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ASSET INFORMATIVENESS AND THE SYSTEMATIC RISK OF REGULATED INFRASTRUCTURE FIRMS AFTER THE ADOPTION OF IFRS IN BRAZIL

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ABSTRACT

This study analyzes the relationship between the informativeness of accounting assets and the systematic risk of regulated infrastructure firms in Brazil following the adoption of IFRS, with a focus on companies applying IFRIC 12. Using data from 89 Brazilian firms listed on B3, including 21 regulated firms that adopted IFRIC 12, panel data linear regressions were performed using the difference-in-differences method, covering the period from 2004 to 2022. Asset informativeness was measured by the coefficient of determination (R^2) in regressions of operating income on lagged assets. This study stands out by exploring a relatively under-researched topic: asset informativeness. The findings show that the informativeness of accounting assets in firms applying IFRIC 12 under IFRS is associated with a reduction in systematic risk. However, for firms in general, asset informativeness is positively associated with systematic risk over the entire study period, but negatively associated after IFRS adoption. This study contributes to the literature by introducing a new measure to assess the quality of accounting information and by focusing on firms that applied IFRIC 12. It offers practical insights to financial statement preparers by showing how IFRS and IFRIC 12 enhanced the asset's ability to explain firm performance, thereby reducing systematic risk. It also helps to understand how accounting choices and methods can impact assets and, consequently, firm risk. Additionally, the study supports policymakers, regulators, and investors in identifying the economic consequences of mandatory IFRS adoption on systematic risk, and how this may influence firms' cost of capital and economic value.

Keywords: IFRS. IFRIC 12. Asset Informativeness. Systematic Risk. Regulated Firms.

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1 INTRODUCTION

Infrastructure companies operating in regulated sectors under state concessions to build and/or operate assets whose prices, revenues, or rates of return are defined through regulation and passed on to consumers often operate as natural monopolies. These companies typically require capital-intensive investments in fixed assets and face challenges such as long maturity periods, high asset specificity, sunk costs, and externalities. Moreover, the goods and services they provide are generally inelastic in demand and considered essential.

Before the adoption of international accounting standards in Brazil, mandated by Law No. 11,638 (2007), the operating assets of infrastructure sectors were recorded as property, plant, and equipment. As of 2010, with the introduction of IFRS, these assets were reclassified as intangible and financial assets, in accordance with International Financial Reporting Interpretations Committee 12 – Service Concession Arrangements (IFRIC 12).

This change affected the financial position of entities in these capital-intensive sectors, as the fixed assets were split into components that followed different accounting treatments, in line with specific standards for financial instruments (IFRS 9), intangible assets (IAS 38), and revenue from contracts with customers (IFRS 15), as well as the Conceptual Framework of the International Accounting Standards Board (IASB). This transition also reflected the principles-based approach of IFRS. One financial effect of this modification, for example, is the distribution of dividends based on the remeasurement of the financial asset, which corresponds to the portion of the asset or investment not subject to depreciation or amortization during the concession period.

The adoption of an international accounting standard aims to enhance the comparability of financial information, benefiting investors and other users by improving information quality and reducing interpretation, audit, and capital costs (Barth, 2008). Studies confirm benefits such as increased comparability of financial reports, higher market liquidity, and reduced cost of equity capital (Opare et al., 2021; Moura et al., 2020; Saha & Bose, 2021).

On the other hand, evidence also points to adverse effects, such as increased costs of equity and debt capital, greater information asymmetry, and reduced liquidity in certain contexts (Habib et al., 2019; Bansal, 2023). Furthermore, replacing local accounting standards with IFRS introduced additional challenges, including the loss of jurisdictional standards that captured local economic nuances, especially for Canadian infrastructure companies regulated by rate-of-return, which faced difficulties due to the non-recognition of deferred regulatory assets and liabilities (Akamah et al., 2022).

Regulatory assets and liabilities refer to rights and obligations related to services already provided, which will be included in future revenues through customer tariffs (IASB, 2021). The difficulty in recognizing them stems from controversies over whether they fully meet the definition of assets and liabilities, particularly regarding control and the obligation to transfer economic resources by the entity (IASB, 2014). The debate on the non-recognition of regulatory assets and liabilities is ongoing within the IASB, with only a provisional standard in place IFRS 14 (Regulatory Deferral Accounts). Nonetheless, in the context of regulated companies, the non-recognition of these assets and liabilities has become a priority topic in the literature, with discussions on how different countries have addressed these issues (Flores & Lopes, 2020; Akamah et al., 2022).

This study advances the existing literature focused on regulatory assets and liabilities by exploring the relationship between the quality of accounting information measured by the informativeness of operating assets used in long-term operations and systematic risk in Brazilian regulated firms following the adoption of IFRS.

The informativeness of accounting assets measures a firm's economic capital, based on the premise that the capital stock reflects the productivity of past investments and is a key determinant of future investments. Information about the capital stock can thus help users estimate the firm's

intrinsic value and make informed resource allocation decisions. Accordingly, the expected value of the firm is linked to its capital stock, and asset informativeness increases insofar as it reduces uncertainty about the firm's economic capital following the observation of the accounting asset, since the latter approximates the former with some degree of measurement error.

Chen et al. (2022) developed the asset informativeness variable, represented by the coefficient of determination (R^2) from the regression of after-tax operating income on lagged operating assets. They validated this metric by demonstrating that business models and operating environments influence it, that there is substantial variation across industries, and that asset informativeness tends to be higher in consumer sectors, while it is generally lower in natural resource sectors such as agriculture, coal, and steel.

Traditional measures of accounting information quality are earnings-based, including persistence, smoothing, timely loss recognition, the magnitude of accruals, and the earnings response coefficient (Dechow et al., 2010). Asset informativeness, by contrast, focuses on operating assets rather than earnings, and is particularly relevant for capital-intensive firms, as it captures the significant costs embedded in these assets (Chen et al., 2022).

Research on asset informativeness and its implications remains scarce. In addition to Chen et al. (2022), who developed the metric, recent studies have begun to explore its associations. Heidary et al. (2024), for example, examined its relationship with investor beliefs, emphasizing earnings quality, while Berger and Tomy (2024) employed it as one of several earnings quality measures in their study on supply chain shocks and firm productivity. In Brazil, Cardoso and Britto (2024) investigated the relationship between asset informativeness and systematic risk across all Brazilian publicly traded firms.

Systematic risk is a component of capital pricing models that reflects the sensitivity of stock returns to fluctuations in the capital market, as defined by the Capital Asset Pricing Model (CAPM) (Sharpe, 1964; Mossin, 1966; Lintner, 1965). Recent studies on systematic risk and its associations include international research using variables related to accounting information or financial reporting quality (Siming, 2023; Randika, 2024), as well as national studies examining the quality of accounting information (Teodósio et al., 2023) and the spillover effect of peer firms' earnings quality (Cardoso et al., 2025).

More than a decade after the adoption of IFRS, it becomes relevant to examine how this transition has affected the informativeness of assets and its relationship with systematic risk in regulated firms. This leads to the following research question: **What is the relationship between asset informativeness and systematic risk in regulated infrastructure firms during the IFRS adoption period?**

Based on this question, this study analyzes the relationship between the informativeness of accounting assets and the systematic risk of Brazilian regulated infrastructure firms during the IFRS adoption period in Brazil.

By examining the relationship between asset informativeness and systematic risk in Brazilian firms required to apply IFRIC 12 and, consequently, its implications for the cost of capital this study contributes to the accounting literature on information quality. It offers relevant insights to accounting standard-setters by demonstrating the effects of standards on systematic risk; to economic and financial regulators by enabling a better understanding of potential impacts on financial health indicators and cash flow generation; and to financial statement preparers by showing the possible effects of accounting choices related to the recognition and measurement of financial and intangible assets, as well as the effectiveness of accounting methods in conveying business performance.

It may also contribute to the work of auditors, given the audit risks inherent to the new reporting dynamics. Furthermore, the research supports investors and analysts by providing evidence of a variable that captures the quality of accounting information based on assets, thus

assisting in firm valuation estimates, in the analysis of systematic risk volatility specifically CAPM beta and in assessing the potential implications of the findings for comparability across firms and sectors.

2 BACKGROUND

2.1 Economic Consequences of IFRS Adoption

The global adoption of IFRS was one of the most significant regulatory events in accounting history. Unsurprisingly, it has generated extensive literature addressing its economic consequences. Accounting convergence across countries was promoted as a means to enhance comparability among firms, foster uniformity in the measurement of equity and performance, and facilitate investor decision-making. It was expected that reducing costs for companies and investors, along with encouraging international investment, would lead to a more efficient allocation of resources in the economy (Leuz & Wysocki, 2016).

As of 2022, IFRS had been adopted by more than 167 jurisdictions. The year 2005 marked a key milestone, as European Union countries implemented the standards, impacting approximately seven thousand firms (Armstrong et al., 2010; IASB, 2022).

In the European Union, the mandatory adoption of IFRS was met with a broadly positive market reaction, including improvements in the quality of accounting information, reductions in information asymmetry, and enhanced comparability. These factors, in turn, contributed to a reduction in the cost of capital. However, the extent of this reduction varied depending on the strength of legal enforcement in each country, being less significant or even negative in jurisdictions with weak legal implementation (Li, 2010; Armstrong et al., 2010).

In Canada, for instance, regulated companies were given the option to adopt IFRS or not, since these standards did not allow for the recognition of regulatory assets and liabilities, which were permitted under Canadian GAAP. As a result, replacing local standards with international ones had the potential to impose significant costs on certain firms, which, by adopting IFRS, forfeited a local framework that was better aligned with their economic realities (Akamah et al., 2022).

2.2 The Case of Regulated Infrastructure Firms

he adoption of IFRS brought significant changes for public infrastructure service concessionaires, particularly with regard to the rules for recognizing and measuring concession assets, based on the International Financial Reporting Interpretations Committee (IFRIC 12) – Service Concession Arrangements, issued by the International Accounting Standards Board (IASB) in 2006.

According to IFRIC 12, public concessions occur when a government entity engages a private operator to build, operate, and maintain infrastructure assets. In such cases, the government regulates the services provided, the target users, the pricing, and retains a residual interest in the asset at the end of the contract (IASB, 2006). The interpretation establishes that concession assets should be classified as either intangible or financial. Intangible assets represent the right to operate the concession through user charges, while financial assets refer to the contractual right to receive cash as compensation at the end of the concession.

As of 2010, the recognition of concession assets as property, plant, and equipment was prohibited, since the concessionaire does not hold direct control over the assets but merely operates the infrastructure to provide public services as specified in the contract (Cruz et al., 2009). For financial assets, the provisions of IFRS 9 (Financial Instruments) apply; for intangible assets that are fully amortized over the concession period, IAS 38 (Intangible Assets) is applicable. Amortization is calculated on a straight-line basis over the asset balance. Concessionaires must

also comply with other relevant standards, such as IFRS 16 (Leases), IFRS 15 (Revenue from Contracts with Customers), and the IASB Conceptual Framework for Financial Reporting.

The subsequent measurement of financial assets may be carried out at amortized cost if they are classified as loans and receivables, or at fair value if designated as available-for-sale or measured at fair value through profit or loss (Scalzer et al., 2016). These accounting decisions, made at the beginning of the contract term, have long-term implications, affecting the entire concession period.

Although the goal was to enhance the relevance, reliability, comparability, and understandability of accounting information, the segregation between financial and intangible assets generated controversy. It allowed for greater preparer judgment, increasing the scope for accounting choices (Scalzer et al., 2016), which in turn affect firms' financial results (Watts, 1992).

2.3 Asset Informativeness as a Measure of Accounting Information Quality

According to Leuz and Wysocki (2016), many studies on the quality of accounting information use earnings-based measures, such as earnings management and accruals, as proposed by Healy (1985), Jones (1991), and Dechow et al. (1995). Other studies examine properties of reported earnings, such as timely loss recognition and conservatism (Basu, 1997), earnings smoothing (Ronen & Sadan, 1975), earnings persistence (Dechow & Dichev, 2002), and the value relevance of earnings (Collins et al., 1997).

Although these proxies capture important aspects of reported earnings, they face conceptual and measurement challenges, as highlighted by Dechow et al. (2010). According to the authors, the main difficulty lies in separating a firm's economic condition from its business model. Earnings- and accrual-based indicators reflect economic characteristics of firms, since the accounting system measures economic performance (Kothari et al., 2005), and economic factors that influence accrual characteristics dominate the association between earnings quality and cost of capital (Francis et al., 2005).

This study adopts a different perspective by investigating the quality of accounting information through asset informativeness and its relationship with the cost of capital, particularly systematic risk in Brazilian firms operating in regulated infrastructure sectors. In infrastructure companies, the capital stock was traditionally associated with fixed assets, but with the adoption of IFRS, it became linked to intangible and financial assets.

Capital stock, tied to the firm's productive capacity and future cash flows, influences future investments and can be understood as economic capital. However, since economic capital is not directly observable, the assets recorded in financial statements serve as a proxy (Chen et al., 2022; Kanodia et al., 2005).

A firm's economic value is determined by the existing capital stock at the end of the previous period (K_{t-1}), the investments made in the current period (I_t), the costs associated with that investment (Υ), and the expected productivity ($\tilde{g}_t$) e (Hayashi, 1982; Bai et al., 2016). Before making new investments, the firm observes private information (f) about expected productivity ($\tilde{g}$). The optimal investment that maximizes firm value is expressed in Equation 1.

$$\frac{I_t^*}{K_{t-1}} = \frac{1}{\Upsilon} \mathrm{E}(\tilde{g}|f) \tag{1}$$

The expected productivity of capital stock includes both endogenous components (related to firm management) and exogenous components (external factors), which helps explain the differences between economic capital and accounting assets. These differences include accounting measurement inaccuracies that may affect firm value, as identified by Kanodia et al. (2005) and Chen et al. (2022).

Four main factors account for these inaccuracies, with the last one directly related to IFRS: the selling price of an asset reflects its exit value rather than its value in use; a firm's value arises from the combined contribution of all assets, not the sum of individual asset values; comparative advantages and disadvantages may affect the ability of accounting to capture the firm's actual productivity; and IFRS standardization may introduce inaccuracies due to restrictive recognition and measurement criteria, as well as the inherent need for professional judgment.

In the case of firms holding concession contracts, since 2010. measurement inaccuracies have been associated with financial and intangible assets rather than with property, plant, and equipment. The central question is whether accounting assets remain relevant for decision-making, given their role as a proxy for economic capital. The relationship between accounting assets and economic capital can be represented as shown in Equation 2 (Kanodia et al., 2005; Chen et al., 2022).

$$A_t = K_t + \varepsilon_t \quad (2)$$

Where: A_t represents the accounting asset, composed of the stock of assets and their historical accounting measurements; K_t is the stock of economic capital, including its expected productivity; and ε_t is the error term, which captures the noise in accounting measurement, including the cumulative effect of inaccuracies in accounting valuations made over time in relation to investment.

The informativeness of accounting assets (IA) is defined by the ability of the accounting asset (A_t) to explain economic capital (K_t), or, in other words, the extent to which economic capital is reflected in the accounting asset. If there is any inaccuracy in the measurement of economic capital through accounting, it may have changed following the adoption of IFRS and may have differed in the case of infrastructure firms, given the application of IFRIC 12, making it relevant to investigate this effect.

In their study, Chen et al. (2022) separated asset informativeness into two components: an innate component, which reflects industry behavior and how well accounting standards capture business fundamentals; and a discretionary component, which represents short-term operating decisions and how firm management applies accounting standards (i.e., accounting choices).

2.4 Accounting Information Quality and Its Relationship with Systematic Risk

Accounting theory suggests that higher-quality financial disclosure can help reduce information asymmetry, mitigate adverse selection problems, increase market liquidity, and lower the cost of capital (Admati & Pfleiderer, 1988). The effect of financial disclosure would be reflected in the cost of capital by improving the allocation of risk in the economy and reducing the market risk premium. (Constantinides, 1986; Leuz & Wysocki, 2016).

The beta coefficient (β_{it}) in the Capital Asset Pricing Model (CAPM) captures the volatility of a firm's stock returns in relation to fluctuations in the returns of a market portfolio, representing the level of systematic risk to which the firm is exposed (Sharpe, 1964; Lintner, 1965; Mossin, 1966; Armstrong et al., 2010).

Xing and Yan (2019) state that the relationship between information quality and market risk has been relatively underexplored in academic research, despite having strong theoretical foundations. According to the authors, the quality of accounting information can directly influence the systematic risk factor, supporting the literature that investigates how attributes of accounting information quality are reflected in a non-diversifiable risk factor that is priced into stock returns (Barth et al., 2013; Leuz & Wysocki, 2016). Furthermore, prior studies show that a firm's accounting information can shape investor perceptions of economically related firms, the aggregate economy, and the covariance of the firm's own cash flows with the market (Lambert et al., 2007; Ma, 2017; Xing & Yan, 2019).

However, recent studies indicate that the reduction in the cost of equity capital associated with accounting information quality may be moderated by firm-specific characteristics, such as corporate social responsibility performance (Bose & Yu, 2023), earnings transparency (Barth et al., 2013), the degree of accounting comparability (Wu & Xue, 2023), the tone of the annual report, and the level of competition faced by the firm (Jian et al., 2023).

Regarding firms operating in regulated sectors, Peltzman (1976) argues that regulation reduces systematic risk by shielding companies from demand and cost shocks, leading to smaller variations in earnings and stock prices. This view is grounded in the work of Stigler (1971), who contended that regulation is captured by the regulated industry and operates in its favor, with firms exerting control over state actions to their own benefit.

3 LITERATURE REVIEW

Previous literature identifies several benefits associated with the adoption of IFRS, including a reduction in analyst forecast errors (Ashbaugh & Pincus, 2001); lower cost of capital (Armstrong et al., 2010; Opare et al., 2021); increased market liquidity and trading volume (Leuz & Verrecchia, 2000; Opare et al., 2021); improved quality of accounting information (Barth, 2008); and increased investment flows due to the attraction of foreign mutual funds (Covrig et al., 2007).

In Brazil, previous studies on the effects of international accounting standards indicate that IFRS adoption improved the comparability of financial reports and the accuracy of analysts' forecasts (Reina et al., 2022), enhanced the informational content of earnings (Kolozsvári & Macedo, 2018), and reduced accounting conservatism (Sousa et al., 2018).

A recent study by Teodósio et al. (2023) on the relationship between accounting information quality and systematic risk, measured by beta, using data from 208 firms listed on B3 from 2010 to 2019, showed that low earnings predictability and a high level of discretionary accrual-based earnings management positively influence systematic risk.

Tenenwurcel and Camargos (2022) analyzed the impact of IFRS adoption on the cost of equity capital, distinguishing between systematic and unsystematic risk for 148 Brazilian publicly traded firms listed on B3, using data from 2002 to 2017. Systematic risk was measured using both the CAPM and the Fama and French (1993) models. The authors found that IFRS adoption reduced the cost of equity capital by lowering systematic risk.

The negative association between accounting information quality and systematic risk has been demonstrated in international studies, such as Xing and Yan (2019), who used CAPM beta and Fama and French's (1993) three-factor model beta as measures of systematic risk, and Dechow and Dichev's (2002) and Jones's (1991) accrual models as proxies for accounting information quality. Ma (2017) employed conditional CAPM beta and the three-factor model beta to measure systematic risk, and a principal component derived from three quality metrics—earnings precision, modified Jones model accruals, and the standard deviation of residuals from the same model—to measure accounting information quality, also finding a negative relationship.

In a study on the effects of financial disclosure incentives on the cost of capital, Francis et al. (2005) found that better financial disclosure levels were associated with a lower cost of both debt and equity capital. This result supports the negative relationship between systematic risk and accounting information quality.

Chen et al. (2022) proposed the variable asset informativeness as a measure of accounting information quality. In their study, CAPM beta was one of the explanatory variables for asset informativeness, and a negative relationship was identified between the two variables. The study used data from U.S. firms from 1960 to 2018 and decomposed asset informativeness into innate and discretionary components, concluding that both are relevant to the firm, with the discretionary component having greater impact.

The variable proposed by Chen et al. (2022) is recent and still underexplored in academic research. Examples of international studies that have adopted it include Heidary et al. (2024), who investigated its relationship with investor beliefs, focusing on earnings quality, and found that increases in both aggregate and discretionary asset informativeness positively influence investor beliefs; and Berger and Tomy (2024), who found that when accounting information quality is measured by the innate component of asset informativeness, it significantly influences the productivity of firms affected by supply and productivity shocks.

Cardoso and Britto (2024) identified a negative relationship between asset informativeness and systematic risk for all Brazilian publicly traded companies between 2010 and 2021. Without focusing on a specific segment or sector, and using panel data regression analysis, the authors also found that both the innate and discretionary components were relevant, with the innate component having a greater effect.

The present study addresses this topic by focusing on regulated infrastructure firms in the context of Brazil's mandatory adoption of IFRS starting in 2010. The aim is to investigate how accounting information quality, measured through asset informativeness, relates to systematic risk. The research hypothesis is as follows: the asset informativeness of regulated infrastructure firms in the post-IFRS adoption period in Brazil is negatively associated with systematic risk.

This investigation is justified by the expectation that IFRS adoption would improve accounting information quality, reduce uncertainty, lower systematic risk, and decrease the cost of capital. However, in the specific case of regulated infrastructure firms that were required to apply IFRIC 12, the relationship with systematic risk remains unknown. The application of IFRS and IFRIC 12 and their effects on asset informativeness are particularly relevant for capital-intensive sectors such as infrastructure. These changes have resulted in a new structure for the balance sheet and income statement, with significant economic and financial repercussions. Following the asset bifurcation, the components of assets evolve differently, potentially affecting cash flow predictability, influencing performance, encouraging dividend distributions based on the remeasurement of financial assets, altering financial indicators that assess financial sustainability, risk structure, and firm valuation. All of these factors may have influenced the risk perception of investors and creditors and affected comparability with other sectors and markets, potentially impacting firms' exposure to systematic risk.

4 METHODOLOGICAL PROCEDURES

The sample included all companies with shares traded on B3 that had available data for the calculation of the selected variables, excluding firms from the financial sector and those grouped under the "other" segment, according to the classification of Brasil, Bolsa, Balcão (B3).

Accounting data were collected from the first quarter of 2000 to the first quarter of 2023 using the Economática® platform. To meet the time window requirements necessary for constructing the variables through regressions and lags, the pre-IFRS adoption period was defined as spanning from the fourth quarter of 2004 to the second quarter of 2009, totaling 19 quarters. The post-adoption period began in the fourth quarter of 2014 and ended in the third quarter of 2022, comprising 31 quarters. Only firms with sufficient observations to calculate both asset informativeness and systematic risk in the pre- and post-IFRS adoption periods were included. The final sample consisted of 89 companies, of which 21 were regulated infrastructure firms applying IFRIC 12, classified in the utilities sector.

Systematic risk for firm i relative to the market index (Ibovespa) is measured by the beta from the CAPM model, which is calculated over a two-year window, using the value at the end of t+2. The unlevered beta is also computed to remove the effects of financial leverage and isolate business risk, separating financial effects from economic effects (Hamada, 1972).

The asset informativeness variable is based on the premise that accounting assets convey

relevant information about economic capital and can therefore be measured by the coefficient of determination (R^2). According to Black (1980), accounting earnings capture economic performance and are useful for estimating firm value. The model based on this rationale is specified below:

$$NOPAT_t = \alpha_0 + \alpha_1 NOA_{t-4} + \varepsilon_t \quad (4)$$

Where: $NOPAT_t$ represents economic performance, measured by net operating profit after taxes; NOA_{t-4} is the difference between operating assets and operating liabilities. Operating assets are calculated as total assets minus the sum of cash, cash equivalents, and short-term investments; operating liabilities are calculated as total assets minus the sum of debt (short- and long-term) and shareholders' equity (Soliman, 2008).

The higher the R^2, the greater the informativeness of the asset in explaining economic capital (Chen et al., 2022). Regressions based on Equation (4) were used to calculate the $R^2_{(ijt)}$ for each firm j in each sector i, in which net operating assets (NOA) at period t–4 serve as the explanatory variable for net operating profit after taxes (NOPAT) at period t (dependent variable). Each regression used 16 quarterly observations, covering four-year periods, with a one-year lag for the explanatory variable, totaling five years (20 quarters) of data. A minimum of 7 observations per firm per regression window was required.

The $R^2_{(ijt)}$ hereafter referred to as Global Asset Informativeness ($IAG_{(ijt)}$) was decomposed into two components: non-discretionary ($IAND_t$) and discretionary (IAD_t). The non-discretionary (or innate) component relates to the sector's business model, incorporating inherent characteristics of the operating environment and the extent to which accounting standards capture the economic fundamentals of firms. The discretionary component reflects daily operational and accounting decisions made by management (Chen et al., 2022).

In this study, $IAND_t$ and IAD_t are calculated differently from Chen et al. (2022). $IAND_t$ is computed as the sector-quarter average for each firm-quarter observation. IAD_t is defined as the square root of the squared difference between $IAG_{(ijt)}$ and $IAND_t$, following Cardoso and Britto (2024), due to the high dispersion observed in the difference between $IAG_{(ijt)}$ and $IAND_t$ when calculated as in Chen et al. (2022). This approach also avoids negative values. Any of the asset informativeness measures is expected to be negatively associated with systematic risk.

Control variables were selected based on Chen et al. (2022), who, however, explored the inverse relationship treating systematic risk as the explanatory variable of asset informativeness. In contrast, this study focuses on the relationship between asset informativeness and systematic risk, treating the latter as the dependent variable, as presented in Table 1.

Table 1

Control Variables: Calculation and Expected Sign of the Relationship with Systematic Risk (Beta)

Indicators	Calculation	Relationship with Beta	References
Size (TAM)	Natural logarithm of Total Assets	Positive or Negative	Negative: Beaver, Kettler e Scholes (1970). Positive: Koussis e Makrominas (2015); Cardoso e Britto (2024).
Growth Opportunity – Value (B2M)	(Book Value of Equity) / (Market Capitalization)	Positive or Negative	Negative: Koussis e Makrominas (2015); Cardoso e Britto (2024). Positive: Piotroski (2000).
Operating Cycle (OC)	Natural logarithm of the sum of days sales outstanding and days inventory outstanding	Positive	Beaver, Kettler e Scholes (1970); Akbar et al. (2021).
Profitability Volatility (σRNOA)	Standard deviation of return on net operating assets (RNOA)	Positive	Beaver, Kettler e Scholes (1970); Hong e Sarkar (2007).

COVID-19 Pandemic (COV)	Dummy variable, equal to 1 for quarters in the years 2020 and 2021, and 0 otherwise	Positive	Nguyen, Phan e Ngo (2022); Koutoupis, Belesis e Canouras (2022).

Source: Elaborated by the authors.

4.1 Modelo Econométrico

To test the study's hypothesis, the model described in Equation 3 was adopted, using the difference-in-differences method to isolate the effect of the interaction between IFRS adoption and asset informativeness in regulated infrastructure firms. The companies were divided into two groups: a treatment group, composed of firms that applied IFRIC 12, and a control group, consisting of the remaining firms. The time variable was represented by the binary variable "IFRS," which segmented the sample into two periods: pre- and post-adoption.

$$\beta_{it+2} = \alpha_{it} + \lambda_1 IFRS_t + \lambda_2 Treat_i + \lambda_3 IA_{it} + \lambda_4 EF1_{it} + \lambda_5 EF2_{it} + \lambda_6 EF3_{it} + \lambda_7 EF4_{it} + \lambda_8 TAM_{it} + \lambda_9 B2M_{it} \lambda_{10} OC_{it} + \lambda_{11} \sigma RNOA_{it} + \lambda_{12} 2016_t + \lambda_{13} 2017_t + \lambda_{14} 2018_t + \lambda_{15} 2019_t + \lambda_{16} COV_t + \varepsilon_{it} \quad (3)$$

Where: $Treat_i$: is a binary variable representing the treatment group composed of regulated infrastructure firms that applied IFRIC12; IA_{it}: is the quality of accounting information, measured by asset informativeness; $EF1_{it}$: is a variable formed by the interaction of $IFRS_t$ and IA_{it}, capturing the effect of IFRS on asset informativeness for all firms, not only regulated infrastructure firms; $EF2_{it}$: is a variable formed by the interaction of IA_t and $Treat_i$ capturing the effect of asset informativeness only for regulated infrastructure firms that applied IFRIC 12, across the entire period; $EF3_{it}$: is a variable formed by the interaction of $IFRS_t$ and $Treat_i$, representing the effect of IFRS on regulated infrastructure firms that applied IFRIC 12; $EF4_{it}$: is the main variable of interest, formed by the interaction between $IFRS_t$, $Treat_i$ and IA_{it}, representing the accounting information quality of regulated infrastructure firms that applied IFRIC 12 during the IFRS adoption period in Brazil; TAM_{it}: is firm size; $B2M_{it}$: is the book-to-market ratio, indicating growth opportunities or value; OC_{it}: is the operating cycle; $\sigma RNOA_{it}$: is the volatility of profitability; 2016_t, 2017_t, 2018_t, and 2019_t are year dummy variables; COV_t: is a dummy variable indicating the occurrence of the Coronavirus Disease 2019 (COVID-19) pandemic (Covid-19).

5 PRESENTATION AND DISCUSSION OF RESULTS

Prior to estimating the model, multicollinearity tests were conducted among the explanatory variables using the Variance Inflation Factor (VIF), and no evidence of multicollinearity was found. The presence of unit roots in the series was tested using the ADF-Fisher test, which rejected the null hypothesis of unit root presence in all series.

The regressions employed robust standard errors following the Cross-Section SUR method (Panel-Corrected Standard Errors – PCSE), in order to address issues of heteroskedasticity and serial correlation in the residuals. Pooled regression was adopted for two reasons: first, fixed effects regression resulted in a circular matrix; second, it was not possible to compare fixed and random effects using the Hausman test, given that this test is not consistent when robust standard errors are applied (Li & Wibbens, 2023). For comparison purposes only, random effects estimations were performed and consistently showed lower goodness-of-fit than the pooled models. The results are presented in Table 2.

A negative relationship was found between IFRS adoption and systematic risk when beta was unlevered, in two regressions. These findings are consistent with Tenenwurcel and Camargos (2022), who found that IFRS adoption reduced the systematic risk of Brazilian firms. Moreover, the results support earlier research suggesting that the new accounting standard reduces information asymmetry, systematic risk, and consequently, the cost of capital (Armstrong et al., 2010; Opare et al., 2021).

Nonetheless, a positive association between IFRS adoption and leveraged beta was found in one regression. This result is considered inconclusive due to the isolated divergence in the sign. However, it warrants further investigation into the effects of IFRS on financial risk or the capital structure of Brazilian firms. For instance, Daneberg and Decourt (2021) found that IFRS adoption reduced leverage indicators and increased credit portfolios and shareholders' equity as a result of adjustments to the recoverable value of loans and the fair value of financial assets in the financial sector. Considering that non-financial firms are on the other side of these transactions, as borrowers from financial institutions, it is possible that the effect was reversed, with IFRS increasing leverage indicators.

The negative relationship between the variable TREAT representing firms that adopted IFRIC 12 and systematic risk is stronger when using leveraged beta, which is consistent with the idea that leverage is priced by investors as additional business risk. Since the firms that adopted IFRIC 12 are notably regulated and operate in the infrastructure sectors, the assumption that they tend to have lower risk was confirmed, corroborating Peltzman (1976) and Stigler (1971).

Contrary to expectations, when considering the full study period, the relationship between global asset informativeness (IAG) and systematic risk was not significant, and it was positive for both the non-discretionary (IAND) and discretionary (IAD) components. IAG was also not significant when considering only the post-IFRS period.

Table 2
Estimation Results

Model

$$\beta_{it+2} = \alpha_{it} + \lambda_1 IFRS_t + \lambda_2 Treat_i + \lambda_3 IA_{it} + \lambda_4 EF1_{it} + \lambda_5 EF2_{it} + \lambda_6 EF3_{it} + \lambda_7 EF4_{it} + \lambda_8 TAM_{it} + \lambda_9 B2M_{it}\ \lambda_{10} OC_{it} + \lambda_{11}\sigma RNOA_{it} + \lambda_{12}2016_t + \lambda_{13}2017_t + \lambda_{14}2018_t + \lambda_{15}2019_t + \lambda_{16} COV_t + \varepsilon_{it}$$

Exp. Var.	Dependent Variable: Leveraged Beta						Dependent Variable: Unlevered Beta					
	Estimation 1		Estimation 2		Estimation 3		Estimation 1		Estimation 2		Estimation 3	
Const.	0.082		-0.484	**	-0.139		-0.368	**	-0.661	***	-0.438	***
	(0.277)		(0.241)		(0.28)		(0.148)		(0.134)		(0.149)	
IFRS	-0.119		0.271	**	0.144		-0.192	***	0.057		-0.115	**
	(0.096)		(0.135)		(0.111)		(0.051)		(0.074)		(0.058)	
TREAT	-0.400	***	-0.039		-0.017		-0.107		0.018		0.018	
	(0.137)		(0.229)		(0.139)		(0.072)		(0.125)		(0.072)	
IA	0.171		1,014	***	1,082	***	-0.005		0.515	***	0.241	
	(0.145)		(0.318)		(0.28)		(0.077)		(0.175)		(0.149)	
EF1	-0.051		-1,487	***	-1,408	***	0.043		-0.885	***	-0.339	*
	(0.197)		(0.456)		(0.369)		(0.105)		(0.251)		(0.195)	
EF2	0.532	*	-0.864		-0.861		0.192		-0.447		-0.288	
	(0.316)		(0.656)		(0.582)		(0.165)		(0.358)		(0.303)	
EF3	0.037		-0.029		-0.395	**	-0.006		0.074		-0.129	
	(0.155)		(0.285)		(0.168)		(0.081)		(0.156)		(0.087)	
EF4	-0.836	**	-1,021		0.767		-0.458	**	-0.936	*	-0.030	
	(0.393)		(0.968)		(0.715)		(0.205)		(0.529)		(0.373)	
TAM	0.032	***	0.055	***	0.036	***	0.023	***	0.036	***	0.024	***
	(0.012)		(0.011)		(0.012)		(0.007)		(0.006)		(0.007)	
B2M	0.190	***	0.144	***	0.184	***	0.049	***	0.039	***	0.047	***
	(0.019)		(0.017)		(0.019)		(0.01)		(0.009)		(0.01)	
OC	0.019		0.038		0.017		0.116	***	0.117	***	0.116	***

	(0.035)		(0.03)		(0.035)		(0.019)		(0.017)		(0.019)	
RNOA	-0.004	**	-0.005	***	-0.005	***	-0.004	***	-0.004	***	-0.004	***
	(0.002)		(0.001)		(0.002)		(0.001)		(0.001)		(0.001)	
2016	0.168	*	0.094		0.173	*	0.078		0.022		0.077	
	(0.098)		(0.092)		(0.098)		(0.052)		(0.051)		(0.052)	
2017	0.056		-0.041		0.049		0.037		-0.030		0.032	
	(0.099)		(0.094)		(0.098)		(0.052)		(0.052)		(0.052)	
2018	0.256	**	0.156	*	0.247	**	0.101	*	0.044		0.097	*
	(0.099)		(0.094)		(0.099)		(0.052)		(0.052)		(0.052)	
2019	0.380	***	0.306	***	0.369	***	0.222	***	0.185	***	0.216	***
	(0.103)		(0.099)		(0.102)		(0.055)		(0.055)		(0.055)	
COV	0.340	***	0.306	***	0.333	***	0.243	***	0.236	***	0.243	***
	(0.084)		(0.086)		(0.084)		(0.044)		(0.048)		(0.045)	
Adj. R^2	0.094		0.092		0.097		0.095		0.108		0.096	
F-stat	13,95	***	16,20	***	14,59	***	14,78	***	19,75	***	14,91	***
Obs.	2.179		2.567		2.179		2.105		2.487		2.105	

Note. β_{it+2}: Systematic risk (leveraged CAPM beta over the last 24 months, at the end of t+2. Unlevered beta: $\left(\frac{leveraged\ beta}{\left(1+(1-tax\ rate)*\frac{\%Debt}{\%Equity}\right)}\right)$; IFRS: Binary variable. Indicates IFRS adoption periods, with a value of 1 for quarters after 2009 and 0 otherwise; Treat: binary variable. Indicates the treatment group, with a value of 1 for regulated firms that applied IFRIC 12 after IFRS adoption, and 0 otherwise; **Estimation 1**: IA is IAG_{ijt} (the firm's global asset informativeness), calculated based on $\frac{Cov^2\ (NOPAT_t, NOA_{t-4})}{Var\ (NOPAT_t) Var\ (NOA_{t-4})} = R^2_{ijt}$; **Estimation 2:** IA is $IAND_{i,t}$ (Non-Discretionary Component of Asset Informativeness), calculated as the sector-quarter average of R^2_{ijt}; **Estimation 3**: IA is $IAD_{i,t}$ (Discretionary Component of Asset Informativeness), calculated by $\sqrt{\left(R^2_{ijt} - R^2_{ind,t}\right)^2}$; EF1: Interaction between IFRS and IA variables represents the asset informativeness of all firms in the sample after IFRS adoption; EF2: interaction between IA and Treat, representing the asset informativeness of regulated infrastructure firms that applied IFRIC 12 throughout the entire period; EF3: interaction between IFRS and Treat, representing the effect on regulated infrastructure firms that applied IFRIC 12 after IFRS adoption; EF4: interaction among IFRS, Treat, and IA, representing the accounting information quality of regulated infrastructure firms that applied IFRIC 12 during the IFRS adoption period in Brazil; TAM_{it}: firm size; $B2M_{it}$: growth opportunities; OC_{it}: operating cycle; and $\sigma RNOA_{it}$: profitability volatility; 2016, 2017, 2018, and 2019 are dummy variables indicating the respective years; COV_t: indicates quarters during the pandemic period (years 2020 and 2021); ***, **, *: parameter significance levels at 1%, 5%, and 10%, respectively; values in parentheses below the coefficients represent standard errors. F-test: does not reject the null hypothesis that all slope coefficients, except for the intercept, are equal to zero.
Source: Elaborated by the authors.

In the post-IFRS adoption period, both the non-discretionary and discretionary components of asset informativeness displayed the expected negative sign in their relationship with systematic risk, as represented in the model by the variable EF1. Therefore, the hypothesis that IFRS improved accounting information quality measured by asset informativeness is confirmed. The negative relationship between accounting information quality, represented by innate and discretionary asset informativeness, and systematic risk after IFRS adoption is consistent with previous research on accounting quality and systematic risk or cost of capital, such as Ma (2017), Xing and Yan (2019), and Chen et al. (2022). Moreover, the results align with Cardoso and Britto (2024), who tested the same relationship across all Brazilian companies listed on B3.

Additionally, the findings are also in line with Francis et al. (2005), who identified that higher financial disclosure quality leads to a lower cost of capital both debt and equity supporting the negative association between systematic risk and accounting information quality found in this study. These results may be interpreted as a signal that creditors and investors regard asset information as a reliable indicator for evaluating firms' economic capital (Cardoso & Britto, 2024).

According to Chen et al. (2022), asset informativeness is important in determining cash flows and firms' intrinsic values. Since asset informativeness is sensitive to both accounting methods (IAND) and firm-level accounting choices (IAD), the results provide insights into how investors use such information in their investment decisions.

Regarding the IAND variable, which is associated with sector-level behavior, the findings show that investors price this information in relation to both leveraged and unlevered beta. This is consistent with the spillover premise of sectoral accounting information, which occurs when, due to limited time and resources, investors use data from certain representative firms within a sector to price others (Ma, 2017; Cardoso et al., 2025).

The relevance of IAD demonstrates that firm-specific accounting choices those that deviate from industry averages are also assessed and priced in systematic risk, indicating they are informative enough to reduce uncertainty and risk.

The results for the relationship between asset informativeness of firms that adopted IFRIC 12 (EF2) and those same firms after IFRS adoption (EF3) and systematic risk are inconclusive, with coefficients diverging between the pooled and random effects regressions.

The main hypothesis of this study that the asset informativeness of regulated infrastructure firms applying IFRIC 12 is negatively associated with systematic risk after IFRS adoption in Brazil (EF4)—was confirmed. This finding aligns with prior studies on the effects of IFRS adoption, which report reduced cost of capital or systematic risk (Francis et al., 2005; Armstrong et al., 2010; Opare et al., 2021) and improved accounting information quality (Barth, 2008). The results also align with Brazilian studies that found a negative relationship between IFRS adoption and systematic risk, such as Tenenwurcel and Camargos (2022) and Cardoso and Britto (2024).

This study's finding of a negative relationship between systematic risk and asset informativeness after IFRS adoption in Brazil in 2010 contributes to resolving uncertainties raised in earlier research that focused primarily on IFRS adoption in the European Union. There had been concerns that observed effects might be confounded by concurrent shocks in that region due to the large number of countries adopting IFRS simultaneously starting in 2005 (Armstrong et al., 2010; Leuz & Wysocki, 2016). By presenting the expected results in a different region and time frame, this study helps clarify that point.

The study also contributes to the debate over potential costs of losing local accounting standards, as occurred in Canada, where the non-recognition of regulatory assets and liabilities led some regulated firms to opt out of IFRS adoption. Thus, the findings support the view that the bifurcation of property, plant, and equipment into contractual and financial assets improved the ability of assets to convey firm performance in regulated infrastructure sectors.

Moreover, the most relevant finding appears to be the interaction between IFRS and IFRIC 12 adoption by infrastructure firms (TREAT), and the average asset informativeness of firms (IA). In the case of unlevered beta, which reflects business risk, any of the asset informativeness measures proves relevant and negatively related to systematic risk.

Regarding the control variables, a positive relationship was identified between firm size and systematic risk, which is consistent with the premise that larger firms are more exposed to both operational risks and risks arising from engaging in more aggressive strategies (Koussis & Makrominas, 2015; Cardoso e Britto, 2024).

Earnings volatility proved to be irrelevant, consistently presenting a coefficient of zero. Unlike Cardoso and Britto (2024), the B2M ratio showed a positive relationship with systematic risk, indicating that such firms are more likely to be perceived as riskier due to their tendency toward financial distress, reduced access to disclosure channels, and lower analyst coverage (Cardoso & Britto, 2024; Piotroski, 2000).

The length of the operating cycle showed a positive relationship with systematic risk as measured by the unlevered beta, which is consistent with prior literature (Beaver et al., 1970;

Akbar et al., 2021). Since the unlevering of beta is performed based on the firm's capital structure (i.e., percentage of debt and equity), removing the leverage effect emphasizes and renders significant the impact of the operating cycle, which is associated with cash needs or working capital requirements, thereby increasing systematic risk.

5.1 Robustness Tests

In order to identify and exclude potential confounding effects from factors that may have simultaneously influenced the results, robustness tests were conducted including the years 2016 to 2019 post-IFRS adoption as well as the COVID-19 pandemic years. The years with the most significant relevance to systematic risk were 2019 and 2018, both showing a positive relationship. The COVID-19 pandemic also showed a positive association with systematic risk, which is understandable given the uncertainty regarding firms' cash flows during that period, even though sector-specific effects may have varied (Nguyen et al., 2022; Koutoupis et al., 2022).

Additional tests were conducted to assess the effect of the voluntary IFRS adoption period, specifically the years 2008 and 2009, prior to the mandatory implementation in 2010. The first three tests were as follows: a) using only data from 2008 and 2009; b) replacing the post-2010 IFRS period with the voluntary adoption period; and c) including the voluntary adoption period as an additional variable in the model. The results from all three tests showed that the voluntary adoption period was positively associated with beta, regulated firms displayed a negative relationship, and asset informativeness showed inconclusive results with divergent signs.

For this reason, regressions were rerun excluding the voluntary adoption period from the model. The results were highly similar to those of the main model presented in Table 2, although with slightly higher coefficient values in most cases. Since the coefficient of determination was nearly identical, the original regressions were retained.

6 CONCLUSION

This study analyzed the relationship between the informativeness of accounting assets and the systematic risk of regulated infrastructure firms following the mandatory adoption of IFRS in Brazil. Additionally, it examined the influence of both the discretionary and non-discretionary components of asset informativeness. Control variables included firm size, growth opportunities (or value), operating cycle, profitability volatility, the years 2016 to 2019, and the impact of the COVID-19 pandemic.

The results indicate that the informativeness of accounting assets in infrastructure firms after IFRS adoption is relevant and negatively associated with systematic risk. This finding supports the study's hypothesis and the existing literature suggesting that IFRS improved the quality of accounting information, reduced uncertainty, cost of capital, and systematic risk. Global and non-discretionary informativeness were found to be more relevant than the discretionary component.

IFRS adoption was positively associated with systematic risk when measured by leveraged beta and negatively associated when measured by unlevered beta, suggesting a possible influence of IFRS on firms' financial risk. Regulated infrastructure firms were negatively associated with systematic risk, supporting Peltzman's (1976) regulatory theory that such firms are generally perceived as less risky.

Specifically regarding asset informativeness across all firms over the full study period, the relationship with systematic risk was found to be positive contrary to expectations. However, after IFRS adoption, this relationship became negative, confirming the hypothesis that IFRS improved the quality of accounting information.

The recent accounting information quality metric focused on assets and tested in this study appears to have captured a greater informational effect following IFRS adoption, particularly for infrastructure firms. The bifurcation of fixed assets linked to concessions into contractual and financial assets appears to have enhanced the ability of assets to convey firm performance in regulated infrastructure firms, thereby reducing systematic risk, benefiting both firms and stakeholders interested in their economic value. For preparers, the study highlights the importance of accounting assets as a measure of information quality capable of reducing firm-level systematic risk.

Among the control variables, firm size, book-to-market ratio (value), operating cycle, the years 2016, 2018, and 2019, as well as the COVID-19 pandemic years (2020 and 2021), showed a positive relationship with systematic risk. Profitability volatility showed a negative but economically insignificant association, with a coefficient close to zero. In addition, robustness tests excluding the voluntary IFRS adoption period confirmed the main findings.

This study advances the literature by focusing on the effects of IFRS adoption in Brazil; by deepening the analysis of regulated infrastructure firms, which were required to change how they recognized and measured fixed assets related to concessions; by applying a recent measure of accounting information quality asset informativeness developed by Chen et al. (2022); and by analyzing the interaction of these variables with systematic risk.

It contributes to the accounting information quality literature by testing the asset informativeness measure in the Brazilian context for regulated infrastructure firms affected by IFRIC 12. The study may assist policymakers, regulators, financial statement preparers, and investors in understanding the nuances between accounting regulation, information quality, and systematic risk in firms especially those in infrastructure sectors.

It supports regulators by demonstrating the effect of accounting standards on systematic risk, and supports financial statement preparers by showing the potential impacts of accounting choices on the recognition and measurement of financial and intangible assets, as well as the effectiveness of accounting methods in conveying business performance. It may also aid auditors due to the audit risks inherent to the new earnings dynamics.

Furthermore, the research contributes to the work of investors and analysts by providing evidence of a quality measure based on asset informativeness, which may assist in firm valuation estimates, in analyzing systematic risk volatility specifically CAPM beta and in assessing the implications of the findings for comparability across firms and sectors.

As a limitation, the study notes the relatively short time series available for calculating variables dependent on regression analysis (asset informativeness and systematic risk), given the need to divide the sample into pre- and post-IFRS adoption periods. Additionally, the requirement that firms have data for both periods further restricted the number of eligible companies. Nonetheless, the available data are considered sufficient to ensure the robustness of the analysis.

As an opportunity for future research, it is suggested to investigate potential interactions between IFRIC 12 and other standards in order to assess their effect on cost of capital, systematic risk, or accounting information quality as measured by asset informativeness. Further evaluation of IFRS effects on financial risk is also encouraged, given the divergent relationship found between IFRS adoption and leveraged versus unlevered beta in this study.

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AUTHOR CONTRIBUTIONS

Roles	1st author	2nd author
Conceptualization	♦	
Data curation	♦	
Formal analysis	♦	
Funding acquisition		
Investigation	♦	
Methodology	♦	
Project administration	♦	
Resources		
Software		
Supervision		♦
Validation		

Visualization		
Writing – original draft	♦	
Writing – review & editing		♦

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding this submitted work.