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INTANGIBILITY AND VALUE OF THE COMPANY: AN ANALYSIS OF THE BRAZILIAN STOCK MARKET

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ABSTRACT

This study aims to investigate the existence of an association between the level of intangibility and the market value of public companies with shares traded on the Brasil, Bolsa, Balcão (B3) to fill a gap in the literature regarding the impacts of investments in intangible assets on the market value of Brazilian companies. The sample comprises 158 non-financial publicly held companies listed on B3, with data available from 2010 to 2018. The collection was conducted using the Thomson Reuters Eikon database. The preliminary results show that the investment level in companies' intangible assets has a positive and statistically significant relationship with the market value. Thus, investment in intangible assets plays a specially prominent role among the company's specific performance factors and acts as drivers for a competitive advantage. In light of the disclosure theory, it appears that the fact that companies achieve greater appreciation in the stock market by increasing the level of investments made in intangible assets reports to an association-based disclosure since the effects of disclosure generate an aggregate change in investors' shares, changing the behavior of asset prices and trading volume. Furthermore, the results indicate considerable implications for companies, managers, shareholders, and potential investors. It can be inferred that benefits will flow from this relationship to the extent that the positive influence of the investment level in intangible assets on the company's value is understood.

Keywords: Intangible assets. Intangibility. Market value.

1 INTRODUCTION

Accountants record assets on a company's balance sheet that can be quantified objectively. However, the reality of a competitive market economy is that ownership of tangible assets easily

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duplicated by competitors is not, in itself, likely to generate sustained economic returns that exceed the cost of capital (Madden, 2017).

With the advance of globalization, remaining in a progressively competitive market increasingly demands the use of research and development and the creation and use of physically imperceptible resources, which have gained increasing relevance in accounting reports and consequently in the market in general. Thus, intangible assets are discussed due to the rising financial importance reported and their significance for the academy in recent decades since they represent challenges and dilemmas because of the complex information they contain (Gu & Wang, 2005; Higgins, 2013).

From this perspective, investments in innovation give rise to a strong and determining cycle of nations' wealth, setting up a scenario represented by universities, research institutes, and companies responsible for generating knowledge on the one hand and by regulators that develop industrial policies to support and stimulate innovation activities and the financial system, on the other (Amaral, Iquipaza, Correia, Amaral, & Vieira, 2014).

In this context, intangible assets are valuable resources to increase competitiveness and profits (Labidi & Jean François, 2019). Thus, intangibles' influence on the value of companies is mentioned among the intangibles study areas (Nichita, 2019), to which the present study contributes.

Higgins (2013) states that companies with intangible assets demand special attention since the information on procedures for recognition, measurement, disclosure, and evaluation is much more complex than that of companies in general. These differences in the company's value can be directly related to the market's measurement of the intangible part of companies, including intellectual capital, brands, patents, Research and Development (R&D), among others (Amaral *et al*., 2014). Thus, accurately and quickly measuring and disclosing intangible assets is essential, given that intangible assets can have a significant positive effect on the company's value (Nagaraja & Vinay, 2016).

Along this line, Dehning, Pfeiffer, and Richardson (2006) argue that information regarding these assets is more difficult to interpret, leading to an increased risk of investment. Therefore, the cost of capital becomes higher. Gazzoni, Simões, Brandão, and Souza (2019) report that financial analysts should observe this aspect in their profit forecasts.

The analysis of intangibles is a critical part of corporate reports, designed to benefit all interested parties. Effective corporate reporting requires that serious efforts be devoted to measuring and managing intangibles to create long-term value, thus improving the plausibility judgments of anticipated corporate performance and leading to better resource allocation decisions, reflecting its history and current market value (Madden, 2017).

Although still in a still incipient stage regarding what can be observed in the international literature, there is a tendency for an increase in research involving the theme of intangible assets in Brazil, especially after the publication of Law 11,638, of December 28th, 2007, due to the mandatory registration of the group of Intangible Assets, matching Brazilian legislation to international accounting practices (Medrado, Cella, Pereira, & Dantas, 2016).

In this sense, the present study investigates the existence of an association between the level of intangibility and the market value of public companies with shares traded in the Brasil, Bolsa, Balcão (B3).

Two reasons justify conducting a study in this area. First, theoretically, the literature review indicates it is a rising topic, given that it is possible to identify studies such as the one conducted by Medrado *et al*. (2016), who evaluated the association between the level of asset intangibility and the market value of the company shares in the Brazilian capital market, using quarterly information from 2008 to 2014 of the companies that make up the IBrX 100 index of BM&FBovespa.

Medrado *et al*. (2016) chose the analyzed period (2008 to 2014) because it was the beginning of the validity of Law nº 11.638/07 and the pronouncement 04 the Accounting

Pronouncements Committee (CPC 04). The authors argue that the IBrx 100 index measures the theoretical portfolio's return composed of 100 selected shares (business numbers and financial volume) among the most traded on the stock exchange. That said, the present study differs when analyzing companies from different sectors of the B3, providing a broader analysis and analyzing information from 2010 due to the mandatory adoption of the International Financial Reporting Standard in Brazil.

In addition to Medrado *et al*. (2016), Gazzoni *et al*. (2019) verified the influence of intangibles on the accuracy and dispersion of profit forecasts made by financial analysts in a sample of American non-financial companies with shares traded on Nasdaq, covering the period from 1995 to 2016, and Moura, Barbosa, Schio, and Mazzioni (2020), who verified the influence of intangible assets on the financial performance and market value of family-owned companies listed on B3 in the period from 2010 to 2017.

Given the above, a gap was identified in the literature regarding intangible assets, which would provide an analysis of the national context within the perspective of intangibility. Therefore, this study aims to fill the gap regarding the association of the level of intangibility and the market value of publicly held companies with shares traded on B3. In summary, this study innovates and contributes to others by using a different theory (disclosure theory), method, sample (158 non-financial public companies listed in B3), and period (2010-2018).

The second reason is that the need to conduct further studies on intangible assets is also justified by increasing the liquidity of shares, attracting investors, increasing the analyst coverage, reducing information asymmetry, and improving analyst forecasts (Gazzoni *et al*., 2019). Additionally, studying the current state and the consequences and future magnitudes of intangibles in accounting and financial reporting are necessary to create competitive advantages for the entities (Nichita, 2019).

Andonova and Ruíz-Pava (2016) consider that the focus on intangible assets in the context of an emerging country becomes relevant for the following reasons: on the one hand, intangible assets explain the heterogeneous performance of companies because they are challenging to be "imitated" by the competition and are protected by property rights or a high level of specificity; on the other hand, companies require institutional enforcement mechanisms that may be absent in emerging countries to create long-term sustainable competitive advantage based on intangible assets such as know-how, brands, or patents.

This study is divided into four other sections. Section 2 reviews the literature on intangible assets and develops the research hypothesis. Section 3 presents the methodological procedures. Section 4 describes and analyzes the data. Finally, the final considerations and references are presented.

2 LITERATURE REVIEW AND DEVELOPMENT OF THE HYPOTHESIS

2.1 Intangible assets

In the current environment of competitive global business, the potential for sustained economic returns above the cost of capital, which is especially valuable when associated with substantial reinvestment rates,- depends on the management's ability to identify and make investments that can significantly contribute to the creation of company value in ways that are specifically difficult for competitors to replicate (Madden, 2017). These investments are intangible assets, an integral part of the value creation process, but with an inherent difficulty associated with estimating their equity values and economic life.

The increase in intangible assets, such as brands, R&D, patents, and other forms of abstract capital, such as digital platforms and data flows, raises the need to modify existing measures and concepts on capital and accumulation within the perspective of a focused structure in accountant measuring, company management, and scholar and regulator monitoring (Bryan, Rafferty, &

Wigan, 2017). This occurs because these were a part of a category of residual assets, often surpassing the fixed or tangible assets in company profitability and valuation.

According to Lim, Macias, and Moeller (2019), a substantial and growing proportion of corporate assets consists of intangible assets. Despite their considerable importance, internally generated intangible assets, which are predominant in this context, are mostly absent in balance sheets and other corporate reports. Thus, the environment is conducive to investigations regarding the possible impacts these accounting elements can confer.

It is known that managers, shareholders, and potential investors use accounting in their decision-making process, especially when measuring added value. This parameter is related to assets that create value and growth power for the company. However, it non always assumes a corporeal form (tangibility), presenting only a compilation of information, which can obtain a high price deliberation of its product and generate value and new business (Amaral *et al*., 2014).

With this perspective, Loop, Scheffer, and Lipfert (2004) emphasize that investors, financial institutions, and regulators are encouraged to pay special attention to this type of investment due to this movement of substituting tangible assets for intangible assets. In this context, Koller, Goedhart, and Wessels (2005) explain that intangible assets require careful attention when gathering information to value companies, emphasizing that all intangible assets must be considered to determine the company's value correctly.

According to Amaral *et al*. (2014), intangible assets such as prominent brands, technological capacity, and intellectual capital are the main factors responsible for the perception and consequent assessment of companies by the markets. The authors indicate that there are still issues to be resolved concerning the form in which entities evaluate their intangibles. Therefore, research is developed on the subject, showing an interest in a topic with no consensus on the best approach to define and resolve it correctly, and the real impacts that its levels of disclosure can cause, highlighting the gap between the economic value and the book value of an entity.

André, Filip, and Paugam (2017) provide a brief review of the existing empirical evidence using a sample of 27,172 observations from European companies from 2006 to 2015. The authors report an average (median) level of intangibles for 16.7% of assets (11.8%). Additionally, they found an average (median) intangible/equity ratio of 47.4% (30.0%). In the same sense, Mazzi, André, Dionysiou, and Tsalavoutas (2017) focused on the constituents of S&P Europe 350, but from 2008 to 2011, finding similar levels of premium concerning the net book value.

Complementarily, Arrighetti, Landini, and Lasagni (2014) found a significant increase in the participation of intangible assets in the GDP of the USA, Japan, Italy, the United Kingdom, Finland, and the Netherlands. Furthermore, they report that this trend is accompanied by evidence that intangible assets contribute positively to the company's profitability, the sectors in which it operates, and market assessment.

In terms of capital structure, using the recent changes in accounting rules that allowed to observe in the intangible assets market, Lim *et al*. (2019) found a strong positive relationship between identifiable intangible assets and financial leverage. According to the results, the identifiable intangible assets generally support financing and can support debts. They are also fundamental to generate cash flows and tangible assets in the companies that lack abundant tangible assets.

Silveira, Schnorrenberger, Gasparetto, and Lunkes (2017) analyzed national and international literature on the intangible assets valuation approaches. Thus, when conducting a literature review on different research bases, the authors proposed categorizing the studies. Among the categories, evaluating the return on assets stands out when no approach was identified. The authors also suggest future research on the practice of using the intangible asset valuation approaches, which highlights the importance of the present study.

In the Brazilian context, Kayo, Patrocínio, and Martin (2009) analyzed the influence of intangibility on creating value for acquiring companies in acquisition events, including debt as moderator. The results showed that intangibles could not create value by themselves in this

context. However, when intangible-intensive companies present a high level of indebtedness, they tend to destroy value in their acquisitions. In contrast, intangible-intensive companies that have a higher proportion of equity can create value in acquisitions, given that they have financial slack for performing these operations (Kayo *et al*., 2009).

Gu and Wang (2005) examined the relationship between analyst earnings forecasts and company intangible assets. The authors concluded that from 1981 to 1998, the high complexity of information on intangible assets increases analysts' difficulty in forecasting and, consequently, their error regarding companies with intensive use of intangibles.

Intangible assets also carry an informational burden in addition to the relationship with the financial aspects discussed above. In this sense, Gazzoni *et al*. (2019) showed that investments in R&D and intangible assets contribute to the predictability of profit by analysts, increasing the accuracy and reducing the dispersion of these estimates in the case of American non-financial companies with shares traded on Nasdaq. However, the authors also report that goodwill has the opposite effect: it contributes to the reduction of predictability.

Moura *et al*. (2020) aimed to verify the influence of intangible assets on the financial performance and the market value of family-owned companies listed in B3. When using data taken from Economática from 2010 to 2017 and conducting quantitative procedures, the authors reported that the mean tests showed that the differences in return on assets (ROA) and return on equity (ROE) are not significant among family companies that had higher and lower investments in intangibles regarding financial performance and that for family companies, intangibles only influenced a higher market value.

In general, there is a specific emphasis concerning the relevance of investments in intangible assets on the market value of companies, reinforcing the perception that the economic environment of companies based on knowledge and technologies maintains their competitive advantages and increases the value of actions (Medrado *et al*., 2016).

2.2 Research hypothesis

Selective disclosure of information occurs when good news is made available to positively affect the return on shares or obtain some economic benefit and the retention of information that could result in a negative return. It is the basis of the disclosure theory (Verrecchia, 1983; Shalev, 2009). Furthermore, Shalev (2009) argues that managers who behave according to this reasoning are likely to disclose more comprehensive information regarding an acquisition they hope will create value and disclose less information on what they believe to be bad news.

From the perspective of the disclosure theory, Verrecchia (2001) categorizes disclosure, regarding taxonomy, in three groups: (i) Association-based Disclosure, which addresses the effects of disclosure on aggregate or cumulative change in investors' actions through the behavior of asset prices and trading volume; (ii) Discretionary-based Disclosure, which considers the incentives given to managers or companies to disclose information known to them; and (iii) Efficiency-based Disclosure, which examines which disclosure arrangements are preferred in the absence of prior knowledge of the information, not conditioning the choice of the disclosure.

Therefore, as discussed in the previous section, greater compliance leads to higher information disclosure levels, whether private or non-private, good or bad news (Verrecchia, 2001). Consequently, companies that exercise positive discretion benefit from more significant value market share by disclosing information that provides private information and reveals the managers' judgment and expectations regarding long-term goals, especially concerning intangible assets (André *et al*., 2017).

In this sense, Amaral *et al*. (2014) indicate that, on average, based on market information, the value of companies listed on the leading stock exchanges worldwide fluctuate between two and nine times their book value, attributing the growth of this difference in recent years, especially

regarding the relevance assumed by intangible assets compared to tangible assets, in the equity composition of companies.

From the perspective of intangibles' effects, Nagaraja and Vinay (2016) empirically investigated the relationship between intangible assets, financial policies, and financial performance with its value in the Indian market. Although intangible assets do not significantly influence financial policies, they have a positive and significant influence on financial performance, as measured by the ROA, and on the company's value, as reported by the authors. The limitation of the financial statements in the measurement and disclosure of intangible assets is the cause of a significant difference between the book value and the market value.

Additionally, Andonova and Ruíz-Pava (2016) analyzed the factors related to the performance of Colombian companies from 1995 to 2012, reporting that the estimates made it possible to explore the profitability role of the intangible, revealing that the intangible assets play a prominent role among the specific performance factors of the company. The authors also confirmed the resilience of intangible assets as drivers of competitive advantage in emerging markets.

Thus, the results show that intangible assets explain a not-insignificant portion of the total variation of the company's performance, confirming that companies can add value using intangible assets as competitive leverage (Andonova & Ruíz-Pava, 2016).

Moreover, an analysis of the companies listed on the IBrX 100 conducted by Medrado *et al*. (2016) evidenced the positive and statistically significant association between the level of intangibility of the assets and the degree of appreciation of the shares, demonstrating that more significant investments in intangible assets can provide a preference in the company's market price.

Because of this and considering that the level of investment in intangible assets can benefit shareholders, it is expected that Brazilian companies that trade in B3 may also be incurring higher market values due to their level of disclosure of investments in intangible assets, as proposed in the H1 research hypothesis:

H_1: *There is a positive relationship between the level of intangibility of publicly held companies listed in B3 and the market value.*

3 SAMPLE SELECTION AND RESEARCH DESIGN

3.1 Sample selection

The sample used in this study comprises Brazilian public companies with shares traded on B3, according to the data from 2010 to 2018, collected through the Thomson Reuters Eikon database. This period was considered due to the mandatory adoption of the International Financial Reporting Standard in Brazil having begun in 2010, providing an increase in the quality of accounting information (Pelucio-Grecco, Geron, & Grecco, 2014), considering that the changes may affect the economic and financial data of interest in this investigation.

Furthermore, Law 11,638/07 and CPC 04 came into force to define the accounting treatment of intangible assets, including standardization concerning the recognition, measurement, and disclosure, which were specifically covered in other pronouncements (Medrado *et al*., 2016).

The sample consists of all listed companies listed on B3, corresponding to 412 listed companies. However, 110 financial companies were excluded from presenting specificities in their equity and operating structures, which may distort the definition of some variables, biasing the estimated results (Costa *et al*., 2018). Companies that did not present all economic and financial information necessary to conduct the analysis, corresponding to 144 companies, were also excluded. Thus, 158 companies make up the sample, totaling 1057 observations, as shown in Table 1.

Table 1
Sample selection procedure

	Companies
Total number of Brazilian publicly held companies	412
(-) Financial companies	(110)
(-) Companies with no data for the analyzed period	(144)
Final Sample	158

Even companies with absent data from some of the years of the analyzed time window were included in the sample to avoid survival bias. Therefore, the analyses were based on data from an unbalanced panel. Additionally, quantitative data winsorization was applied at the 1% level, like Hastings, Mosteller, Turkey, and Winsor (1947) recommended to mitigate outliers' effect in the sample.

3.2 Research design

A multiple regression model with robust fixed effects and panel data was estimated to investigate the existence of an association between the level of intangibility and the market value of publicly held companies with shares traded on B3. The decision to adopt the method resulted from the Breusch-Pagan and Hausman tests.

In this sense, the following econometric model was estimated to test the H_1 research hypothesis:

$$MTB_{i,t} = \beta_0 + \beta_1 Intang_{i,t} + \beta_2 ROE_{i,t} + \beta_3 Lev_{i,t} + \beta_4 EBITDA_{i,t} + \beta_5 Size_{i,t} + \beta_6 Year_{i,t} + \beta_7 Sector_{i,t} + \varepsilon_{i,t} \quad (1)$$

Table 2 lists the variables included in the econometric model, how they were calculated, and the previous studies that investigated factors that could be related to the company's value that subsidized the inclusion of these variables.

Table 2
Variable description

Abbreviation	Variable	Description	Previous Studies
MTB	*Growth Opportunity*	Ratio between the Market value and the company equity.	Medrado *et al.* (2016); Nagaraja e Vinay (2016); André *et al.* (2017); Carvalho, Maia, Louzada e Gonçalves (2017).
Intangibility	*Level of Intangibility*	Total value of the intangible assets weighted by the total assets.	Andonova e Ruíz-Pava (2016); Nagaraja e Vinay (2016); Medrado *et al.* (2016).
ROE	*Return on Equity*	Ratio between the net profit and equity.	Andonova e Ruíz-Pava (2016); Medrado *et al.* (2016); Akgun, Samiloglu e Oztop (2018).
Lev	*Financial Leveraging*	Ratio between the total financial debts and the total assets.	Medrado *et al.* (2016); Pandya (2016); Carvalho *et al.* (2017); Li, Gong, Zhang e Koh (2018); Battisti, Bollani, Miglietta e Salvi (2020).
EBITDA	*EBTIDA*	Profit value before interest, tax, depreciation, and amortization, weighted by the total assets.	Medrado *et al.* (2016); Postula e Chmielewski (2019).
Size	*Size of the company*	Natural logarithm of the total assets.	Kayo *et al.* (2009); Sousa, Silva, Ribeiro e Weffort (2014); André *et al.* (2017); Li *et al.* (2018).

The market-to-book (MTB) variable is listed as a proxy for the company's value and assumes the role of a dependent variable. The choice of growth opportunity as a proxy is based on the perspective that this index represents how much a company is valued (MTB>1) or devalued (MTB<1) by the market concerning its book value (Carvalho *et al*., 2017). By connecting the explanation with the disclosure theory, companies' higher levels of disclosure in intangible assets can generate positive results in the company's value.

In line with previous studies, the independent variable of interest in the investigation is Intangibility, which reports the proportion of intangible assets compared to the total assets presented in the balance sheet of the Brazilian companies analyzed (Andonova & Ruíz-Pava, 2016; Medrado *et al*., 2016; Nagaraja & Vinay, 2016).

The use of this proxy is based on the prerogative that intangible assets can represent a critical part of corporate reports and are increasingly designed to promote long-term sustainable performance, which benefits all shareholders (Madden, 2017). Furthermore, the greater participation of intangible assets in the equity structure, to the detriment of other assets, can increase the prospect of generating abnormal profits (Medrado *et al*., 2016).

ROE is a financial indicator that reflects the company's ability to add value to itself using its resources (Medrado *et al*., 2016). This variable is included because it is commonly used to measure accounting performance and a good indicator of a company's profitability, indicating the effectiveness in using its resources to generate results (Lys, Naughton, & Wang, 2015; Najah & Jarboui, 2013). Thus, it is expected that higher rates of return on equity will have a positive association with the market value.

Leverage represents the degree of company financial leverage and translates the ability to add value to the company using third-party resources in its capital structure (Medrado *et al*., 2016). Moreover, leverage can measure its risk (Lys *et al*., 2015; Plumlee, Brown, Hayes, & Marshall, 2015). In this sense, a positive relationship between leverage and market value is expected based on the risk and return premise and the possibility that the capital structure has a strong relationship and positive impact on the firm's value (Silva & Silva, 2017).

The EBITDA control variable was included in the model since, as highlighted by Medrado et al. (2016), it is primarily used to analyze organization performance, reflecting a proxy for the capacity of generating operational cash. Therefore, it should be perceived positively by the market.

Finally, the natural logarithm of the asset was included as a proxy for size (Size). It was incorporated into the model to capture the effects of the company's size on its market value, considering that this variable can impact the value of the company, assuming that larger companies tend to present a higher market value (Li *et al*., 2018; Sousa *et al*., 2014).

Additionally, controls for the sector in which companies operate and the year were included in the model, considering that the analyzed relationship may vary depending on the company's operating segment (Iatridis, 2013; Sousa *et al*., 2014). Furthermore, the year is used to control the effects of macroeconomics on companies' financial situation (Sousa *et al*., 2014).

4 RESULTS

4.1 Descriptive analysis

The descriptive analysis shows that the average growth opportunity index (MTB), assumed as a proxy for market value, of the companies listed in B3 is 2.6. In this sense, it is possible to state that the market value of the companies that trade in B3 is approximately 2.6 times higher than the value reported in the financial statements. This evidence gives rise to the discussion that the growth of this discrepancy may be related to intangible assets, as observed by Amaral *et al*. (2014).

The results showed that, on average, 11.56% of total assets are composed of intangible assets. However, it is worth noting the standard deviation and the distance between the minimum and maximum values, which may be related to the complexity of intangible assets and the

possibility of some companies not registering them. In contrast, others have almost the full amount of assets comprised of intangibles.

This increase in intangibility is in line with the study developed by Lim *et al*. (2019), which addresses the fact that a substantial and growing proportion of corporate assets consists of intangible assets in contemporary business.

Table 3
Descriptive statistics

Variable	Obs	Mean	Stand. Dev.	Min.	Max.
MTB	1057	2.6021	4.4263	-14.9139	28.1394
Intangibility	1057	0.1156	0.1829	0.00006	0.8433
ROE	1057	0.0642	0.3976	-2.0645	1.5576
Leveraging	1057	0.3202	0.2402	0	1.6284
EBITDA	1057	0.0917	0.0994	-0.4321	0.3388
*Size**	1057	8.1077	1.7750	2.8496	12.6845

Note. *Variable in natural logarithm. *MTB* represents the company's growth opportunity and is calculated by the ratio between the market value and the book value. *Intangibility* is the company's intangibility level and is calculated by the ratio of total intangible assets to total assets. *ROE* represents the return on equity and is calculated by the ratio between net profit and equity. *Leverage* is the ratio between debt to total assets. *EBITDA* corresponds to earnings before interest, taxes, depreciation, and amortization, weighted by total assets. *Company Size* is the natural logarithm of the total asset.

ROE corresponds to 6.42%. In this perspective, financial leverage (Leverage) shows that companies' debt represents, on average, 32% of their total assets.

The EBITDA variable, the average index of the companies' operational performance, corresponds to 9.17% of their total assets. This value is close to that reported by Medrado *et al*. (2016) when analyzing companies that make up the IBrX 100.

Finally, the values referring to the company's size (Size) were presented by their natural logarithm.

Table 4 shows the results of the correlation test between the variables inserted in the econometric model. Spearman correlations were performed between continuous quantitative variables considering that the variables examined did not show normality according to the Shapiro-Wilk test.

Table 4
Correlation matrix

		1	2	3	4	5	6
1	*MTB*	1					
2	*Intangibility*	**0.2847**	1				
3	*ROE*	**0.1120**	**0.0698**	1			
4	*Leveraging*	**0.3387**	**0.1151**	**-0.1246**	1		
5	*EBITDA*	**0.4238**	**0.3960**	**0.1625**	**0.2131**	1	
6	*Size*	**0.3142**	**0.4015**	-0.0327	**0.3052**	**0.8779**	1

Note. Bold coefficients are significant at a level of 5%. *MTB* represents the company's growth opportunity and is calculated by the ratio between the market value and the book value. *Intangibility* is the company's intangibility level and is calculated by the ratio of total intangible assets to total assets. *ROE* represents the return on equity and is calculated by the ratio between net profit and equity. *Leverage* is the ratio between debt to total assets. *EBITDA* corresponds to earnings before interest, taxes, depreciation, and amortization, weighted by total assets. *Company Size* is the natural logarithm of the total asset.

The results of the correlation matrix indicate that intangibility tends to a positive correlation with the market-to-book. Profitability, operational performance, and company size also have a positive correlation with the market value proxy. In contrast, there is a negative correlation between the companies' leveraging and market-to-book.

Table 4 indicates that the highest correlation between the variables is 0.8779. Despite a strong correlation between the variables Size and EBITDA, the variance inflation factors (VIF) tests that preceded the econometric model's estimation reported no multicollinearity problems, as shown in Table 5.

Table 5
Variance Inflation Factor

Variable	VIF	1/VIF
Intangibility	**1.04**	**0.9586**
ROE	**1.01**	**0.9875**
Leveraging	**1.03**	**0.9693**
EBITDA	**1.08**	**0.9285**
Size	**1.11**	**0.8974**

Therefore, there is no evidence of multicollinearity, considering that the resulting values are within the recommended limit, indicating no breach of this assumption (Hair, Anderson, Tatham, & Black, 1995).

4.2 Econometric model

An ordinary least-squares regression model with panel data with fixed effects was used to investigate whether there is an association between the level of intangibility and the market value of publicly held companies with shares traded on B3, given the nature of the data. The coefficients reported in Table 6 can be interpreted as an increase or decrease in market value.

Table 6
Econometric model

Dependent Variable	*MTB*
Intangibility	0.956145* (1.4245)
ROE	3.6124*** (0.8184)
Leveraging	3.1717* (0.313)
EBITDA	3.8396* (3.2885)
Size	-0.8694 (0.5921)
Constant	8.8137* (4.7205)
Year	Included
Sector	Included
R2 within	0.2095
R2 between	0.089
R2 overall	0.047
Observations	1057

Nº of companies	158

Note. Standard errors reported between parentheses. ***, **, * indicate the significance at the levels of 1%, 5%, and 10%, respectively. *MTB* represents the company's growth opportunity and is calculated by the ratio between the market value and the book value. *Intangibility* is the company's intangibility level and is calculated by the ratio of total intangible assets to total assets. *ROE* represents the return on equity and is calculated by the ratio between net profit and equity. *Leverage* is the ratio between debt to total assets. *EBITDA* corresponds to earnings before interest, taxes, depreciation, and amortization, weighted by total assets. *Company Size* is the natural logarithm of the total asset.

Table 5 shows a positive and statistically significant association between Brazilian companies' level of intangibility and the market-to-book. This evidence reports that intangible assets may be acting as factors that improve investors' perception of the company for the sample analyzed, resulting in higher market values. Therefore, the H_1 research hypothesis, of which assumption is that there is a positive relationship between the intangibility of publicly held companies listed in B3 and the market value, is not rejected.

Additionally, it is also possible to conclude that the results refer to the financial statements' limitation in measuring and disclosing intangible assets, which implies significant differences between companies' book value and market value.

Furthermore, the findings corroborate Nagaraja and Vinay (2016) and Andonova and Ruíz-Pava (2016), who found evidence of this positive relationship of intangibles with the company's value when also studying emerging market scenarios. In developing countries, intangible assets play a prominent role in the company's specific performance factors and act as drivers of competitive advantage (Andonova & Ruíz-Pava, 2016).

Specifically, in the Brazilian context, the results of the present study add to those found by Medrado *et al*. (2016) while broadening the view that more significant investments in intangible assets can increase the company's market price, exceeding the limits of a specific portfolio (IBrX 100) for companies listed in B3.

Thus, in light of the disclosure theory, the fact that companies achieve greater appreciation in the stock market through the disclosure of investments made in intangible assets reports to association-based disclosure since the effects of disclosure generate an aggregate change in investors' shares, changing the behavior of asset prices and trade volume (Verrecchia, 2001).

Thus, by providing the market with information on the expectations of managers regarding long-term objectives, especially concerning intangible assets, companies benefit from a higher market value, considering that intangibles act as the company's long-term maintenance mechanisms (André *et al*., 2017).

ROE presented a positive association with the market value, reporting that companies that achieve better financial performance using equity as a structure present greater opportunities, growth, and greater market value. Thus, investors perceived ROE as a value aggregator, indicating the company's profitability to the market and evidencing the effectiveness in using its resources to generate results (Lys *et al*., 2015; Medrado *et al*., 2016; Najah & Jarboui, 2013).

The Leverage variable, which refers to third-party capital, showed a positive and statistically significant relationship with the market value. This relationship indicates that the market positively prices, up to a certain level, the expected return due to the risk assumed by leveraged companies, corroborating the study conducted by Medrado *et al*. (2016). In this sense, leverage may be related to creating shareholder value (Pandya, 2016).

The positive association of the EBITDA variable with the market-to-book shows that the parameter is perceived positively by the market, given that it shows the performance of organizations and reflects the capacity to generate operating cash (Medrado *et al*., 2016).

This result follows the same line as Medrado *et al*. (2016) while also demonstrating that investors value companies capable of generating operating cash, considering that this also reflects the company's ability to honor its contractual obligations, generate results, and distribute dividends.

Finally, Size was not statistically significant. Therefore, it is not possible to infer that this economic-financial factor, which represents the company's size by the natural logarithm of total assets, is related to the market value of companies in the case of Brazilian publicly held companies.

5 FINAL CONSIDERATIONS

The present study aimed to investigate the existence of an association between the level of intangibility and the value of the market of public companies with shares traded on B3 given the increasing proportion of investment in intangible assets, to the detriment of tangible assets, and the gradual academic discussion regarding the specificities of the elements that make up this class.

The analyses were conducted with 158 companies, with data available from 2010 to 2018. The ordinary least squares regression model was used for the econometric analysis, with panel data with fixed effects.

Based on the results obtained, we determined that the companies' intangibility level has a positive and statistically significant relationship with its market value. This finding led to the non-rejection of the H_1 research hypothesis, which assumed a positive relationship between the level of intangibility of the companies listed on B3 and the assigned market value.

We also identified that the return on equity, EBITDA, and size of the company is positively related to its value. Thus, there is evidence that companies with higher profitability for shareholders, better operating performance, and larger size have higher market values.

Considering the diversified sample, period, and technique used, these findings bring a new perspective to studies in the area, contributing to previous works to satisfy the existing gaps, especially concerning the relationship between the presentation of intangible assets and the value of Brazilian public held companies.

Furthermore, the results indicate considerable implications for companies, managers, and shareholders. To the extent that the positive influence of the level of investment in intangible assets on the company's value is understood, it can be inferred that benefits will flow from this relationship since the increase in the share price may result in gains for shareholders.

Therefore, this study's results can base other works, considering that it is an area with many gaps to be discussed empirically, both at the national and international levels. Moreover, new requirements may emerge that change the relationships presented here.

The possibility of replicating the study under other metrics and methods to test whether the results converge is also emphasized since the works available on the subject use different variables and methodologies, including the proxy representing the investment level in intangible assets.

The disclosure theory findings allow the association of the level of investment disclosure and the market value since the results indicate that the disclosure effects generate an aggregate change in investor actions. The analyzed theory is a challenge and an opportunity for new research, limiting the present study since few studies addressed it, which limited but did not invalidate the discussions in the present study. Finally, we suggest that future research seeks to identify intangibles' impact on other accounting aspects, such as the creation of value, measurement, and regulation, or even compare the results between different markets.

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