetry both impacts companies' profitability and can also act as a potentiating factor for the impact of indebtedness on profitability. From this, the study aims at **analyzing the influence of capital structure, moderated by information asymmetry, on the profitability of joint-stock companies in Brazilian market.**

The present research is substantiated by presenting a new perspective on the issue once it brings light on how asymmetry can play a role in potentiating the impact of capital structure on profitability, through the lens of the Pecking Order Theory. Even because information asymmetry, as a factor undermining comprehending the real status of a company, can impact the relation between indebtedness and profitability as far as, according to Scott (2015), it

is used for shading the current economical-financial performance by external users of accounting information. Such analysis perspective corroborates Gaud, Jani, Hoesli and Bender (2005), Correa, Basso and Nakamura (2013), Vuong, Quynh and Mitra. (2017), Khémiri and Noubbigh, (2018), and Li e Islam (2019) discussions since those investigations did not check aspects that can interfere with the relation between capital structure and profitability. Feltes and Ribeiro (2020) showed the relation between indebtedness and profitability is not absolute, being either mitigated or potentiated from factors interfering with this relation. The authors investigated the role of economic environment, but it is clear that the companies' features can also play a role on that relation. In practice the present study evidences how information asymmetry, detrimental to investors, interferes with the effect of capital structure on the profitability level of the company.

Another justification consists in presenting nuances of Brazilian companies scenario. This is because Brazil, being a country with emergent capitals market, has higher levels of asymmetry than developed countries (SOSCHINSKI, et. al., 2020). Because of this, asymmetry can potentiate negative effects of indebtedness from third parties on profitability. It is important to remember yet that Brazilian capital market is mostly composed by close capital companies which are usually under family domain (SILVA and FERREIRA, 2016; MONTEIRO, GAPARETTO and LUNKES, 2019). So, Brazil is a unique environment comparing to developed countries and, thus, studies approaching its specific context may be a parameter for other emerging economies with similar features.

The present study included joint-stock companies in Brazilian market with a sample composed by 106 companies, considering quarterly periods from 2011 to 2020. Results showed that indebtedness causes a decrease in both assets profitability and companies net equity. That is, joint-stock capital Brazilian companies follow the Pecking Order Theory envision. Findings also showed that information asymmetry potentiates the negative relation between indebtedness and assets profitability and net equity profitability. With this, companies which information is more asymmetrical have a sharper decrease in profitability as far as indebtedness increases when compared to those which information are less asymmetrical.

Beyond introduction, the present study embodies four more sections: (i) theoretical referential and hypotheses, (ii) methodology, (iii) data presentation and discussion, and finally (iv) conclusions.

## **THEORETICAL REFERENTIAL AND HYPOTHESES**

Capital structure corresponds to the relation between equity and capital from third parties used for financing organizational activities (THIPPAYANA, 2014). Modigliani and Miller (1958) papers were highlighted by the way they approached the discussion on capital structure. In the discussion about the issue authors pointed out some premises needed for validating the logical presented. Among them, there is: i) Existence of equal interest rate

for companies and investors, ii) Existence of perfect information, iii) Lack of transactional costs, iv) Lack of taxes, v) Lack of bankruptcy costs, and vi) Lack of agency costs (HARRIS and RAVIV, 1991).

Modigliani and Miller (1958) premises were criticized by some traditional currents, such as Durand (1959), who defended the lack of perfect markets in practice. Such criticism led Modigliani and Miller (1963) to perform a new research acknowledging some negative points of their proposal, highlighting the irrelevance of taxes on establishing the capital structure. Modigliani and Miller (1963) disagree with some criticisms, but they boosted studies for a better understanding of companies' capital structure. The most highlighted researches were Jensen and Meckling (1979), Myers and Majluf (1984), Harris and Raviv (1991), and Fama and French (2002), since they allowed the raising of two significant theoretical contributions: Trade-off and Pecking Order theories.

In Trade-off Theory Myers (1984) defends the existence of an optimal structure to be reached by companies in order to maximize its value, that is, companies must search for a balance between tax benefits and bankruptcy costs. Fama and French (2002) emphasize that this theory core proposition is that, for financing capital, managers search for an ideal relation between equity and capital from third parties, analyzing costs and tax benefits.

Pecking Order Theory aims at explaining the options for financing companies' capital. The main argument is that, for financing capital, companies follow a hierarchical order that prioritizes internal financing by means of profit retention (MYERS, 1984; MYERS and MAJLUF, 1984). This theory states only in case of a lack of internal resources, when financing their activities, companies will search for capital from third parties, considering issuing shares as a last hypothesis (MYERS, 1984; MYERS and MAJLUF, 1984).

As long as capital structure is a way to get resources that impacts profitability in a direct way (FAMA and FRENCH, 2002; LARA and MESQUITA, 2008), Trade-off and Pecking Order Theories were used by different studies as a basis for explaining the way such influence takes place. Trade-off Theory defends the increase on third parties' capital is a way to search for resources aiming at making more efficient investments and, thus, increasing companies' profitability (CORREA, BASSO and NAKAMURA, 2013).

Empirical researches analyzing the relation between capital structure and profitability confirmed the logic of the Trade-off Theory, finding a positive relation between these two variables. Jing (2017) analyzed the impact of capital structure on profitability of housing companies negotiating shares in Hong Kong and Shanghai and he found that the increase on indebtedness level related to financing by own capital propels profitability in the time frame. Ramli, Latan and Solovida (2019) detected that an increase in third parties financing proportion influences companies' performance in Malaysia and Indonesia. They report that, even being neighbor countries, they show a slight difference in the impact of capital structure on performance. So, it can be presumed that the internal context of a country may influence the impact of capital structure on companies' profitability. Mardones and Cuneo (2019) analyzed Latin America emergent countries and found out that, when companies increased the ratio of resources from third parties, they had positive effects on their profitability markers.



Although it is confirmed that Trade-off Theory can explain the impact of capital structure on profitability, there are investigations contradicting that thinking, since results point out to another perspective. Those researches concluded that the most suitable order consists in the one presented in the Pecking Order Theory, since companies prioritize their own retained resources to finance their operational activities, only searching for third parties resources when they lack them (CORREA, BASSO and NAKAMURA, 2013).

Empirical investigations that invoked Pecking Order Theory for analyzing the impact of capital structure on companies' performance (CORREA, BASSO and NAKAMURA, 2013; VUONG, QUYNH and MITRA, 2017; KHÉMIRI and NOUBBIGH, 2018) found a negative influence of capital structure on companies' profitability. Vuong et al. (2017), when analyzing British companies, found that the increase in indebtedness of companies leads to a decrease of different profitability indexes, such as assets and net equity profitability. Khémiri and Noubbigh (2018) found that in Sub-Saharan Africa countries, higher levels of indebtedness are detrimental to profitability. So, high levels of indebtedness cause financial expenses triggered by interest to overload total expenses and decrease profitability. Correia, Basso and Nakamura (2013) found that the increase in indebtedness ratio impacts the decrease of Brazilian companies' profitability. This way, as long as companies increase the ratio of third parties' capital in their capital structure, there is a negative impact on profitability indexes. It can be reflected on company's value since investors use information about profitability to evaluate a company pricing process.

A justification for such behavior consists in intrinsic aspects of the companies being, in Brazilian stock-joint ones, close capital companies prevail (SILVA and FERREIRA, 2016), because many of those companies are under family control (MONTEIRO, GAPARETTO and LUNKES, 2019). According to Prencipe, Bar-Yosef and Dekker (2014) and Yousaf and Hassan (2016) such aspects cause managers to refuse asking financing from third parties because they fear not payment on due date, including interest from loan, and so lose share control of their companies. Because of this they tend to finance their operations with their own resources and search for additional resources from third parties only under unavailability or scarcity in their reserve.

Behavior averse to getting financial resources from third parties can be potentiated depending on the macro economical context. When the interest rate applied by the country where the company locates goes beyond that applied in other countries managers are stimulated to refuse the increase of leverage. In Brazil, for example, there is a history of high basic interest rate, mostly above 5% (BANCO CENTRAL DO BRASIL, 2021), giving the country, historically, the status of being one of the countries with higher interest rates in the world (WORLD BANK, 2021). It is important to highlight that the increase in interest rate in Brazil, many times, is due to an unstable national economics as well as an answer to inflation rates.

That peculiar feature Brazil shows causes obtaining loans to result in a higher financial expenditure and, eventually, lower profitability, even with tax incentives. It stimulates companies to prioritize loans from their own resources instead of external financing, from creditors (DURAN and STEPHEN, 2020). Under such scenario the theoretical basis of Pecking Order



Theory is adopted, which says the increase in the ratio of resources from third parties comparing to total assets causes a decrease in profitability. In this sense it is stated that:

*H1: There is a negative, significant relation between indebtedness level and profitability.*

Pecking Order Theory emerges from information asymmetry (MYERS, 1984; SHYAM-SUNDER and MYERS, 1999) which occurs when managers detain more information than investors and make use of that advantage, generating problems of adverse selection and/or moral hazard (JENSEN and MECKLING, 1976). Information asymmetry represents a problem to those who make use of accounting information, since it is linked to lower quality in accounting statements (KAO and WEI, 2014).

In capital markets investors face problems to suitably price assets negotiated due to information asymmetry (DEMSETZ, 1968). It causes a larger difference as to purchase and sale of papers negotiated (WELKER, 1995). Due to such feature, empirical evidence (COPELAND, 1979; COPELAND and GALAI, 1983; GLOSTEN, 1987; GLOSTEN and MILGROM, 1985; STOLL, 1989) show that the bid-ask spread is more suited to evidencing information asymmetry because it allows measuring differences between the purchase offer and sale offer of a given asset (DEMSETZ, 1968).

Kao and Wei (2014) found that information asymmetry is negatively related to profitability. That is, information asymmetry impacts on profitability. That relation can be intensified when companies present “little profits”, since managers feel encouraged to manipulate results of a period in a more intense way (Martinez, 2001), generating more information asymmetry (CORMIER, HOULE and LEDOUX, 2013).

Since information asymmetry causes a negative impact on profitability, the increase of indebtedness level tends to decrease profitability (CORREA, BASSO and NAKAMURA, 2013; VUONG, QUYNH and MITRA, 2017; KHÉMIRI and NOUBBIGH, 2018). That is, the higher the level of information asymmetry the more intense the effect of indebtedness level from third parties on profitability. Thus, it is stated that:

*H2: there is a negative, significant relation between indebtedness level moderated by information asymmetry and profitability.*

## METHODOLOGY

The population was composed by non-financial, stock-joint companies listed in Brazilian stock exchange – Brasil, Bolsa, Balcão (B3), in quarter cycles from 2011 to 2020. After data collection some criteria were applied in order to establish the study sample. Those criteria were needed because the largest part of the population (158 companies) did not present needed information, several times linked to information asymmetry. The lack of information for calculating information asymmetry comes from the low number of negotiations in Brazilian capital market. Besides, 67 companies with negative net equity were excluded

because it distorts the result of the variable net equity profitability. So, Box 1 shows criteria for exclusion:

**BOX 1**  
**Criteria for selection of study sample**

(=) Assets corresponding to shares issued by companies* (= N# of companies listed)	332
(-) Companies showing negative Net Equity in any quarter**	-67
(-) Companies showing incomplete variables for any quarter***	-158
(=) Companies that composed the initial sample for the study	107
(-) Companies which notes were all ranked as outliers	-1
<b>(=) Companies composing the final sample for the study</b>	<b>106</b>

**Note:** \* Each company presented a single code of listed action, so there were not two or more assets listed for the same company;

\*\*\* Balanced panel was the option chosen in the present study.

**Source:** Elaborated by the authors.

With the criteria for selection, the initial study sample was made out of 107 companies, originating 4,280 notes. However, since the multivariate analysis used for reaching the goal of the study is based on averages, discrepant data may distort the reading of results. Due to this, data were submitted to the Hadi (1992) multivariate testing, aiming at tracking discrepant notes. That test detected the presence of 348 notes ranked as *outlier* notes. Those discrepant data belong to different companies from the sample, said that from the 106 companies 55 ones had, at least, one discrepant note.

Due to the detrimental effect of discrepant data, excluding all *outliers* was the option. From these discrepant data it is highlighted that all notes from a company had their data excluded for they were ranked as discrepant. Thus, the final sample was composed by 3,932 notes (92% from the initial sample) corresponding to 106 companies. The option for excluding outlier notes caused the balanced panel to be converted into an unbalanced panel, as suggested by Fávero and Belfiore (2017).

The research uses two dependent variables (return on net equity and return on assets) and two interested independent variables (general indebtedness and information asymmetry). Besides that, there are the control independent variables, as shown in Box 2.

**BOX 2**  
**Study variables**

Dependent Variables			
Variables		Form of Measurement	References
Return on Asset (ROA)		$ROA = \left( \frac{\text{Net Profit}_{it}}{\text{Total Asset}_{it}} \right) \times 100$	Myers and Majluf (1984), Myers (1984), and Nakamura et al. (2007).
Return on Net Equity (ROE)		$ROE = \left( \frac{\text{Net Profit}_{it}}{\text{Net Equity}_{it}} \right) \times 100$	Myers and Majluf (1984), Myers (1984), and Titman and Wessels (1988).
Independent Interest Variables			
Variables	Relational Logic	Form of Measurement	References
General Indebtedness (GIND)	The increase on general indebtedness causes profitability on assets and net equity to decrease.	$END = \left( \frac{\text{Total Liability}_{it}}{\text{Total Assets}_{it}} \right) \times 100$	Myers and Majluf (1984), Myers (1984), and Titman and Wessels (1988).
Information Asymmetry (AINFO)	The increase on information asymmetry is linked to the decrease of profitability on assets and net equity. Besides, information asymmetry is a factor potentiating the negative relation between general indebtedness and profit on assets, as well as profitability on net equity.	$ST = \left  \frac{(\text{Ask } t - \text{Bid } t)}{\text{Spread Average Point (PM)}} \right  \times 100$ $PMt = \frac{\text{Ask } t + \text{Bid } t}{2} \times 100$ <p>Ask: quarter average of lowest prices of assets negotiated; Bid: quarter average of highest prices of assets negotiated</p>	Demsetz (1968) and Soschinski et al. (2020).

*Continue*

Dependent Variables			
Variables		Form of Measurement	References
Independent Control Variables			
Variables	Relational Logic	Form of Measurement	References
Tangibility (TANG)	Companies with higher tangibility have lower levels of profitability on assets and net equity.	$TANG = \left( \frac{\text{Fixed Assets}_{it} + \text{Stocks}_{it}}{\text{Total Assets}_{it}} \right)$	Bastos and Nakamura (2009)
Revenue Increase (CRESC)	Revenue increase is linked to the increase on profitability on assets and net equity.	$CRESC = \left( \frac{\text{Total Revenue}_{it} - \text{Stocks}_{it}}{\text{Total Revenue}_{it}} \right)$	Nakamura et al. (2007)
Company Age (IDADE)	The older the company is, in years negotiating at stock market, the lower its levels of profitability on assets and net equity.	Time, in years, during which the company negotiates at stock market.	Rajan and Zingales (1995).
Size (TAM)	Larger companies are linked to higher profitability levels.	Natural Logarithm of Total Assets	Rajan and Zingales (1995), Bastos and Nakamura (2009), and Mazzioni et al. (2014)

Source: Elaborated by the authors.

At first, the descriptive data statistics aiming at understanding the research data distribution was performed. In a complimentary way, quarter data of variables profitability on assets, profitability on net equity, and general indebtedness were segmented according to yearly periods of time lapse in this study.

Information referent variables presented in Table 2 were analyzed by means of multivariate models present in Equations 1 and 2. It is highlighted that, due to multicollinearity between variables  $END \cdot AINFO$  and  $END$ , it was necessary to split the models into two equations. With this, models of Equation 1 check the impact of indebtedness on profitability. Models of Equation 2 aimed at discovering if there is a moderating effect of information asymmetry on the relation between indebtedness and profitability.

$$\begin{aligned}
 ROA_{it} \text{ and } ROE_{it} \\
 = \beta_0 + \beta_1 END_{it} + \beta_2 AINFO_{it} + \beta_3 TANG_{it} + \beta_4 CRESC_{it} + \beta_5 IDADE_{it} \\
 + \beta_6 TAM_{it} + \varepsilon_{it}
 \end{aligned}
 \quad (1)$$

$$\begin{aligned}
 ROA_{it} \text{ and } ROE_{it} \\
 = \beta_0 + \beta_1 AINFO_{it} + \beta_2 END_{it} * AINFO_{it} + \beta_3 TANG_{it} + \beta_4 CRESC_{it} \\
 + \beta_5 IDADE_{it} + \beta_6 TAM_{it} + \varepsilon_{it}
 \end{aligned}
 \quad (2)$$

Where: ROA = profitability on the asset of company *i* at time *t*; ROE = profitability on net equity of company *i* at time *t*; END = total indebtedness of company *i* at time *t*; AINFO=information asymmetry of company *i* at time *t*; TANG=tangibility of the assets of company *i* at time *t*; IDADE = time horizon in which company *i* at time *t* negotiates shares in capitals market; TAM = size of company *i* at time *t*.

Because research data come from different companies between 2011 and 2020 the four multivariate models were analyzed with the panel data methodology. Data in each model were submitted to Chow test, which scope is checking the most suitable estimation between pooled and fixed effects. To choose between either fix or random models notes were tested with Hausman test and, finally, to check for the estimation that suits better to data when considering the comparison between random and pooled effects, the Breusch-Pagan LM (MP LM) was performed. These tests results (presented in Table 5) suggest that, for the four multivariate models, estimation with fixed effects is the most suitable method.

Multivariate normality was tested with Doornik–Hansen test. Since Kolmogorov-Smirnov test identified data did not present a univariate normal distribution the Spearman test was used and, from it, the Variance Inflation Factor (VIF) was performed for checking multicollinearity. The presumptions of non-existence of heteroscedasticity and serial autocorrelation were checked by means of Breusch-Pagan (BP) and Wooldridge tests, respectively.

## DATA PRESENTATION AND DISCUSSION

Table 1 presents the descriptive statistics of values assigned to the variables in the present study.

**TABLE 1**  
**Descriptive Statistics**

Variable	Mean	Standard deviation			Min.	Max.	KS (p-value)	Obs.
		O	B	W				
ROA	1.174	1.633	1.014	1.286	-5.938	9.665	0.000	3,932
ROE	2.411	3.485	2.018	2.872	-15.475	20.534	0.000	3,932
END	29.210	15.826	14.800	7.026	0.000	77.297	0.000	3,932
AINFO	0.032	0.013	0.008	0.010	0.000	0.096	0.000	3,932
TANG	32.097	24.224	23.292	6.874	-38.770	91.808	0.000	3,932
CRESC	0.698	21.816	3.088	21.626	-125.65	91.001	0.000	3,932
IDADE	14.965	10.595	11.310	2.911	0.450	72.381	0.000	3,932
TAM	22.443	1.552	1.560	0.343	18.116	27.646	0.012	3,932
END*AINFO	0.962	0.688	0.548	0.443	0.000	3.909	0.000	3,932

**Note:** O = Overall; B = Between; W = Within; KS (valor p) = p-value of the univariate normality test of Kolmogorov-Smirnov.

**Source:** Research data (2021).

Results indicate that ROA average was 1.17% with  $\pm 1.63\%$  standard deviation 1,17% and these values can be taken as similar to those found by Mardones and Cuneo (2019), because they found that this profitability index was 8.02% when taking the annual period into account. With this, when performing the quarter transformation, it is seen that the average was 2.05%. similar results also occur when analyzing ROE, since in the present study the quarter ROE average was 2.41% ( $\pm 3.48$ ) and Mardones and Cuneo (2019) found a quarter average of 3.05%.

Evidence on ROE and ROA averages (table 1) are also similar to Pamplona, Dal Magro and Silva (2017) who found that quarter ROA and ROE of Brazilian companies averaged 2% and 2.75%. Such similarities may indicate that ROA and ROE of companies negotiating shares in Brazil remained stable even at different time frames.

As to indebtedness, findings that values originated by third parties' debts cover, in average, 29.21% ( $\pm 15.83\%$ ) of the total assets of the period. This result is close to Mardones and Cuneo (2019) and Pamplona et al. (2017), because they found that average indebtedness was close to 36.60% and 25.00%, respectively. With this it can be said that most of the amounts used in companies comes from own resources.

That behavior can be justified from the perspective of high interest rates practiced in Brazil, which cause the total payable amount to be significantly higher than the total obtained with the loan. Duran and Stephen (2020) explain high interest rates make managers more



afraid of third parties financing. It occurs because, when there is increase of third-party financing, there is increase in the probability of not paying installments which, in the event of, would put the control of shareholders on net assets in risk, especially in companies with highly concentrated capital.

Even if asset profitability, net equity profitability, and general indebtedness would present similar results when compared to previous investigations, it is worth highlighting that these variables behavior showed a slight oscillation along time, as seen in Table 2.

**TABLE 2**  
**Descriptive statistics along time**

Variable	Ano										KW
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
ROA	1.187	1.048	1.092	1.065	1.156	1.242	1.143	1.18	1.358	1.17	15.295*
ROE	2.512	2.127	2.243	2.233	2.46	2.494	2.329	2.35	2.788	2.411	13.962
END	28.984	29.436	29.748	29.22	29.459	29.055	29.635	29.304	28.687	29.21	2.542

**Note:** KW = chi-square value of the Kruskal-Wallis test when considering the 95% confidence level; two-tailed significance levels at: \*10%; \*\*5%; \*\*\*1%.

**Source:** Research data (2021).

Evidence contained in Table 2 indicate the year registering the quarters with highest assets profitability and net equity profitability indexes was 2019, 1.36% and 2.79% respectively. 2012 showed, in average, the quarters with lowest assets profitability and net equity profitability indexes, 1.05% and 2.13% respectively. Those results indicate a low ROE and ROA volatility along time. Besides that, when considering Kruskal-Wallis test, it was seen that there is no significant difference in quarterly asset profitability (Chi-square = 15.295; p value < 0.083) and quarterly net equity profitability (Chi-square = 13.962; p value < 0.124) allocated in yearly periods.

A similar result was also found when checking the average of quarter indebtedness segmented into groups of annual periods, since there was no significant variation along time (Chi-square = 2.542; p value < 0.978). It shows that, even in times of increased economic uncertainty, such as 2015, 2016, and 2020, companies maintained the same indebtedness level. Such behavior is different of the expected when compared to other countries since Zhang, Han, Pan and Huang (2015) found that, as economic uncertainty increases, managers enlarge the number of decisions aiming at decreasing indebtedness level. It occurs because uncertain environments usually show a decrease in working capital (BAUM, CAGLAYAN and TALAVERA, 2009) and, thus, the risk of nonpayment of installments from debts increases.

When analyzing correlations among independent variables Spearman test indicated that any of the variables pairs presented a correlation over 0.70, except for that one between END and END\*AINFO, presenting a coefficient of 0.76. such result indicates the presence of collinearity, according to Fávero and Belfiore (2017).

Besides, data were submitted to VIF in order to identify the possible presence of multicollinearity. Similarly, to Spearman, the test showed that variables END and END\*AINFO are collinear and, due to this, they cannot be used simultaneously in the same multivariate model, as suggested by Fávero and Belfiore (2017) and Wooldridge (2016). So, the analyses of the moderator variable END\*AINFO and variable END were performed separately in four distinct models, according to Equations 1 and 2.

About the multivariate models' assumptions, Doornik–Hansen Test rejected the hypothesis of a neglectable presence of multivariate normality in all multivariate models. BP and Wooldridge tests rejected the absence of autocorrelation and heteroscedasticity in data distribution and, because of this, the choice was reducing such problems by using heavy clustered standard deviations in the individuals. From this, Table 3 presents results related to the impact of indebtedness on profitability, and the moderation of that relation by means of information asymmetry.

**TABLE 3**  
**Results of panel estimations by MQO, with companies' fixed effects**

Variable	ROA		ROE	
	Model 1	Model 2	Model 3	Model 4
	Coefficient (Standard error)	Coefficient (Standard error)	Coefficient (Standard error)	Coefficient (Standard error)
END	-0.0249*** (0.0071) <sup>1</sup>	-	-0.0285* (0.0144) <sup>1</sup>	-
AINFO	-19.060*** (2.5815) <sup>1</sup>	-1.2094 (10.9793) <sup>1</sup>	-45.8684*** (5.7001) <sup>1</sup>	-17.120 (12.8378) <sup>1</sup>
END*AINFO	-	-0.5764*** (0.1629) <sup>1</sup>	-	-0.9141*** (0.3363) <sup>1</sup>
TANG	-0.0145** (0.0057) <sup>1</sup>	-0.0149*** (0.0057) <sup>1</sup>	-0.0285** (0.0118) <sup>1</sup>	-0.0293** (0.0117) <sup>1</sup>
CRESC	1.1938*** (0.1470) <sup>1</sup>	1.1894*** (0.1469) <sup>1</sup>	2.4956*** (0.3012) <sup>1</sup>	2.4750*** (0.3008) <sup>1</sup>
IDADE	-0.0567** (0.0262) <sup>1</sup>	-0.0594** (0.0262) <sup>1</sup>	-0.1307** (0.0548) <sup>1</sup>	-0.1380** (0.0550) <sup>1</sup>
TAM	0.1668 (0.2204) <sup>1</sup>	0.1503 (0.2161) <sup>1</sup>	0.6524 (0.5200) <sup>1</sup>	0.7075 (0.5131) <sup>1</sup>
Constant	0.0827 (4.6189) <sup>1</sup>	-0.2459 (4.5601) <sup>1</sup>	-7.0562 (10.9793) <sup>1</sup>	-9.0452 (10.9279) <sup>1</sup>
R <sup>2</sup>	0.1136	0.1115	0.0922	0.0952
F Test	28.64***	27.53***	29.88***	31.82***

Continue

Variable	ROA		ROE	
	Model 1	Model 2	Model 3	Model 4
	Coefficient (Standard error)	Coefficient (Standard error)	Coefficient (Standard error)	Coefficient (Standard error)
<b>Chow Test</b>	17.77***	17.80***	15.79***	15.66***
<b>Hausman Test</b>	31.92***	41.04***	36.11***	40.11***
<b>LM of BP Test</b>	6,144.53***	6,010.49***	4,868.25***	4,791.38***
<b>VIF</b>	1.14	1.38	1.14	1.38
<b>DH<sup>2</sup> Test</b>	5,017.80***	5,232.35***	5,032.90***	5,253.22***
<b>Observations</b>	3,932	3,932	3,932	3,932

**Note:** The four multivariate models were estimated using fixed effects with standard errors clustered in the individuals. \* significant ratio at 10%; \*\* significant relationship at 5%; \*\*\* significant relationship at 1%. <sup>1</sup> = Robust standard error values clustered in individuals. <sup>2</sup> = **Doornik-Hansen multivariate normality test**.

**Source:** Research data (2021).

Results allow inferring that indebtedness presented a significant negative effect regards ROA (Estat T = -3.50; p value < 0.001). Negative coefficient between indebtedness and profitability leads to the acceptance of H1. That evidence reinforces results found by Correa et al., (2013), Vuong et al., (2017), and Khémiri and Noubbigh, (2018), who identified a negative relation between these two constructs. A possible explanation for such negative relation may be based on the Pecking Order Theory, which suggests companies privilege financing with their own retained resources because the search for capital from third parties increases the indebtedness level and, thus, cause them to be less profitable.

Information asymmetry also showed to be significantly, negatively related to profitability in terms of ROA (Estat. T = -7.58; p value < 0.000) and ROE (Estat T = -8.05; p value < 0.000) corroborating Kao and Wei (2014) result, which showed information asymmetry degrades accounting information and reduces organizations profitability. A way of mitigating such detrimental effect, according to Kao and Wei (2014), consists in improving command and control mechanisms by means of corporative management practices.

Additionally, with asymmetry moderation, indebtedness presented a significantly negative effect on ROA (Estat T = -3.54; p value < 0.001) and ROE (Estat T = -2.72; p value < 0.008). It indicates asymmetry potentiates the negative effect of indebtedness on profitability, a result that allows proving H2, which says there is a negative, significant relation between indebtedness level, moderated by information asymmetry, and profitability.

Those findings agree with Correa, Basso e Nakamura (2013) study that prove that companies in Brazilian Market have a behavior based on Pecking Order Theory, in which capital financing by retaining profits instead of external financing sources is the choice. A likely explanation is the predominance of concentrated capital in that market (SILVA and FERREIRA, 2016), mostly controlled by family companies (MONTEIRO, GAPARETTO and LUNKES, 2019). Inserting information asymmetry in moderation worsen the relationship between capital structure and

profitability, showing that although it is needed to search for third parties' capital, companies can tend to hide inside information from the market.

Results provide evidence that, as indebtedness increases, the reduction on profitability is reinforced in the presence of information asymmetry. Asymmetry influences the cost of capital (KAO and WEI, 2014); due to this, the more intense asymmetry is, the higher the cost of loans and financing, which contributes to increasing financial expenditure and the consequent reduction on profitability.

For more, according to Pecking Order Theory, there is a reluctance in making use of external capital sources due to informational issues (MYERS and MAJLUF, 1984). Thus, since incurring debts and opening capital require sharing information with capital suppliers, and property of Brazilian companies is mostly closed, there is a trend to continue with information asymmetry, a behavior that ends up contributing for potentiating the negative effect on profitability.

## CONCLUSIONS

Two major points show up: indebtedness causes ROA and ROE to decrease; information asymmetry is a potentiating factor of the negative impact of indebtedness on profitability.

The first result shows that, in Brazil, the increase on indebtedness causes profitability rates to decrease. It points out that stock-joint companies in Brazilian market behave according to the statement of Pecking Order Theory, choosing for financing with retained resources instead of external sources. The justification is that the increase on indebtedness reduces profitability. Such behavior, aligned to the Pecking Order Theory, can be justified by the features of Brazilian companies, most of which have a concentration of property. That is, much of the shares negotiated are under possession of a few shareholders, often members of a single family. It triggers the second reflection, since in such environment shareholders owning the biggest portion of capital tend to choose for companies' self-resources once avoiding interest and loan tranches may result in a loss of power by those shareholders.

The second finding shows information asymmetry potentiates the negative effect of increase in indebtedness on profitability indexes, translating into a contribution to Kao and Wei (2014) study, so asymmetry do not jeopardize only the quality of accounting information but it is also an indication that two companies that increase indebtedness in the same ratio can get different impacts on profitability, depending on the level of information asymmetry.

Those two findings do not only contribute with literature, but they also have a practical vein since investors can understand that, in Brazil, the negative relation between indebtedness and profitability do not happen in a similar way for all companies because information asymmetry plays an important role in that relation. So, investors can better understand the impacts of increasing indebtedness level on profitability, and it can be helpful when taking decisions about choosing among different assets as investment alternatives.

With regards to the studies limitations, it is highlighted that only general indebtedness and not the different nuances of indebtedness were approached, when taking both short and long term into account. With this a space is open for suggesting future researches on the issue, especially about the way information asymmetry interacts with these two types of indebtedness on profitability. For future studies it is suggested to analyze more capital markets around the world

with the same feature of capital concentration, in order to know if the increase on indebtedness also causes profitability to decrease and asymmetry also plays a role of potentiating the relation, which could bring contribution to the analyses of investors and stimulate the debate about Pecking Order and Trade-off theories.

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