Tax Litigation and Its Influence on Systematic and Idiosyncratic Risks in Brazil's Capital Market

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Abstract

This study investigates the relationship between tax litigation and the systematic (Beta) and idiosyncratic risks of Brazilian companies, considering the direct impact of tax litigation in a context of high regulatory uncertainty. Given Brazil's complex tax system and the scarcity of studies on this subject, the research aims to fill an important gap in the literature. The research adopts a descriptive approach, with panel data analysis, using 1,398 observations of companies listed on B3 between 2017 and 2022. The methodology uses linear regression models to examine how tax litigation influences business risks, focusing on the dynamics between tax litigation and business volatility. The results confirm the hypothesis that tax litigation is associated with an increase in companies' systematic and idiosyncratic risk. This shows that tax disputes directly and significantly impact companies' volatility and stability in the market. This study contributes to understanding corporate risks by demonstrating how tax litigation can amplify companies' uncertainties, especially in the Brazilian context. The findings provide a solid basis for managers, regulators, and investors to develop more effective risk mitigation strategies. It is recommended that future research explore these relationships in different sectors and regulatory contexts, broadening the understanding of the impacts of tax litigation on business risks.

Keywords: Tax litigation; Systematic risk; Idiosyncratic risk; Corporate Risk Management.

1 Introduction

Risk management is a critical area for the sustainability and success of any organization, especially in markets characterized by high uncertainty and volatility. In the context of Brazilian companies, tax litigation emerges as a significant risk factor, given the country's complex and challenging tax system. The relationship between tax litigation and companies' systematic and idiosyncratic risks is still little explored in the literature, which makes this research particularly relevant.

Systematic and idiosyncratic risks represent two distinct but complementary dimensions of companies' risk exposure. Systematic risk, also known as market risk, is related to macroeconomic factors that affect all companies, such as changes in fiscal policies, economic crises, and fluctuations in interest rates. On the other hand, idiosyncratic risk refers to factors specific to a company, such as management decisions, innovations, and compliance with tax regulations.

Companies face significant challenges in managing their tax risks in Brazil, where the tax system is characterized by its complexity and frequent legislative changes. Tax litigation can influence systematic and idiosyncratic risk, affecting companies' perception of risk in the market and, consequently, their financial stability.

This study investigates how tax litigation impacts companies' systematic (Beta) and idiosyncratic risk, considering the moderating role of financial variables such as company size and profitability. The analyses were based on a robust data set, totaling 1,398 observations of companies listed on B3 between 2017 and 2022, allowing a detailed assessment of the interactions between the variables. Through a linear regression model, this research seeks to provide valuable insights into how tax litigation can influence the volatility and stability of companies, contributing to a deeper understanding of the determinants of these risks.

The relevance of this research lies in its ability to fill an important gap in the existing literature by exploring the relationship between tax litigation and business risks in a complex regulatory context such as Brazil. The expected results have the potential to provide practical guidelines for managers, regulators, and investors, assisting in the Formulation of effective strategies for risk mitigation and the promotion of organizational resilience. The article follows a logical and well-organized structure, beginning with a comprehensive literature review that contextualizes the central themes of the study: systematic and idiosyncratic risk in companies, tax litigation in Brazil, and the association between these risks and tax litigation. The review culminates in formulating hypotheses examining tax litigation's impacts on companies' systematic and idiosyncratic risk.

The methodology adopted for data collection and analysis is then detailed, emphasizing the use of linear regression models to examine the relationships between the variables of interest. The results are analyzed in detail, showing how tax litigation and financial variables influence companies' systematic and idiosyncratic risk. The study's conclusion highlights its importance in understanding the relationship between tax litigation and business risk, enriching the academic debate and providing valuable insights for managers and other stakeholders. This study fills a significant gap in the literature and provides a solid basis for strategic decision-making aimed at companies' financial stability, regulatory compliance, and operational efficiency.

2 Literature Review

This section explores the theoretical foundations of the association between tax litigation and the systematic and idiosyncratic risks of companies, as well as the influence of financial variables such as the size and profitability of organizations. The aim is to understand these fundamentals to develop robust and empirically testable research hypotheses, contributing to advancing knowledge in tax litigation. This critical analysis will make it possible to identify the main forces influencing the impact of tax litigation on company risk, offering valuable insights for risk management and strategic decision-making.

2.1 Systematic and Idiosyncratic Risk in Companies

In the financial markets, understanding risks is fundamental for investors and managers. Risks can be classified as systematic and idiosyncratic. Systematic risk, or market risk, is a risk that affects all assets, driven by macroeconomic factors such as fluctuations in interest rates, inflation, and geopolitical crises (Santos et al., 2022). Because it is inherent to the entire financial system, this type of risk cannot be eliminated by diversification; it remains present regardless of investment choices. The literature suggests that although systematic risk is inevitable, effective management can mitigate its effects (Santos et al., 2022; Vieira, 2023).

For example, companies that adopt hedging and predictive analysis strategies can protect their earnings during high volatility. In addition, organizational resilience in the face of external shocks becomes a competitive advantage, better positioning these companies in the market (Nunes et al., 2024).

On the other hand, idiosyncratic risk is specific to a company or sector, arising from factors such as management decisions, innovations, or internal problems (Lima, 2024). Unlike systematic risk, idiosyncratic risk can be reduced by diversifying investments. A company with strong governance and risk management practices can better control its idiosyncratic risk, making it more attractive to investors (Carvalho et al., 2024). The interrelationship between these risks suggests that, while systematic risk predominates in crisis contexts, idiosyncratic risk proves to be crucial for assessing individual company performance.

A manager attentive to these dynamics can protect assets from broader risks and exploit specific market opportunities (Lima, 2024). In an ever-changing economic environment, the combination of rigorous analysis of systematic and idiosyncratic risks becomes vital for the sustainability and success of companies.

2.2 Tax Litigation in Brazil

Tax litigation in Brazil reflects the complexity of the tax system and the frequent disputes between taxpayers and tax authorities. As Lopo Martinez et al. (2024) highlighted, this complexity, evidenced in the World Bank's Doing Business Report (2020), generates an environment susceptible to controversy, with Brazilian companies facing long compliance periods with their tax obligations. Baldivieso (2022) points out that habitual litigants, with greater knowledge of the process and institutional connections, prolong tax disputes, generating uncertainty and additional costs for companies. Divergences in interpreting tax laws are common causes of these disputes (Machado, 2021), exacerbated by the constant evolution of tax laws in Brazil, as highlighted by Lopo Martinez et al. (2024).

Despite the difficulties, tax litigation also reflects the search for greater legal certainty, with taxpayers and tax authorities trying to clarify legal issues and ensure the fair application of the rules. Companies in Brazil, concerned about tax litigation, adopt sophisticated planning and risk management practices, as suggested by Lopo Martinez et al. (2024), to deal with the challenges of the tax system. Thus, tax litigation impacts companies' capital structure complexly, influencing their financial decisions. In short, understanding the causes and consequences of tax litigation is essential to promoting tax justice, legal certainty, and economic growth in Brazil.

2.3 Association between Systematic and Idiosyncratic Risk and Tax Litigation

Risk management in companies is a crucial issue, especially when considering tax litigation. Risks can be classified as systematic and idiosyncratic, impacting organizations' strategic and financial decisions.

Systematic risk, which affects the market as a whole, includes uncertainties related to changes in tax policies, changes in tax legislation, and economic crises. According to Lopo Martinez et al. (2024), tax legislation variations can significantly impact companies' stability, introducing risks that transcend an organization's specific operations. This volatility can result in tax litigation, where companies must deal with legal disputes regarding tax interpretations.

On the other hand, idiosyncratic risk refers to factors specific to each company, such as internal management, accounting practices, and tax compliance. Baldivieso (2022) argues that companies with a robust organizational culture and effective compliance practices tend to reduce their chances of facing tax litigation. Thus, organizations that invest in internal audits and training their teams can mitigate idiosyncratic risks, reducing their exposure to litigation.

The interrelationship between systematic and idiosyncratic risks in the tax context becomes evident during economic uncertainty. (Machado, 2021) notes that an unstable tax environment can exacerbate risks, as companies that do not adapt quickly to new rules face greater chances of litigation. Therefore, effective risk management must consider the impact of external forces and the organization's internal resilience.

Furthermore, tax litigation represents a financial cost and a significant reputational risk. Lopo Martinez et al. (2024) points out that tax litigation cases can affect the market's perception of a company, impacting its commercial relations and ability to attract investment. Therefore, companies must develop strategies that integrate the management of systematic and idiosyncratic risks, promoting a proactive approach to mitigating tax litigation.

In short, the association between systematic and idiosyncratic risk and tax litigation is complex and multifaceted. The integration of risk management strategies, which includes both the analysis of market factors and the effectiveness of internal practices, is fundamental to guaranteeing the sustainability and competitiveness of companies.

2.4 Tax Litigation as a Determining Factor of Systematic and Idiosyncratic Risk in Companies

The literature addresses various determinants of business risk, and a new variable that can be explored to identify its influence is tax litigation (**TL**). Studies, such as that by Lopo Martinez et al. (2024), have observed that the complexity and inflexibility of the Brazilian tax system are distinctive characteristics. Due to compliance requirements and the management of tax litigation, companies face various challenges that can impact their systematic and idiosyncratic risk. Despite the significant importance of tax litigation (**TL**) in the business context, there is a notable lack of studies exploring the relationship between **TL** and the systematic (Beta) and idiosyncratic risk of companies. To date, the literature does not include a specific analysis of how tax litigation influences these types of risks, which creates a gap in the understanding of the effects of **TL** on the stability and volatility of companies.

Growing tax litigation makes companies' operations more complex, affecting tax compliance and financial risk. Companies involved in tax disputes face uncertainties that can increase their market volatility (Beta) and their specific risk. Constantino (2021) points out that

tax litigation can compromise the reliability of accounting estimates related to tax liabilities and contingency provisions, factors that can intensify risks unique to each company.

Therefore, tax litigation (**TL**) is an important component that directly impacts business risk, both systematic and idiosyncratic. With the legal and regulatory system constantly changing in Brazil, **TL** can play a significant role in the volatility and instability of companies. In this sense, the lack of specific studies on this relationship highlights the need for research to fill the gap in the literature.

It is also important to note that this research represents an unprecedented contribution to the Brazilian scenario. To date, no studies specifically explore how tax litigation influences the systematic and idiosyncratic risk of companies in Brazil. Therefore, this research aims to fill this gap in the literature, providing valuable insights into a new variable determining business risk in the Brazilian context.

2.4.1 Formulation of the hypothesis: Examining the impact of Tax Litigation on Companies Systematic and Idiosyncratic Risk*

Based on the literature review on the subject, there is a need to investigate the impacts of tax litigation on the systematic and idiosyncratic risk of companies, considering the role of the size and profitability of organizations, since there are still no studies on this subject, which makes this research unprecedented.

Research hypothesis 1 (H1) posits that **H1 - Tax litigation increases companies' systematic risk (Beta).** This hypothesis explores the relationship between tax litigation and companies' systematic risk, as measured by Beta. H1 suggests that tax disputes and related litigation increase the volatility of a company's shares concerning the market as a whole. By indicating that tax litigation contributes to an increase in Beta, the research aims to investigate whether the uncertainties and costs associated with tax cases increase companies' sensitivity to market variations, resulting in greater systematic risk. This study is crucial because identifying this correlation offers valuable insights for investors and managers on how exposure to tax litigation can impact companies' perception of risk and financial stability in the market.

Research hypothesis 2 (H2) posits that **H2 - Tax litigation increases companies' idiosyncratic risk.** This hypothesis seeks to explore the relationship between tax litigation and companies' idiosyncratic risk, which refers to the specific risk of each organization unrelated to fluctuations in the general market. H2 posits that tax disputes and related litigation increase companies' idiosyncratic risk, suggesting that these tax conflicts negatively impact internal and unique aspects of companies, such as their operations, reputation, and financial stability. By investigating this hypothesis, the research aims to reveal whether the uncertainties and costs arising from tax litigation can exacerbate each company's specific challenges, resulting in greater risk that diversification cannot mitigate. This analysis is essential because identifying a possible correlation offers important insights for managers and investors into how tax litigation can affect a company's internal risks and market performance, highlighting the importance of effective tax risk management for organizational sustainability and success.

In addition, research hypothesis 3 (H3) proposes: **H3 - Company size reduces the effect of tax litigation on systematic risk.** Larger companies generally have more resources and capacity to manage tax litigation effectively. They can count on more robust legal and tax teams, access to specialized consultants, and greater negotiating power with tax authorities. Consequently, the impact of tax litigation on systematic risk tends to be lower for these

companies. In addition, larger companies generally have more diversified operations, which can help mitigate the impact of specific tax litigation on their overall market risk. Business and market diversification can provide a natural hedge against specific tax shocks. The market may also perceive that larger companies have a greater capacity to absorb potential losses from tax litigation without significantly compromising their overall financial position. This can result in a lower sensitivity of the company's Beta to its tax litigation.

Finally, research hypothesis 4 (H4) proposes **that H4 - Company profitability (ROA) moderates the relationship between tax litigation and idiosyncratic risk, weakening the effect for more profitable companies.** More profitable companies generally have a greater capacity to absorb the potential costs associated with tax litigation. They may have more financial resources to deal with possible fines, tax adjustments, or legal costs without significantly compromising their financial position or future operations. High profitability can signal to the market that the company has efficient management and sound business strategies. This can lead investors to perceive that the company is well-positioned to manage its tax risks effectively, thus reducing the impact of tax litigation on idiosyncratic risk. In addition, more profitable companies may have greater flexibility to adjust their tax strategies in response to litigation, minimizing the long-term impact on their cash flows and financial results. This flexibility can reduce the uncertainty associated with tax litigation, mitigating its effect on the company's idiosyncratic risk.

Given the gap in the literature and the practical importance of the relationship between tax litigation and companies' systematic and idiosyncratic risks, this research seeks to fill a significant knowledge gap. By investigating the proposed hypotheses, we hope to contribute to a deeper understanding of the determinants of tax litigation and how it can influence these crucial aspects for companies. In addition, the results of this study can provide valuable insights for managers, regulators and policymakers, assisting in developing strategies and practices to mitigate the risks associated with tax disputes. Ultimately, this research aims to provide a solid basis for informed decision-making, promoting stability, resilience, and efficiency in the business environment.

3 Methodology

3.1 Method

The method used in this study is quantitative descriptive, as defined by Barros and Lehfeld (2000, p. 70), complemented by panel data analysis. Using numerical data and statistics, this approach is appropriate for testing hypotheses and investigating causal relationships between variables. Panel data analysis allows exploring the relationship between tax litigation and its impact on companies' systematic and idiosyncratic risk over time and between different organizations.

This methodology allowed for a detailed analysis of the characteristics and patterns within the data. It was applied in this study to explore the relationship between the remuneration of independent auditors and various variables in companies listed on B3. A comprehensive literature review was conducted, following the examples set by Rossetti (2017), Salles, Liu, and de Abreu Rodrigues (n.d.), Teodósio, Madaleno, and Vieira (2022), Conte and Ceretta (2021), and Pereira (2020). The purpose of the review was to identify relevant studies on tax litigation and its connection to companies' systematic and idiosyncratic risks. This review provided the

foundation for the study's key concepts, theoretical model, and statistical methods.

3.2 Data Collection Procedures

The study began with a population of 386 companies listed on B3 between 2017 and 2022. After excluding 34 financial companies and 56 without information on tax contingencies and removing 63 companies without other relevant data, the final sample totaled 233 companies. The quantitative description of the financial data, according to Soyemi (2021), resulted in 1,398 observations detailed in Table 1. The data was mainly obtained from the Comdinheiro platform, considered secondary due to its origin in other sources.

Table 1: Sample Selection: B3 Listed Companies

Sub-sector	Company	Observations
Agribusiness	3	18
Water and Sanitation	4	24
Processed foods	11	66
Consumer Goods and Retail	13	78
Biofuels, Gas and Oil	10	60
Pulp, Paper, and Wood	6	36
Trade	12	72
Construction and Real Estate	28	168
Energy and Basic Services	33	198
Holding	7	42
Industry	8	48
Industry - Machinery and Equipment	7	42
Industry - Construction Materials	2	12
Industry - Road Equipment	6	36
Computing	2	12
Metallurgy and Steel	11	66
Mining	2	12
Participation	1	6
Petrochemical	4	24
Health	14	84
Services	13	78
Educational Services	4	24
Fabrics, Clothing and Footwear	12	72
Information Technology	5	30
Transport	13	78
Household Utilities	2	12
Total	**233**	**1.398.**

Source: B3

The Comdinheiro platform offers a robust database, providing access to detailed financial information on companies, including essential data such as assets, liabilities, company

size (Size), financial leverage (Lev), return on assets (Roa), and tax litigation (TL). Tax litigation, which represents companies' exposure to tax issues, is calculated as the sum of the tax provision and the contingent tax liability divided by total assets.This data was fundamental for structuring the variables in this study. Data collection covered 233 companies over five years, from 2017 to 2022. After completing the data collection and transformation stages, the variables were organized in a panel format, facilitating the longitudinal monitoring of each company's information over time. The analysis seeks to understand how tax litigation, company size, financial leverage, and profitability influence companies' risks, both systematic and idiosyncratic. The expected results should provide insights into the relationship between these variables and the risk behavior of companies over time.

3.3 Data Analysis Procedures

The study followed a quantitative approach to analyzing the collected data, as Deyganto (2021) suggested. First, the data was organized into an electronic database using statistical software, where it underwent descriptive analyses to examine key characteristics, such as means and standard deviations. Correlation analyses were then conducted to explore the relationships between the variables of interest. The multiple linear regression model was used to identify the main factors associated with the dependent variables. All statistical procedures were carried out at a 5% significance level.

3.4 Variables

This section presents the definitions of the variables, most of which are derived from financial information obtained from the Comdinheiro database. The aim is to investigate the relationship between tax litigation and company risk, both systematic and idiosyncratic, and to explore how company size and profitability influence this relationship. The research seeks to understand whether tax litigation affects corporate risk and whether characteristics such as size and profitability can moderate this effect. After selecting the sample of companies listed on B3, a set of variables is presented, which will be used in the analysis.

- ***Beta*:** Measures a stock's sensitivity or volatility to the whole market. A beta greater than one indicates that the stock is more volatile than the market, while a beta less than 1 suggests that the stock is less volatile (Lopo Martinez & Martins, 2020; Seo, 2023).
- ***Idiosyncratic (IdioRisk)*: Refers to the risk specific to a company or asset that diversification cannot eliminate.** It is the part of the risk that is unique to the company, unlike market risk (Lopo Martinez & Martins, 2020; Seo, 2023).
- *Tax Litigation (TL*): Represents the value of tax issues in pending proceedings, calculated by adding the tax provision and contingent tax liability divided by total assets (Campello, Graham, & Harvey, 2010; Bastos, Forte, & Nakamura, 2013; Lopo Martinez et al., 2024).
- ***Size:*** Variable represented by the natural logarithm of the company's total assets (Fluck, Holtz-Eakin & Rosen, 1998; Rajan & Zingales, 1995; Akinyomi, 2022).
- ***Leverage (Lev):*** Degree of financial leverage, calculated by the sum of current and non-current liabilities divided by total assets (Pinheiro, 2024; Bastos & Nakamura, 2009; Lopo Martinez et al., 2024).
- ***Return on Assets (ROA):*** Measures a company's efficiency in generating profit from its assets, calculated as net profit divided by total assets (De Sousa Silva, de Oliveira

Maximo, & de Sousa Ribeiro, 2023; Damasceno & de Lorena Stanzani, 2024; Stüpp & Flach, 2023).

- ***TL x Roa*:** Represents the interaction between tax litigation and return on assets and may indicate how tax litigation affects a company's efficiency in using its assets to generate profit. This analysis is proposed as an original contribution of this study, seeking to explore the potential implications of this interaction on corporate finance.
- *TL x Size*: This represents the interaction between tax litigation and company size, suggesting how the impact of tax litigation may vary according to company size. This interaction is an original proposal of this study, aimed at investigating how company size can influence how tax disputes affect its operations and risks.

3.5 Econometric Model

3.5.1 Effects of Tax Litigation on Systematic Risk

To test the hypothesis, equations 1 and 2 below were estimated using panel data:

$$Beta_{(t+1)} = \alpha_0 + \alpha_1 TL_{(it)} + \alpha_2 Size_{(it)} + \alpha_3 Lev_{(it)} + \alpha_4 Roa_{(it)} + \alpha_5 (TL_{(it)} \times Size_{(it)}) + \epsilon_{it} \quad (1)$$

Model 1 aims to predict the company's Beta in period (t+1) based on financial and tax variables in the current period (t). The model investigates the direct impact of each explanatory variable (such as tax litigation, company size, leverage, and profitability) on the future Beta but also explores how the interactions between tax litigation and other factors (profitability and size) affect the company's Beta.

$$Idiorisk_{(t+1)} = \alpha_0 + \alpha_1 TL_{(it)} + \alpha_2 Size_{(it)} + \alpha_3 Lev_{(it)} + \alpha_4 Roa_{(it)} + \alpha_5 (TL_{(it)} \times Roa_{(it)}) + \epsilon_{it} \quad (2)$$

The model aims to predict the company's idiosyncratic risk in the period (t+1) using financial and tax variables similar to the previous model, except for the interaction between tax litigation and company size. The model examines how tax litigation, size, leverage, profitability, and the interaction between tax litigation and profitability influence idiosyncratic risk, which is the risk specific to the company and unrelated to the market. Where β_0 indicates the intercept, $\epsilon_{(it)}$ represents the error term, and the other variables are defined in section 3.4. The estimation method is LS (Least Squares) - or LS and AR (Autoregressive).

This model was developed to investigate the relationship between tax litigation and companies' systematic (Beta) and idiosyncratic risks, analyzing the influence of factors such as company size, leverage, profitability, and their interactions with these risks. In addition, the variable Size, which represents the company's size, was transformed by the Neperian logarithm to ensure a better fit with the model's assumptions. Statistical analysis confirms the relationship when it reveals significance, indicated by a p-value of less than 0.05. This shows that tax litigation, together with variables such as size and profitability, significantly influences companies' systematic and idiosyncratic risks.

4 Analysis of Results

The results of this study are presented in this section. Firstly, the data was analyzed using descriptive statistics (Table 2), univariate analysis of mean differences (Table 3), scatter plot, and correlation matrix of the variables (Table 4). Table 2 provides an overview of the data,

while Table 3 identifies the means of the variables along the quartiles, revealing possible trends or patterns. Table 4 illustrates the relationships between the variables. Next, the model estimation results are presented and analyzed, with the conclusions highlighted. The significant relationships identified in the analysis are shown in Table 5.

4.1 Descriptive Statistics

To carry out the econometric analysis envisaged in the models developed exclusively for this study, 1,398 observations were collected. The descriptive statistics of the variables included in equations 1 and 2 are shown in Table 2.

Table 2: Descriptive Statistics

Variables	Minimum	1st Quartile	Median	Average	3rd Quartile	Maximum	Standard Deviation
Beta	-0.508	0.598	0.838	0.888	1.141	4.974	0.426
Idiorisk	0.000	0.000	0.312	0.351	0.481	11.386	0.473
TL	0.000	0.007	0.033	0.168	0.106	7.293	0.602
Size	2.150	6.942	8.227	8.198	9.514	13.802	1.890
Lev	0.050	0.461	0.632	0.936	0.789	55.536	2.911
Roa	-1459.898	-0.170	4.028	1.896	7.850	1549.216	61.027
TL x Roa	-248.833	0.051	0.048	-0.688	0.928	513.790	19.321
TL x Size	0.000	0.000	0.281	1.258	0.324	47.511	3.920

Beta: Measures a stock's sensitivity or volatility to the whole market. A beta greater than one indicates that the stock is more volatile than the market, while a beta less than 1 suggests that the stock is less volatile. **Idiosyncratic (IdioRisk)** Refers to the risk specific to a company or asset that diversification cannot eliminate. It is the part of the risk that is unique to the company instead of market risk. **Tax Litigation (TL)**: Represents the value of tax issues in pending cases, calculated by adding the tax provision and contingent tax liability divided by total assets**; Size**: Variable represented by the natural logarithm of the company's total assets; **Leverage (Lev)**: Degree of financial leverage, calculated by the sum of current and non-current liabilities divided by total assets; **Return on Assets (Roa):** Measures the company's efficiency in generating profit from its assets. Calculated as net profit divided by total assets; **TL x Roa**: Represents the interaction between tax litigation and return on assets and may indicate how tax litigation affects a company's efficiency in using its assets to generate profit; **TL x Size**: Represents the interaction between tax litigation and company size, suggesting how the impact of tax litigation may vary according to company size.

Source: Prepared by the authors

Table 2 shows the descriptive statistics of the study's main variables. The Beta variable, which measures systematic risk, shows an average of 0.888 and a standard deviation of 0.426. These figures indicate that, on average, companies have a slightly lower volatility than the market. Still, the significant variation between Beta values, which range from -0.508 to 4.974, reflects different levels of risk companies face, directly impacting investors' strategies.

IdioRisk (Idiosyncratic Risk), with an average of 0.351 and standard deviation of 0.473, shows a substantial variation in the specific risk of companies, with maximum values reaching 11.386. This risk, which is not correlated with the market, can be particularly relevant for investors seeking diversification, reflecting specific internal or sectoral challenges.

Tax litigation (TL) has a mean of 0.168 and a standard deviation of 0.602, suggesting that although many companies in the sample have low levels of tax litigation, some face considerable tax disputes, with a maximum value of 7.293. These disputes can represent significant legal and financial risks for the companies affected, negatively influencing their

market perception.

The Size variable, with a mean of 8.198 and a standard deviation of 1.890, reflects a diverse sample of company size, with values ranging from 2.150 to 13.802. Larger companies tend to have greater capacity to mitigate tax and financial risks, which can be a competitive advantage in the market.

Financial leverage (Lev), with an average of 0.936 and a standard deviation of 2.911, indicates a significant variation in debt levels between companies. With values reaching a maximum of 55.536, it is clear that some companies are highly leveraged, increasing their financial risk, especially in unfavorable economic scenarios.

The return on assets (Roa), with an average of 1.896 and a standard deviation of 61.027, highlights a huge variation in the profitability of companies, from significant losses (-1459.898) to substantial gains (1549.216). This variability can indicate both opportunities and risks, depending on the management strategy adopted by each company.

The TL x Roa and TL x Size interactions provide additional insights into how tax litigation affects profitability and company size. The negative mean of TL x Roa (-0.688) suggests that tax litigation may be associated with lower returns on assets, while the variability in TL x Size (mean of 1.258 and standard deviation of 3.920) indicates that the impact of tax litigation varies with company size, being more pronounced in larger companies.

These results emphasize the importance of considering tax litigation, size, leverage, and profitability when assessing the risk and performance of companies in the market. The differences in descriptive statistics indicate the need for careful analysis when making investment decisions, considering the various risk factors that affect companies.

4.2 Univariate Analysis of Differences of Means

Table 3 presents the results of the univariate difference of means test, showing how the Beta Average and Idiorisk Average variables behave within the different Tax Litigation (TL) quartiles.

Table 3: Univariate Difference of Means Test

Variables	Q1 (25%)	Q2 (50%)	Q3 (75%)	Q4 (100%)
TL	0.007	0.034	0.106	7,293
Beta Average	0.898	0.852	0.866	0.935
Idiorisk Average	0.310	0.340	0.321	0.433

Tax Litigation is divided into quartiles (Q1, Q2, Q3, Q4), with Q1 representing the Quartile of companies with the lowest levels of tax litigation and Q4 representing the Quartile of companies with the highest levels of tax litigation.

Within these Tax Litigation quartiles, we observed the behavior of the averages of the Beta Average and Idiorisk Average variables. The average Beta is relatively stable in the first three quartiles, varying from 0.898 in Q1 to 0.866 in Q3. However, there is a small increase in Q4, where the average Beta reaches 0.935. This suggests that although systematic risk is relatively constant in the first three quartiles, it tends to be higher in companies in the top Quartile of Tax Litigation, indicating that these companies face a slightly higher systematic risk.

The Idiorisk Average variable also shows similar behavior. The Idiorisk averages vary

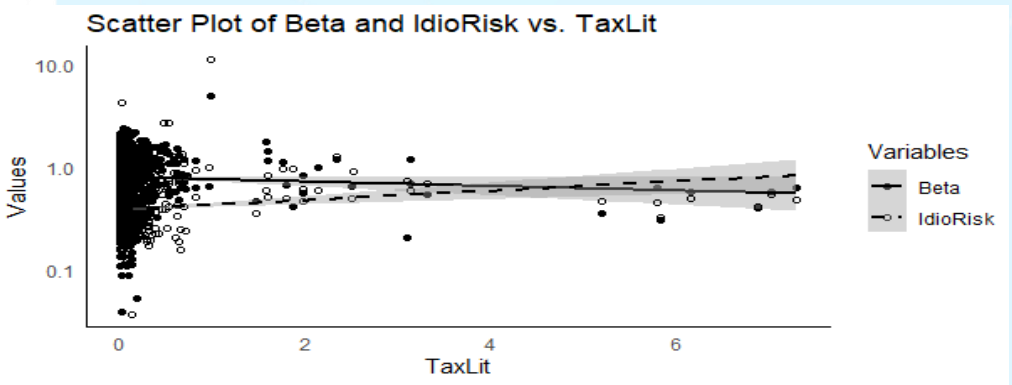
slightly between 0.310 and 0.340 in the first three quartiles. However, in Q4, when companies have the highest levels of tax litigation, the Idiorisk average increases to 0.433. This suggests that companies with higher tax litigation face higher systematic risk and higher idiosyncratic risk, which may be related to specific and complex factors in these companies' operations.

In addition, the Welch Two Sample t-test reveals statistically significant differences between the upper and lower quartiles of Tax Litigation. These results indicate that systematic and idiosyncratic risks increase as companies move into higher quartiles of tax litigation. This reflects a riskier operating environment for these companies, which is crucial for investors and managers to consider when assessing the stability and performance of companies.

4.3 Scatter Plot Analysis

The scatter plot illustrates the relationship between TL (tax litigation) and the Beta and IdioRisk variables. The dashed lines represent the trends for these variables, with shaded areas indicating confidence intervals.

The graph shows a slight upward slope in the Beta trend line as TL increases. This suggests that companies with higher levels of tax litigation tend to have a slightly higher systematic risk. In market terms, this behavior may reflect a perception of greater risk associated with these companies, possibly due to the uncertainty and volatility generated by prolonged or complex tax disputes.



The IdioRisk trend line also shows an upward slope, albeit more subtly. This indicates that as tax litigation increases, companies' idiosyncratic risk, which is related to specific internal or sectoral factors, also tends to increase. The dense concentration of points to the left of the graph, where TL is low, reveals that most companies in the sample have low levels of tax litigation. However, as TL increases, the dispersion of points becomes more evident, especially to IdioRisk, suggesting greater variability in the behavior of companies facing high levels of tax litigation.

From the market's point of view, the correlation between the increase in TL and the increase in the averages of Beta and IdioRisk suggests that companies with higher tax litigation are perceived as riskier, both in terms of market exposure and specific risks. Investors and managers need to consider these factors when assessing the attractiveness and risk of investing in companies with high levels of tax litigation, given that the associated volatility can negatively impact market valuations and investor confidence. In summary, the graph reinforces the idea

that greater tax litigation is associated with increasing companies' systematic and idiosyncratic risk, underlining the importance of effective tax risk management to mitigate negative impacts on market perception and long-term financial stability.

4.1.4 Variable Correlation Matrix

In analyzing the correlation matrix of the variables, we compared the Pearson and Spearman coefficients. The robustness of the Shapiro-Wilk test in evaluating Spearman's correlation eliminated the need for data to be normal, considering atypical values.

Spearman's correlation Table 4 reveals some significant relationships between the variables analyzed. The correlation between Beta and IdioRisk is weak (0.272), indicating that companies' systematic and idiosyncratic risks are slightly related but not significantly so. This suggests that, in the market, companies with greater exposure to market risk do not necessarily face higher specific risks.

Table 4: Correlation Matrix

	Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
(1)	Beta		0.272	0.028	0.146	0.083	-0.206	-0.138	0.045	Spearman
(2)	Idiorisk	0.346		0.127	-0.459	0.283	-0.403	-0.353	0.084	
(3)	TL	-0.064	0.097		0.109	0.234	-0.083	0.359	0.993	
(4)	Size	0.126	-0.291	-0.139		0.090	0.094	0.243	0.203	
(5)	Lev	0.016	0.321	0.250	-0.217		-0.406	-0.231	0.244	
(6)	Roa	-0.142	-0.411	-0.125	0.196	-0.443		0.741	-0.082	
(7)	TL x Roa	-0.050	-0.287	-0.000	0.110	-0.224	0.589		0.367	
(8)	TL x Size	-0.066	0.080	0.991	-0.080	0.251	-0.113	0.004		

Pearson

Beta: Measures a stock's sensitivity or volatility to the whole market. A beta greater than one indicates that the stock is more volatile than the market, while a beta less than 1 suggests that the stock is less volatile. **Idiosyncratic (IdioRisk)** Refers to the risk specific to a company or asset that diversification cannot eliminate. It is the part of the risk that is unique to the company instead of market risk. **Tax Litigation (TL)**: Represents the value of tax issues in pending lawsuits, calculated by adding the tax provision and contingent tax liability divided by total assets**; Size (Size)**: Variable represented by the natural logarithm of the company's total assets; **Leverage (Lev)**: Degree of financial leverage, calculated by the sum of current and non-current liabilities divided by total assets; **Return on Assets (Roa):** Measures the company's efficiency in generating profit from its assets. Calculated as net profit divided by total assets; **TL x Roa**: Represents the interaction between tax litigation and return on assets and may indicate how tax litigation affects a company's efficiency in using its assets to generate profit; **TL x Size**: Represents the interaction between tax litigation and company size, suggesting how the impact of tax litigation may vary according to company size.

Source: Prepared by the authors

TL has a very weak correlation with Beta (0.028) and IdioRisk (0.127), implying that tax litigation has no significant impact on systematic or idiosyncratic risk. In the market, this suggests that tax disputes alone are not a critical factor in assessing the risk of these companies.

On the other hand, financial leverage (Lev) shows a weak but notable correlation with IdioRisk (0.283), indicating that more leveraged companies tend to face greater specific risks. This reflects the importance of debt in amplifying financial risks. A moderate correlation of 0.741 between ROA and TL x Roa highlights the strong dependence between economic performance and the impact of tax litigation on companies' operational efficiency, underlining

the importance of considering both factors when assessing financial health. Finally, the very strong correlation (0.993) between TL and TL x Size confirms the interdependence of these variables, showing that company size combined with tax litigation is a crucial aspect of risk analysis. In summary, while most correlations are weak, reflecting limited relationships, financial leverage, operating performance, and tax litigation appear to be the most relevant factors for assessing market risk.

4.2 Discussion of Results

The results presented in Table 5 provide insights into how tax litigation and financial indicators impact companies' systematic risk (Beta) and idiosyncratic risk (IdioRisk). These results reveal important relationships between the variables analyzed and their implications for the market.

The positive and highly significant coefficient of the intercept (C) for both Beta (0.503***) and IdioRisk (0.519***) suggests that, even in the absence of variation in the other variables, companies have a basic level of risk, whether in terms of market volatility or specific risk. This finding highlights an inherent risk in business operations, regardless of other factors.

Tax litigation (TL) is significant in both models, with a positive coefficient of 0.427** for Beta and 0.044** for IdioRisk. In the context of Beta, this suggests that companies involved in tax disputes tend to be more volatile to the market, possibly reflecting the uncertainty that these disputes bring.

Table 5: Regression of Tax Litigation and Financial Indicators on BETA and Idiosyncratic Risk

	Beta	**Idiorisk**
C	0.503***	0.519***
TL	0.427**	0.044**
Size	0.049***	-0.020***
Lev	-0.005	-0.010**
Roa	-0.006***	-0.000
TL x Roa		-0.002***
TL x Size	-0.069**	-
R-Squared	0.058	0.027
Adjusted R-squared	0.052	0.024
Standard error	0.415	0.467
F-Statistic	9.333	7.918
Observations	910	1398

Beta: Measures a stock's sensitivity or volatility to the whole market. A beta greater than one indicates that the stock is more volatile than the market, while a beta less than 1 suggests that the stock is less volatile. **Idiosyncratic (IdioRisk):** Refers to the risk specific to a company or asset, which diversification cannot eliminate. It is the part of the risk that is unique to the company instead of market risk. **Tax Litigation (TL)**: Represents the value of tax issues in pending lawsuits, calculated by adding the tax provision and contingent tax liability divided by total assets**; Size (Size)**: Variable represented by the natural logarithm of the company's total assets; **Leverage (Lev)**: Degree of financial leverage, calculated by the sum of current and non-current liabilities divided by total assets; **Return on Assets (Roa):** Measures the company's efficiency in generating profit from its assets. Calculated as net profit divided by total assets; **TL x Roa**: Represents the interaction between tax litigation and return on assets and may indicate how tax litigation affects a company's efficiency in using its assets to generate profit; **TL x Size**: Represents the interaction between tax litigation and company size, suggesting how the impact of tax litigation may vary according to company size.

***, ** and * indicate statistical significance at 1%, 5% and 10%

Source: Prepared by the authors

In the case of IdioRisk, although the impact is smaller, the significance indicates that tax litigation also contributes to increasing the specific risk of companies, reinforcing the importance of efficient tax management to mitigate risks.Company size (Size) shows a significant and positive impact on Beta (0.049***), indicating that larger companies tend to have greater volatility in the market. This result can be attributed to these companies' greater complexity and exposure, making them more susceptible to market fluctuations. On the other hand, the impact of Size on IdioRisk is negative and significant (-0.020***), suggesting that larger companies can somehow mitigate specific risks, possibly due to a greater capacity for internal diversification and resources to face idiosyncratic challenges.

Financial leverage (Lev) had a negative and significant impact on IdioRisk (-0.010**) but was not significant to Beta. This indicates that more leveraged companies face greater specific risks, but this leverage does not significantly affect their exposure to market risk. This finding is important for the market, as it suggests that indebtedness can increase vulnerability to internal risks without necessarily altering the company's sensitivity to market conditions. Profitability (Roa) negatively and significantly impacts Beta (-0.006***), indicating that more profitable companies tend to have lower systematic risk. This result suggests that profitability acts as a buffer against market volatility, probably because investors perceive companies with better financial performance as more stable. However, Roa showed no statistical significance to IdioRisk, implying that profitability is not a key determinant of company-specific risk.

The interaction between TL and ROA showed a negative and significant impact on IdioRisk (-0.002***), indicating that tax litigation combined with profitability mitigates specific risks. This may suggest that companies that can maintain good profitability even when facing tax disputes can somehow limit the negative impact of these disputes on their specific risks.

Finally, the interaction between TL and Size has a negative and significant impact on Beta (-0.069**), suggesting that the effect of tax litigation on systematic risk decreases as company size increases. This result highlights the ability of large companies to better manage the impacts of tax disputes on their market risk, perhaps due to better compliance and risk management resources.

The R-squared and adjusted R-squared values indicate that, although the models explain a modest part of the variability in Beta (5.2%) and IdioRisk (2.4%), the variables included are relevant to understanding the dynamics of risk in companies. In the market, these insights are valuable for managers and investors looking for strategies to mitigate risks related to tax litigation, company size, and financial leverage, balancing profitability with the management of both systematic and idiosyncratic risks.

5 Conclusion

This study investigated the relationship between tax litigation and the systematic (Beta) and idiosyncratic risks of companies, considering the moderating role of the size and profitability of organizations. Using a linear regression model, assessing how tax litigation impacts these types of risks was possible. The analyses were based on a robust data set, totaling 1,398 observations of companies listed on B3 between 2017 and 2022, which allowed for a detailed assessment of the interactions between the variables.

The results of the analysis confirmed all the proposed hypotheses. Hypothesis H1, which suggested that tax litigation increases the systematic risk of companies, was confirmed. The positive and significant Beta coefficient indicated that tax disputes and litigation are associated with greater volatility of company shares to the market. Hypothesis H2, which proposed that tax litigation also increases companies' idiosyncratic risk, was also confirmed. This result suggests that tax conflicts affect not only the company's relationship with the market but also aggravate the specific risks of each organization, such as its operations and financial stability.

In addition, hypothesis H3, which proposed that company size reduces the effect of tax litigation on systematic risk, was also confirmed. Larger companies, with more resources and capacity to manage tax litigation, showed a lower sensitivity of Beta to tax litigation, highlighting the importance of diversification and organizational robustness in mitigating this risk. Finally, hypothesis H4, which suggested that company profitability moderates the relationship between tax litigation and idiosyncratic risk, was also confirmed. More profitable companies showed less influence of tax litigation on idiosyncratic risk, indicating that robust financial capacity allows for better absorption of the costs associated with tax litigation, minimizing the negative impact of these conflicts.

These findings offer valuable insights for managers, regulators, and policymakers. Confirmation of the hypotheses suggests that tax litigation is a critical factor that can significantly influence the risks faced by companies. Larger and more profitable companies, due to their greater management capacity and resources, are better placed to mitigate the negative impacts of such litigation. On the other hand, smaller or less profitable companies may need additional strategies to manage these risks effectively.

Ultimately, this study contributes to a deeper understanding of the systematic and idiosyncratic risk determinants of tax litigiousness as a novel determinant, filling an important gap in the literature. Future studies could expand this analysis by exploring how different sectors or regulatory contexts influence the relationship between tax litigation and business risks.

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