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MODERATING EFFECT OF RISK FACTOR READABILITY ON THE RELATIONSHIP BETWEEN INTANGIBLE ASSETS AND MARKET RISK: AN ANALYSIS OF COMPANIES IN THE BRAZILIAN CAPITAL MARKET

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ABSTRACT

The study analyzes the moderating effect of the readability of risk factors disclosed by companies on the relationship between intangible assets and market risk among Brazilian companies listed on B3. The sample comprised companies with data available for the study between 2018 and 2022. totaling 1.117 firm-year observations organized in an unbalanced panel. To this end, descriptive statistics and multiple linear regression with parameters estimated using the Generalized Method of Moments (GMM) were employed. The results showed that readability, measured by the Flesch Index, attenuates the positive effect of intangible assets on market risk, whereas greater length of risk reports amplifies this effect, suggesting that a greater volume of information does not necessarily imply greater transparency. These findings indicate that the readability of risk information plays a more relevant role than its quantity in investors' risk perceptions. As a contribution, the study demonstrates that different dimensions of readability have distinct effects on the relationship between intangible assets and market risk, expanding the evidence regarding the moderating role of risk factor readability in this relationship and corroborating the assumptions of Communication Theory and Signaling Theory.

Keywords: intangible assets, market risk, risk factor readability.

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1 INTRODUCTION

Intangible assets are considered the main drivers of strategic differentiation and organizational wealth creation in the contemporary economy (Kang & Gray, 2011; Lev, 2019). However, the peculiar and subjective nature of these resources poses measurement challenges for capital markets. Unlike physical assets, resources such as intellectual capital, brands, and innovations in Research and Development (R&D) are intrinsically linked to business risk, given investors' uncertainty in assessing the ability of these items to generate future benefits (Iudícibus & Marion, 2020; Perez & Famá, 2015). Consequently, intangible-intensive firms operate under a veil of uncertainty that heightens risk perceptions among investors and managers, directly affecting the volatility of their returns and market risk (Gharbi *et al.*, 2014; Jia, 2018; Wu & Lai, 2020).

To mitigate this uncertainty, investors rely on information disclosed by companies. In this context, readability acts as a component of transparency (Kim *et al.*, 2019; Shandiz *et al.*, 2022). In light of Communication Theory (Shannon & Weaver, 1948) and Signaling Theory (Spence, 1973), it is assumed that disclosing risk factors clearly, without "noise" or excessive complexity, sends a signal of credibility to investors. Readable communication facilitates the accurate pricing of assets and reduces uncertainty associated with business risks (Holtz & Santos, 2020; Li, 2008).

Although the literature has advanced in investigating the effects of intangible assets on market risk (Ben-Nasr *et al.*, 2021; Yu *et al.*, 2008) and the effects of readability on the quality of accounting information (Rody & Almeida, 2023), these topics have been analyzed separately. Evidence regarding the role of risk factor readability as a moderating variable in the relationship between intangible assets and market risk remains limited. Thus, it remains poorly understood whether the readability of risk information is capable of altering the risk perception associated with intangible-intensive firms, particularly in the context of the Brazilian capital market.

In this regard, readability becomes particularly relevant in decisions involving intangible assets, given that the valuation of these assets depends heavily on disclosed information (Li, 2008; Taylor & Ward, 2021). Accordingly, this study aims to analyze the moderating effect of the readability of risk factors disclosed by companies on the relationship between intangible assets and risk in the Brazilian stock market.

The research offers relevant contributions to the accounting and finance literature. Unlike previous studies, which separately analyzed the effects of intangible assets on market risk or the effects of readability on the quality of accounting information, this study investigates risk factor readability as a moderating variable in the relationship between intangible assets and market risk.

First, the study innovates by revealing the dichotomous effect of risk *disclosure*: while ease of reading (Flesch Index) reduces the positive impact of intangibles on market risk, excessive verbosity (report length) acts as an obfuscating factor, increasing perceived risk. Second, it deepens the debate on the pricing of complex resources by demonstrating that, when risk factors are not objective, investors tend to underestimate or overestimate the asset, evidence that is particularly critical in the case of intangibles (Eisfeldt & Papanikolaou, 2014).

Furthermore, the findings have practical implications for investors, regulators, and managers, highlighting that merely increasing the volume of information does not substitute for textual clarity. Finally, the research aligns with the Sustainable Development Goals (SDGs 8 and 9) by demonstrating that information clarity and investor retention are pillars for supporting innovation and strengthening corporate reputation in sustainable and resilient business environments (Garcia *et al.*, 2021).

2 THEORETICAL FRAMEWORK

2.1 Intangible Assets and Market Risk

The literature highlights a dual role of intangible assets: while they are drivers of value, they also entail inherent risks that may constrain their own financing (Perez & Famá, 2006; Silva *et al.*, 2024). In this regard, property rights are susceptible to being copied or stolen (Lev, 2001). Moreover, intellectual capacity is a resource that, if misused or even lost by the company, may lead to unsatisfactory results (Gharbi *et al.*, 2014).

R&D activities, associated with the company's innovation capacity (Surroca *et al.*, 2010), are linked to many types of risk (Gharbi *et al.*, 2014). Peters and Taylor (2017) consider investments in R&D to be highly risky. Amir *et al.* (2007) and Ho *et al.* (2004) found that a company's R&D intensity positively affects systematic risk in the U.S. stock market. Jia (2018) examined the association between corporate innovation and stock price crash risk in U.S. firms, showing that companies focused on *exploration* have higher risk compared with those focused on *exploitation*.

On the other hand, empirical evidence suggests that the protection of intangibles and successful innovations (such as patents) mitigate stock price crash risk by enhancing information quality and reducing information costs (Ben-Nasr *et al.*, 2021; Yu *et al.*, 2008). Additionally, Lev *et al.* (2006) found that R&D investments made by market-leading firms are less risky and negatively associated with future volatility, unlike those made by follower firms.

Borges and Rech (2019) caution that a lack of transparent information may lead to the misvaluation of investments, including intangibles. In this context, the assessment of a company's risk profile has proven to be a key factor in its performance/risk (Santos & Coelho, 2018). The disclosure of risk information can contribute to reducing information asymmetry and affect a company's risk (Rody & Almeida, 2023). Risk factor readability, associated with transparency and ease of reading (Kim *et al.*, 2019), has the potential to explain the relationship between intangible assets and market risk.

2.2 Readability of Disclosed Risk Factors, Intangible Assets, and Market Risk

Readability is associated with the ease of reading texts and is a constituent element of the transparency of disclosed information (Shandiz *et al.*, 2022). It is important for the effective communication of relevant information in investment assessment during the decision-making process (Loughran & McDonald, 2014). From the perspective of accounting information, writing quality aims to facilitate the understanding of financial statements, streamlining communication with users (Machado, 2023).

The readability of information can change investors' perceptions of inherent risks (Xing & Yan, 2019). This finding is of substantial importance for corporate decisions related to disclosure, portfolio management, and asset pricing (Xing & Yan, 2019). Thus, readability is essential in financial and non-financial reports to ensure that information on performance and future prospects is conveyed clearly and accurately (Rody & Almeida, 2023), enabling a fluid and objective reading, including with respect to corporate risks (Shandiz *et al.*, 2022).

From this perspective, reporting risk factors maximizes the chances of business success because it supports *shareholders'* investment decisions (Santos & Coelho, 2018). *Disclosure* (including risk-related disclosure) can be used to assess how managers deal with market volatility and uncertainty (Dobler *et al.*, 2011). The readability of such disclosure also affects investors' assessments, since less readable disclosure tends to increase investors' search for external information (Asay *et al.*, 2017). Thus, readability enables greater confidence in stock markets and facilitates the attraction of investors (Ajina *et al.*, 2016).

The quality of risk *disclosure* and risk management tends to be negatively related to information asymmetry (Miihkinen, 2012). Risk disclosures can increase market efficiency by mitigating uncertainties and increasing business opportunities, as well as improving the company's future performance and supporting investment decisions, thereby enabling a more efficient allocation of resources (Santos & Coelho, 2018). In other words, risk *disclosure* is essential for the efficient allocation of assets, including intangible assets (Moura *et al.*, 2014).

Previous studies indicate that companies with greater disclosure transparency tend to signal lower perceived risk (Pandya & Jain, 2015). In the case of intangible assets, however, this relationship becomes more complex, since the subjectivity of these resources makes their measurement difficult and increases uncertainty regarding the generation of future economic benefits (Lim *et al.*, 2020; Jia, 2018; Wu & Lai, 2020). From this perspective, evidence indicates that intangible assets may increase market risk (Silva *et al.*, 2024), reinforcing the importance of mechanisms capable of reducing the information uncertainties associated with these assets.

Risk disclosure, particularly when presented in a readable manner, can increase the efficiency of the assessment of investments in intangible assets. Risk factor readability enables investors to conduct a more robust analysis of these assets, facilitating the identification and assessment of resources such as brands and patents, while also signaling greater transparency and reliability (Xue & Hong, 2016; Siqueira *et al.*, 2023).

From an economic perspective, risk factor readability can help reduce the information costs faced by investors when assessing intangible assets, whose measurement depends heavily on expectations regarding future economic benefits (Iudícibus & Marion, 2020; Perez & Famá, 2015). Thus, the greater the readability of disclosures related to risk information, the lower the uncertainty regarding the ability of intangible assets to generate economic benefits tends to be, which may result in reduced information asymmetry. On the other hand, excessively complex or lengthy disclosures may hinder the interpretation of information, increase investors' processing costs, and raise the risk premium required for intangible-intensive companies (Chien *et al.*, 2016).

In light of Communication Theory, clarity and the absence of noise in the transmission of information between sender and receiver are fundamental factors for effective communication (Shannon & Weaver, 1948). In the corporate context, the company acts as the sender, investors as the receivers, and published reports constitute the communication channel. When risk factors are disclosed by the company in a complex and poorly readable manner, the message becomes "noisy," which, consequently, negatively affects investors' interpretation and understanding.

In the case of intangible assets, the difficulty of properly measuring and assessing these resources (Lev, 2001) increases the relevance of clarity in risk factor disclosure. Communication that is difficult to read (understand) may lead investors to underestimate the value of these assets, affecting risk perception and the depreciation of the company's shares. Li (2008) and Loughran and McDonald (2014) mention that less readable communication increases uncertainty (regarding intangibles, for example) among investors, thereby increasing market risk.

According to Signaling Theory (Spence, 1973), companies send signals to the market through their disclosures, such that the quality of these signals (in this case, risk factor readability) affects how they are perceived by investors. Thus, greater risk factor readability may indicate greater transparency, whereas low readability suggests greater uncertainty (risks). In line with this assertion, Miller (2010) reinforces that companies with better *disclosure* practices are perceived as less risky. Providing clear information about risks helps reduce investors' perceived risk, increasing the possibility of greater investment, including investment in intangible assets.

In light of the foregoing, the following hypotheses are proposed:

H_{1a}: Risk factor readability, measured by the Flesch Index, negatively influences the relationship between intangible assets, in terms of their relative importance, and market risk.

H_{1b}: Risk factor readability, measured by the Flesch Index, negatively influences the relationship between intangible assets, in terms of their composition, and market risk.

H_{1c}: Risk factor readability, measured by length, positively influences the relationship between intangible assets, in terms of their relative importance, and market risk.

H_{1d}: Risk factor readability, measured by length, positively influences the relationship between intangible assets, in terms of their composition, and market risk.

3 METHODOLOGICAL PROCEDURES

The study hypotheses were tested using data from non-financial companies listed on B3 (Brasil, Bolsa, Balcão) between 2018 and 2022. a period encompassing the effects of the Covid-19 pandemic on corporate risk exposure (Balassiano *et al.*, 2023; Barbosa *et al.*, 2019). Financial institutions were excluded due to the specific characteristics of their capital and regulatory structures, which hinder comparability with other companies. Companies that did not provide the information required to calculate the dependent variable (Beta coefficient) or the other study variables were also excluded. These procedures resulted in an unbalanced panel comprising 1.117 firm-year observations. The use of an unbalanced panel does not compromise the estimations performed, since the System GMM estimator allows for different numbers of observations per sample unit, preserving the consistency of the estimated parameters.

The variables, together with their respective metrics and theoretical references, were structured into four groups. The **dependent variable**, market risk, was measured by the Beta coefficient () obtained from Economatica, calculated based on the covariance of daily stock returns relative to the Ibovespa and the Selic rate (Almendra *et al.*, 2018; Teodósio *et al.*, 2023; Vasconcelos *et al.*, 2023). The Beta coefficient was selected because it represents the company's market risk, reflecting its sensitivity to stock market fluctuations, and is widely used in the literature to measure market risk (Teodósio *et al.*, 2023; Vasconcelos *et al.*, 2023). According to Damodaran (2002), fundamental analysis is the best tool for obtaining a company's Beta, without considering it a research limitation that would invalidate the findings.

The **independent variables** (intangible assets), expected to be positively related to risk, were assessed from two perspectives: *i)* representativeness, calculated as the proportion of intangible assets relative to Total Assets (INTANG/AT), Non-Current Assets (INTANG/ANC), and Equity (INTANG/PL), using data from Economatica (Machado, 2023; Silva *et al.*, 2024); and *ii)* composition, obtained from the Notes to the Financial Statements as the proportion of relationship, innovation, structural, and human assets, a classification established by Kayo (2002), relative to total intangible assets (Leite & Pinheiro, 2014; Mantovani & Santos, 2014; Moura *et al.*, 2012).

The **moderating variable** (readability) was measured based on item 4.1 of the Reference Form. Two *proxies* were extracted: the Flesch Index, with an expected negative sign (Borges & Rech, 2019), and length (natural logarithm of the number of words), with an expected positive sign (Li, 2008; Loughran & McDonald, 2014). The Reference Forms were obtained directly from the CVM *website* in PDF format, and only section 4.1 (Risk Factors) was extracted. Subsequently, the PDF files were converted to TXT format, retaining only the textual content corresponding to the risk factors. The texts were then processed using ALT – Textual Readability Analysis software, which automatically calculated the Flesch Index and document length (Banhos & Decoster, 2023; Moreno *et al.*, 2022; Santos, 2023; Souza *et al.*, 2022). The risk factor readability indicator ranges from 0 to 100 (high readability) and can be divided into 7 levels (Borges & Rech, 2019; Flesch, 1948): 0–30: very difficult; 30–50: difficult; 50–60: fairly difficult; 60–70: plain language; 70–80: fairly easy; 80–90: easy; and 90–100: very easy.

The Flesch Index was adopted because it is the most widely used readability metric in corporate disclosure research, allowing an objective assessment of how easy the risk factors are to

read. Although originally developed for general texts, recent studies demonstrate its suitability for financial documents in Portuguese when combined with other textual measures, such as document length (Borges & Rech, 2019). It is acknowledged, however, that the Flesch Index predominantly captures syntactic aspects of readability and does not encompass semantic or technical elements characteristic of regulatory texts. For this reason, report length was additionally adopted as a complementary measure of information quality (Loughran & McDonald, 2014).

Finally, **control variables** (Economatica) were adopted, all with a theoretically expected positive effect on risk: size (Ln of Total Assets) (Rengel *et al.*, 2020), leverage (Debt/Equity) (Di Luca & Rambalducci, 2020), indebtedness (Total Liabilities/Total Assets), and profitability (ROA) (Muñoz *et al.*, 2020). *Dummy* variables were also included for the pandemic years (2020–2021) (Almeida & Costa, 2021) and for the B3 economic sector (Machado, 2023).

The data were analyzed using STATA 13 through descriptive statistics and multiple regression using the *System Generalized Method of Moments* (System GMM). The estimator ensures analytical robustness by addressing endogeneity, heteroscedasticity, and serial autocorrelation through the use of exogenous instrumental variables (Roodman, 2009). System GMM estimations are capable of significantly reducing the effects arising from regressor endogeneity by accounting for the direct influence of past values of the response variable on its contemporaneous values (Albuquerque Filho *et al.*, 2021).

4 RESULTS

Table 1 summarizes the descriptive statistics of the sample for the 2018–2022 period.

Table 1
Descriptive Statistics of the Sample Variables for the 2018–2022 Period.

Variable	Mean	Standard Deviation	Minimum	Quartile			Maximum
				1st	2nd (median)	3rd	
Market Risk							
RISK	1.045	0.884	-1.625	0.480	0.979	1.506	5,688
Asset Intangibility							
INTANG/AT	0.111	0.159	0	0.003	0.029	0.164	0.735
INTANG/ANC	0.177	0.230	0	0.006	0.056	0.286	0.894
INTANG/PL	0.784	6.932	0	0.002	0.057	0.482	145.16
IE	0.266	0.342	0	0.024	0.083	0.394	1
II	0.274	0.321	0	0.021	0.103	0.456	1
IR	0.382	0.372	0	0.042	0.246	0.768	1
Risk Factor Readability							
FLESCH	22.246	8.479	2.200	13.300	21.100	25.900	61.700
EXTENSÃO	8.663	1.112	4.465	8.125	8.912	9.481	10.393
Control							
TAM	15.179	1.901	9.112	13.991	15.208	16.454	20.710
ALAV	0.808	0.735	4.269	0.490	0.642	0.785	5.163
END	0.366	0.411	0.016	0.164	0.247	0.362	2.996
ROA	0.207	0.145	-0.930	-0.003	0.037	0.077	0.825

Source: Prepared by the authors.

The data in Table 1 indicate that the average market risk of Brazilian companies is 1.045. This indicates that stock risk is higher than that of the market portfolio (Risk > 1), signaling higher returns for the companies. Nevertheless, there is considerable dispersion around the mean (Standard Deviation = 0.884), indicating high variability in risk across companies and variation in risk levels (Minimum = -1.625 and Maximum = 5.688), with some companies exhibiting negative

Market Risk (which may indicate financial stability), while others face substantial variations in risk.

Furthermore, the median of 0.979 suggests that 50% of the companies in the sample exhibited Market Risk below this value. In addition, since the median and mean are close, it can be inferred that Market Risk is relatively symmetrically distributed across companies, although the high Maximum value and relatively high Standard Deviation also indicate the presence of companies with high risk levels.

Regarding representativeness, the intangible assets of the companies in the sample account, on average, for 11.1% of Total Assets, 17.7% of Non-Current Assets, and 78.4% of Equity. Additionally, it should be noted that some companies in the sample have no intangible assets (Minimum = 0), whereas in others intangible assets predominate within Total Assets (as indicated by the Maximum values). Intangible assets are positively skewed (median lower than the mean), indicating that few companies have high proportions of intangible assets relative to Total Assets, whereas most reported low values.

Regarding the Standard Deviation, considerable variation is observed across companies in terms of the representativeness of tangible and intangible assets (INTANG/AT and INTANG/ANC). For intangibility relative to Equity (INTANG/PL), this variation is even greater (Standard Deviation = 6.932), with a high Maximum value (145.16). This suggests that some companies have intangible assets whose value exceeds their Equity, that is, companies with high intangible asset values.

Regarding the composition of intangible assets, relationship assets account, on average, for 38.2%, followed by innovation assets, at 27.4%, and structural assets, at 26.6%. High dispersion (Standard Deviation above 0.300) is observed across the sample companies for all three classifications, demonstrating that companies exhibit heterogeneous values in how they organize and invest in their intangible assets related to structure, innovation, and relationships. Furthermore, a comparison of the mean and median (median lower than the mean) reveals positive skewness across companies, but with substantial variation in the values reported. In other words, some companies did not report certain types of these intangible assets (Minimum = 0), whereas others have intangible assets in all classifications (Maximum = 1), namely structural, innovation, and relationship assets. It should be noted that, during the analysis period (2018–2022), the Notes to the Financial Statements of the sample companies did not report human intangible assets.

The Flesch Index measures the ease of reading texts, with values ranging from 0 to 100, such that the higher the value, the easier the text is to read (greater readability). Risk factor readability, measured by the Flesch Index, had a mean of 22.246, with values concentrated in the lower portion of the sample, demonstrating positive skewness (median lower than the mean: 21.100 < 22.246).

The mean, the variation between the quartiles (Q1 and Q3), and the variation in the dispersion measure (Standard Deviation = 8.4790) of readability indicate that the Brazilian companies in the sample have, on average, readability classified as very difficult, as values range from 0 to 30. This indicates high variance in readability across companies (Minimum = 2.2000 and Maximum = 61.700) and variation relative to the mean. Thus, it can be inferred that readability is relatively low and that, in general, most companies' risk documents are very difficult to understand.

Text length, measured by the number of words, showed similar mean and median values, with the median being higher (8.9122 > 8.6637), indicating negative skewness. Nevertheless, there is no substantial discrepancy between the quartiles, as the values are similar across companies. Thus, the length of the texts on risk factors disclosed by companies is generally consistent, without substantial variation.

The control variables (TAM, ALAV, END, ROA), in turn, exhibited a more uniform distribution, although indebtedness (Standard Deviation = 0.411) and leverage (Standard Deviation = 0.735) showed greater dispersion across companies. Overall, the variations in the means, standard deviations, and ranges of the control variables make it possible to identify differences between larger and smaller companies (TAM), financial strategies (ALAV), capital structure (END), and performance (ROA) among the companies in the sample.

Subsequently, in order to achieve the objective of the study, Tables 2 and 3 present the specifications considering intangible assets in terms of representativeness and composition, respectively.

Table 2

Moderating Effect of Risk Factor Readability on the Relationship between Intangible Assets (in Terms of Representativeness) and Market Risk

General Model: Riski,t = αi + β1Risk$it-1$ + β2Intangibleit + β3(Intangibleit x Readabilityit) β4-9$\sum$ CONTRit, + ηi + ωt + υit

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
RISKt-1	-0.035	-0.006	-0.033	-0.013	0.015	-0.002
	(-1.55)	(-0.30)	(-1.48)	(-0.59)	(071)	(-0.13)
INTANG/AT	**11.01*****	**-2.594****				
	(3.60)	(-2.04)				
INTANG/ANC			**7.104*****	**-1.858**		
			(2.93)	(-1.46)		
INTANG/PL					**0.893*****	**-0.028****
					(4.26)	(-2.49)
(INTANG/AT* FLESCH)	**-1.176*****					
	(-3.52)					
(INTANG/AT* EXTENSÃO)	-	**0.140****				
		(2.37)				
(INTANG/ANC* FLESCH)			**-0.813*****			
			(-3.00)			
(INTANG/ANC* EXTENSÃO)				**0.092**		
				(1.52)		
(INTANG/PL* FLESCH)					**-0.096*****	
					(-4.25)	
(INTANG/PL* EXTENSÃO)						**0.005*****
						(2.62)
TAM	-0.089*	-0.107**	-0.062	-0.106**	-0.088***	-0.076***
	(-1.62)	(-2.25)	(-1.05)	(-1.99)	(-2.89)	(-3.46)
ALAV	-0.165*	-0.139	-0.130	-0.089	-0.173**	-0.177**
	(-1.76)	(-1.54)	(-1.44)	(-0.97)	(-2.16)	(-2.00)
END	0.538**	0.406*	0.522**	0.300	0.514***	0.563***
	(2.45)	(1.77)	(2.25)	(1.31)	(2.59)	(3.08)
ROA	0.192	0.219	0.283	0.305	0.279	0.267
	(0.90)	(1.01)	(1.26)	(1.33)	(1.39)	(1.20)
COVID_19	0.119***	0.106***	0.132***	0.116***	0.155***	0.117***
	(3.12)	(2.83)	(3.36)	(3.08)	(4.93)	(3.71)
_constant	2.523**	2.738***	2.186**	2.796***	2.472***	2.256***
	(2.93)	(3.67)	(2.34)	(3.33)	(4.93)	(6.17)
Sector Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of Instruments	68	68	68	68	68	68
Hansen J Test	59.89	63.26	61.85	61.81	61.83	57.53
Arellano-Bond AR1	-4.77***	-4.93***	-4.75***	-4.88***	-5.05***	-4.99***
Arellano-Bond AR2	-0.76	-0.71	-0.76	-0.77	-0.66	-0.83

Source: Prepared by the authors.

Based on Table 2, the coefficient of the first lag of the dependent variable, RISKt-1, was not statistically significant in any of the models. Nevertheless, it should be noted that the validity of the model estimates was not necessarily compromised, given that the coefficient is consistent with Roodman (2009), that is, it is less than 1 (in absolute value) ($|\beta 1| < 1.0$).

Furthermore, the intangibility variables in terms of representativeness exhibit different effects in the presence of moderation by readability. The INTANG/AT, INTANG/ANC, and INTANG/PL variables were positive and statistically significant at the 1% level in the presence of moderation by the FLESCH variable (Models 1, 3, and 5), whereas in the presence of LENGTH (moderation), they exhibited negative and statistically significant coefficients (Models 2 and 6).

Based on Table 2, the moderating effect between readability (FLESCH) and intangible assets in terms of representativeness (INTANG/AT, INTANG/ANC, and INTANG/PL) was negative and significant at the 1% level (Models 1, 3, and 5). This finding indicates that the moderating effect of the readability of disclosed risk factors on intangible assets in terms of representativeness reduces Market Risk (RISK) and, more precisely, that with each unit increase in readability, the effect of intangible assets on Market Risk decreases, *ceteris paribus*. Based on this finding, hypothesis **H1a** – Risk factor readability, measured by the Flesch Index, negatively influences the relationship between intangible assets in terms of their representativeness and Market Risk – is not rejected.

On the other hand, the analysis of the moderating effect of readability (LENGTH) and the intangibility variables (INTANG/AT and INTANG/PL) revealed a positive and statistically significant effect (Models 2 and 6) on Market Risk. This means that as the risk factor report becomes longer (with each unit increase), the effect of the proportion of intangible assets relative to Total Assets and Equity on Market Risk also increases, *ceteris paribus*. In this context, hypothesis **H1c** – Risk factor readability, measured by length, positively influences the relationship between intangible assets in terms of their representativeness and Market Risk – is not rejected.

Li (2008) mentions that transparency and clarity in financial reports affect investors' and analysts' perceptions of risk. Barth and Schipper (2008) state that transparency increases market confidence, mitigating uncertainty. Readability is essential for the transparency of disclosed information (Shandiz *et al.*, 2022), as it facilitates the communication of information relevant to investment assessment (Loughran & McDonald, 2014). The representativeness of intangible assets requires greater emphasis on signaling their risks compared with other assets, probably because managing the risks related to these assets is fundamental when they are exposed to various types of risk (Albuquerque Filho *et al.*, 2024; Costa *et al.*, 2017).

These *insights* suggest that the readability (ease of reading) of a company's risk factors can increase the efficiency of investments in intangible assets (Siqueira *et al.*, 2023), facilitating their proper identification and assessment while increasing investor confidence and protection (Xue & Hong, 2016), with subsequent impacts on Market Risk (Albuquerque Filho *et al.*, 2024; Silva *et al.*, 2024). However, when document length is excessive, it may be associated with a signal of detailed complex information and may hinder comprehension and increase information asymmetry (You & Zhang, 2009).

In the Brazilian context, characterized by concentrated ownership control and lower analyst coverage compared with more developed markets, risk factor readability plays a relevant role in intangible-intensive companies (intangible assets) because a significant portion of the value of these assets is not directly observable by investors. In contrast to tangible assets, whose valuation involves more objective aspects, intangible assets depend on interpretations of future expectations, and, therefore, risk communication is a crucial element for their proper pricing (Santos & Coelho, 2018).

Furthermore, for companies with high investments in intangible assets, the disclosure of risk factors in lengthy reports may be associated with a signal of complexity or lower transparency, increasing perceived risk. Ease of reading can be viewed as a key element in balancing risk disclosure, the pricing of assets (intangibles), and their subsequent impact on Market Risk. This is

consistent with the findings of Bukh and Malmi (2005), who discussed the integration of intangible asset disclosures with companies' risk reports, indicating that effective communication strengthens investors' confidence in the company's risk management, insofar as transparency in communication can align their expectations and uncertainties.

Thus, an increase in the volume of information does not necessarily reduce investors' risk perceptions when accompanied by greater textual complexity. In the Brazilian context, this finding is particularly relevant because it indicates that lengthy reports may hinder the processing of information related to intangible assets, leading investors to interpret such disclosures as signals of greater uncertainty or greater difficulty in monitoring corporate risks (Chien *et al.*, 2016).

Table 3

Moderating Effect of Risk Factor Readability on the Relationship between Intangible Assets (in Terms of Composition) and Market Risk

General Model: Riski,t = αi + β1Risk$it-1$ + β2 Intangibleit + β3(Intangibleit x Readabilityit) β4-9$\sum$ CONTRit, + ηi + ωt + υit

Variable	Modelo 1	Modelo 2	Modelo 3	Modelo 4	Modelo 5	Modelo 6
RISKt-1	0.046***	0.040***	0.073***	0.083***	-0.028*	-0.040**
	(3.67)	(2.89)	(2.78)	(3.38)	(-1.79)	(-2.30)
IE	**0.957*** **	**-3.014*** **				
	(2.67)	(-7.12)				
II			**0.233**	**0.675**		
			(1.59)	(0.69)		
IR					**-0.700****	**-1.792****
					(-2.23)	(-2.28)
(IE*FLESCH)	**-0.045*** **					
	(-4.04)					
(IE*EXTENSÃO)	-	**0.379*** **				
		(6.99)				
(II*FLESCH)			**-0.026*** **			
			(-4.15)			
(II*EXTENSÃO)				**-0.094**		
				(-0.88)		
(IR*FLESCH)					**-0.010**	
					(-0.87)	
(IR* EXTENSÃO)						**0.122**
						(1.40)
TAM	0.039	-0.007	-0.078**	0.006	-0.117***	-0.122**
	(1.36)	(-0.23)	(-2.04)	(0.14)	(-2.66)	(-2.52)
ALAV	0.406***	0.984***	-0.255***	-0.204***	1.247***	0.948***
	(4.73)	(13.63)	(-3.69)	(-2.82)	(4.64)	(3.65)
END	-0.518***	-1.060***	-0.247**	-0.428***	0.112	0.012
	(-3.00)	(-6.87)	(-2.09)	(-4.23)	(0.75)	(0.06)
ROA	-0.016	0.398**	-0.125	-0.297	0.654***	0.268**
	(-0.11)	(2.44)	(-0.47)	(-1.13)	(5.25)	(1.93)
COVID_19	0.087***	0.082***	0.103**	0.088**	-0.119***	-0.080**
	(3.00)	(2.60)	(2.45)	(2.10)	(-355)	(-2.16)
_constant	0.619	1.038**	2.749***	1.422*	2.479***	2.815***
	(1.31)	(1.95)	(4.23)	(1.91)	(3.94)	(3.76)
Sector Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of Instruments	68	68	68	68	68	68
Hansen J Test	48.05	46.86	59.66	56.61	61.80	59.37
Arellano-Bond AR1	-3.63***	-3.48***	-3.81***	-3.99***	-2.90***	-2.84***
Arellano-Bond AR2	-0.89	-0.84	-1.23	-1.53	0.55	0.53

Source: Prepared by the authors.

Table 3 presents the regression models considering intangible assets in terms of composition. It can be observed that the lagged Market Risk variable (RISK) was statistically significant in all models, with a positive coefficient below 1 (in absolute value) ($|\beta 1| < 1.0$). In other words, risk in the previous period influences current Market Risk.

Intangible assets, in terms of composition, exhibit different effects on Market Risk in the presence of moderation by readability. Structural intangible assets (IE) had a positive and significant influence (coefficient = 0.957, significant at the 1% level) on Market Risk (RISK) in the presence of the moderating variable IE * FLESCH. Thus, this finding may be associated with the difficulty of assessing intangible assets, particularly in emerging markets (such as Brazil), where transparency regarding intangible assets remains challenging (Li, 2008).

On the other hand, in the presence of the moderating variables IE * LENGTH and IR * LENGTH, structural intangible assets (coefficient = -3.014, significant at the 1% level) and relationship intangible assets (coefficient = -1.792, significant at the 5% level) had a negative and significant effect on Market Risk. It should also be noted that relationship intangible assets negatively affect Market Risk in the presence of the moderating variable IR * FLESCH.

Regarding the moderating variables, the results presented in Table 3 show that IE * FLESCH and II * FLESCH were statistically significant at the 1% level (Models 1 and 3). The negative sign of the coefficients (IE * FLESCH = -0.045; II * FLESCH = -0.026) indicates that the moderating effect of the readability of disclosed risk factors on structural and innovation intangible assets reduces Market Risk (RISK). In other words, with each unit increase in the interaction variables between readability (Flesch Index) and structural and innovation intangible assets, *ceteris paribus*, Market Risk decreases. Thus, hypothesis **H1b –** Risk factor readability, measured by the Flesch Index, negatively influences the relationship between intangible assets in terms of their composition and Market Risk – is not rejected.

Furthermore, among the moderating variables involving intangible assets in terms of composition and readability (LENGTH), only the IE * LENGTH variable (Model 2) was statistically significant (1%), with a positive effect (coefficient = 0.379) on Market Risk (RISK). Thus, *ceteris paribus*, a 1% increase (each unit increase) in the interaction between structural intangible assets and risk report length increases Market Risk, particularly during periods of crisis (COVID_19, significant at the 1% level). Thus, hypothesis **H1d –** Risk factor readability, measured by length, positively influences the relationship between intangible assets, in terms of their composition, and Market Risk – was not rejected.

Regarding readability (FLESCH), intangible-intensive companies, because they make substantial investments in these intangible assets, which, according to Albuquerque Filho *et al.* (2019) and Hussinger and Pacher (2019), constitute competitive advantages and generate value, may feel the need to disclose risk information to the market clearly and concisely, given that disclosure of the company's overall risks, including those associated with this type of asset, can serve as a basis for investors' assessment of the company, in addition to reducing the cost of capital and increasing confidence in management (Loughran & McDonald, 2014), with subsequent impacts on Market Risk (Silva *et al.*, 2024).

Moura *et al.* (2012) emphasize that structural intangible assets, such as information systems and concession contracts, improve operational efficiency, facilitating faster and more assertive decisions. In addition, organizational capacity and efficient processes are essential for the company's survival and create competitive barriers, reducing perceived risk (Lev, 2001). In line with this, market intelligence contributes to identifying trends and adjusting strategies (Barney, 1991), which is essential for the company to maintain (or even increase) its competitive position in this dynamic market. Therefore, structural intangible assets strengthen operations and promote the company's sustainable growth, despite the risks.

With regard to innovation intangible assets, previous studies (Peters & Taylor, 2017; Silva *et al.*, 2024) have highlighted that R&D and patents are associated with Market Risk. Suwansin *et al.* (2024) emphasize that transparent reports that include intangible assets such as R&D and patents can reduce information gaps, enabling more informed investments. The disclosure of information on these assets promotes market transparency, but the complexity of the information makes it difficult for investors and stakeholders to interpret it (Chien *et al.*, 2016).

Document length can increase information asymmetry, overloading users and reducing the transparency of disclosed information (Duarte & Lucena, 2018). In addition, the length of risk factor reporting may disclose relevant information about the risks associated with the company, particularly when intangible assets are involved.

When communicating information that demonstrates greater transparency (clear and easy to read), and for lengthy text to be advantageous to investors, such information must also be structured in an organized manner (Becher & Zarsky, 2014); otherwise, there is a risk that the additional complexity arising from the length of risk reporting may impair transparency and, consequently, increase Market Risk. Excessive disclosure may be perceived negatively by investors, even when reports comply with applicable standards (Duarte & Lucena, 2018).

The results obtained have relevant implications for intangible-intensive companies, investors, and regulators. For companies, not only is the intensity of investments in intangible assets relevant to the market, but also the manner in which the risks associated with them are disclosed, since disclosure affects investors' interpretation of information (Pandya & Jain, 2015). Investors, in turn, may consider that the disclosure of excessively lengthy reports can increase information-processing costs while also making it more difficult to assess risks related to the future economic benefits of intangible assets (Chien *et al.*, 2016). For regulators, the evidence suggests that improving information quality requires not only a greater volume of disclosure but also the disclosure of clearer, more understandable, and more useful information for decision-making by investors and other capital market participants.

Based on the results and explanations discussed in Tables 4 and 5, Communication Theory and Signaling Theory support these arguments: the former emphasizes that clarity and the absence of noise in the disclosure of risk information between companies and investors are crucial for effective communication (Shannon & Weaver, 1948); the latter indicates that the signals sent by companies are decisive in how they are perceived by investors (Spence, 1973).

Communication containing noise (difficult to read / lengthy reports) can generate ambiguous interpretations (with uncertainty), which may lead investors to underestimate the value of assets (such as intangible assets), increasing the perception of risk associated with the company. In this regard, risk factor readability can be interpreted as a signal of greater transparency, given that, as noted by Miller (2010), companies with better disclosure practices are considered less risky.

It should be noted that an alternative interpretation of the findings is that the association between risk report length and increased Market Risk may signal not only lower readability but also greater operational, regulatory, or contractual complexity among intangible-intensive companies, requiring more detailed disclosures to the market (Becher & Zarsky, 2014). In line with this, the characteristics of market participants, including their level of financial knowledge, ability to interpret information, and experience, may influence how readability affects the perception of risks communicated by companies.

5 CONCLUSION

This study analyzed the moderating effect of the readability of risk factors disclosed by companies on the relationship between intangible assets and Market Risk among Brazilian companies listed on B3. To this end, available data from companies between 2018 and 2022 were used, totaling 1,117 firm-year observations organized in an unbalanced panel.

The results of the descriptive analysis indicated an average market risk of 1.045 for Brazilian companies, meaning that stock risk is higher than that of the market portfolio (Risk > 1), signaling higher returns for the companies. In terms of representativeness, intangible assets account, on average, for 11.1% of Total Assets, 17.7% of Non-Current Assets, and 78.4% of Equity. Regarding composition, relationship assets account, on average, for 38.2% of intangible assets, followed by innovation assets (27.4%) and structural assets (26.6%). Risk factor readability, in turn, had an average value of 22.246 when measured by the Flesch Index, while length had an average value of 8.663.

The regression results indicated that the readability of risk factors disclosed by companies moderates the relationship between intangible assets and Market Risk. The moderating effect of readability (ease of reading) and the representativeness of intangible assets, including in terms of their composition, such as structural and innovation intangible assets, contributes to reducing Market Risk. In contrast, the moderating effect of the readability of disclosed risk factors (risk report length) on intangible assets, considering their representativeness and structural assets, leads to an increase in Market Risk.

In light of this result, it should be emphasized that, in the Brazilian capital market, while the ease of reading disclosed risk factors reduces the positive impact of intangible assets on Market Risk, the length of the reports disclosing these factors may amplify this impact. This means that preparing more transparent reports characterized by clarity and conciseness is an effective alternative for improving investors' perceptions of the risks incurred, rather than merely increasing report length. These findings extend the literature by demonstrating that different dimensions of readability have distinct effects on the relationship between intangible assets and Market Risk, highlighting the moderating role of risk factor readability in this relationship.

The readability of risk factors disclosed by the company, including risks associated with intangible assets, can serve as a basis for investors' assessment of the company. Thus, in light of Signaling Theory, the readability of disclosed risk factors is viewed as a signal of transparency to the market, which, in turn, and in accordance with Communication Theory, generates trust and credibility between the company and investors by providing risk information about assets (such as intangible assets), which may consequently enable a more accurate assessment of these assets and Market Risk.

The research evidence has implications for capital market participants. The findings may support investors in their risk analyses, given that risk factor readability can assist in assessing a company's assets (intangible assets, for example). In addition, they may support regulatory and standard-setting bodies in implementing policies aimed at increasing risk factor readability at the national level, since there is no universal standard for report writing. The study is expected to raise managers' awareness of the relevance of the Reference Form (FR) and other institutional reports, highlighting the need for proactive initiatives, such as emphasizing the disclosure of the company's risk factors.

The limitations of the study include: i) the measurement of Market Risk, which used Economatica parameters, although other methods of measuring Beta could be employed; ii) the scope of the readability analysis, which limits inferences to a specific part of the Reference Form (item 4.1 – Risk Factors) and captures only part of communication quality, without fully encompassing aspects such as content organization and the contextualization of risk information, for example; iii) the consideration solely of intangible assets recognized in accounting records, meaning that these measures do not capture aspects related to human capital, organizational knowledge, and corporate reputation; iv) the sample, which included only Brazilian non-financial companies listed on B3 with available data (selectivity); v) the analysis period (2018–2022); vi) the control variables used, as other variables relevant to the topic could be employed; and vii) the

theories used as a foundation (Communication Theory and Signaling Theory), given that other theoretical frameworks could also be employed.

Therefore, for future studies, it is recommended to: i) investigate the moderating effect of other variables, such as corporate governance, company internationalization, content analysis of risk information (CVM Resolution No. 193 of October 20, 2023), and other factors that may affect the relationship between intangible assets and Market Risk. Understanding company-specific characteristics may contribute to broadening the discussion of the risk-return trade-off involving intangible assets; ii) analyze the relationship between the variables in other institutional contexts (countries), using different *proxies* for measuring the variables, other control variables, different theories, and varying analysis periods.

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CONFLICT OF INTERESTS

The authors declare that there is no conflict of interest.

DATA AVAILABILITY

The complete dataset supporting the findings of this study is available from the authors upon reasonable request.

AUTHOR CONTRIBUTIONS

Roles	1º Author	2º Author	3º Author	4º Author
Conceptualization	♦	♦		
Data Curation	♦			
Formal Analysis		♦		
Funding Acquisition				
Investigation	♦	♦	♦	♦
Methodology	♦	♦	♦	♦
Project Administration	♦	♦		
Resources				
Software	♦	♦	♦	
Supervision		♦	♦	♦
Validation	♦	♦	♦	♦
Visualization	♦	♦		
Writing – Original Draft Preparation	♦	♦	♦	♦
Writing – Review & Editing				

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