The Capital Structure Determinants of Reits

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Abstract

This paper investigates the capital structure determinants of REITs. The research aims to verify traditional capital structure theories to this asset class, such as trade-off, pecking order, agency costs, and market timing by applying them to Brazilian REITs, which have unique regulatory provisions. Using OLS regression models and data from Brazilian Equity REITs, we find that while the overall determinants align with the international literature, the semi-annual mandatory payout of 95% of its AFFO significantly impacts the REIT's accounting equity. Additionally, the study introduces a new determinant, total management compensation, which is found to have a negative influence on market leverage. This result compounds on REIT literature that rejects the *pecking order* and validates *market timing*, because management has direct incentives to expand the REIT through new equity raisings, especially when market conditions are favourable, as most of their compensation comes from a percentage of the REIT's accounting equity or market capitalization.

Keywords: REIT, Optimal Capital Structure Theory, Trade Off Theory, Pecking Order Theory, Market Timing Theory, Agency Costs Theory.

1. Introduction

The Real Estate Investment Trust, "REIT", is a type of company that raises capital from a pulverized investor base to invest in real estate assets (Block, 2012; CVM, 2022, p.590). REITs have proved popular in many countries that followed the US and created their own REIT legislation, such as Brazil, Japan, and the UK (Block, 2012; Dogan et al., 2019; B3, 2023). This asset class has a unique financial economic dynamic (Feng et al., 2007), and its regulatory framework can explain different capital structures amongst jurisdictions (Dogan et al., 2019). These features have spawned research on capital structure determinants, which have been analysed by optimal capital structure theories, such as trade-off, pecking order, agency costs and market timing (Ott et al., 2005; Feng et al., 2007; Boudry et al., 2010; Harrison et al., 2011; Barclay et. al., 2013; Morri & Artegiani, 2015; Dogan et al., 2019).

The Brazilian REIT has some unique regulatory provisions compared to its international peers (Cosentino et al., 2011), such as the mandatory semi-annual payout of at least 95% of its Adjusted Funds from Operations, or "AFFO"[1] (CVM, 2014, 2015), which significantly constrains reinvestment. While extensive research on REITs has been conducted in many countries (Dogan et al., 2019), the factors influencing the capital structure of Brazilian REITs remain unexplored (Ribeiro et al., 2019). To fill this literature gap, the following questions were developed:

How do the capital structure determinants of Brazilian REITs differ from those of international REITs, and can these differences be attributed to unique regulatory provisions?

Do unique Brazilian REIT regulatory provisions significantly impact capital structure decisions, and if so, what are the implications for investors and policymakers?

Hypothesis zero, "H0", considers that Brazilian results of its capital structure determinants converge with the REIT literature, whilst the first hypothesis, "H1", states the divergence. A second hypothesis, "H2", was introduced to verify whether the high mandatory payout of Brazilian REITs and the clientele effect on dividends (Deliberato, 2022) hamper REITs' capability to reduce leverage by retaining earnings. The econometric modelling consists of two OLS models based on Dogan et al. (2019) and Feng et al. (2007). The sample comprises 53 Brazilian Equity REITs from the IFIX index, after which 259 data points from 2018 to 2022 were extracted from public databases.

[1] Brazilian REITs' distributable income must follow a cash flow perspective, where the accounting net profit is adjusted to non-cash effects, such as rent linearization, change of property fair value, accounts payable or receivable, debt accrued interests, and depreciation.

The first model analysed the capital structure determinants, and the results converged with those of its international peers. Ultimately, they presented significance and direction consistent with previous results, thus H1 was not supported and H0 was not rejected. However, to our knowledge, this was the first time that the determinant *total management compensation* had been verified, and the result was promising. It explained market leverage significantly and negatively, which implied that the more REITs earn, the less leveraged they are. Raising new equity is a way to ensure a higher level of recurrent compensation, which resounds with agency costs theory, and this preference over debt is consistent with the REIT literature, which has mostly rejected pecking order theory and validated market timing theory (Boudry et al, 2010; Harrison et al., 2011; Morri & Artegiani, 2015).

The second model results were intriguing as management can only retain 5% of the AFFO and the change in retained earnings significantly and negatively explained the changes in accounting leverage. The sample's financial statements were revisited and revealed that the retained earnings consisted mostly of changes in properties' fair value[2]. This shed light on the mandatory 95% payout of the AFFO, as these accounting profits only become distributable when the property is sold and they are converted into cash. Therefore, H2 was rejected and H0 was not, but the results provided a clear picture of how this unique Brazilian regulatory provision impacts the REIT's accounting equity, as earnings (or losses) are retained as long as the underlying asset is not sold, and the payment is received.

Overall, the main contributions of this research are that it: (1) fills the literature gap regarding the capital structure determinants of the Brazilian REIT; (2) introduces to the literature the fact that the REIT's distributable income is actually the AFFO and that its mandatory payout of 95% interferes with retained earnings and dividend distribution; (3) identifies that *total management compensation* significantly and negatively explains market leverage, corroborating with agency costs theory; and (4) shows that, despite its unique regulatory requirements, the Brazilian results converge with those of its international peers. Finally, this paper also paves way for further research on the capital structure of Brazilian REITs and on the determinant total management compensation, which we recommend verifying in other countries as well.

The remaining sections of this paper are organized as follows. We begin by reviewing the relevant literature on the capital structure and regulation of REITs, in order to develop our hypotheses and theoretical framework at the end of Section 2. The research method, data

[2] The properties of Brazilian REITs do not depreciate and their fair value is evaluated annually.

collection, and variables used to test the hypotheses are described in Section 3. The results of our OLS regression model and our robustness tests are provided in Section 4. We conclude and disclose the limitations of our research in Section 5.

2. Literature Review and Hypothesis Development

2.1 The Optimal Capital Structure Theory: the REIT Case

The concept of the optimal capital structure resides in factors that explain the combination of equity and debt (Brito et al., 2007). The REIT literature has used the umbrella of theories from the optimal capital structure theory to verify its capital structure determinants (Feng et al., 2007; Morri & Artegiani, 2015; Boudry et al., 2010; Harrison et al., 2011; Barclay et. al., 2013; Dogan et al., 2019). One of the main objectives has been to check if these theories also apply in the REIT context, since (1) the optimal capital structure theory was developed and matured using non-REIT companies (Durand, 1952); and (2) the REIT asset class has a unique financial economic dynamic (Ott et al., 2005). Moreover, analysing REITs in many countries is relevant because different regulatory requirements can explain different capital structures (Dogan et al., 2019).

The *trade-off theory*, hereafter referred to by its acronym "TOT", was developed by Durand (1952), Modigliani & Miller (1958, 1963), and Miller (1977), and posits the influence of the capital structure over firm value. The combination of debt and equity reduces the WACC and provides a tax shield, as the debt cost is lower than the equity, and the interest expenses reduce the taxable income. These benefits increase the firm value, but they can be offset by an increase in credit risk, by which creditors may demand higher interest rates. Thus, to maximize the firm's value, the optimal capital structure lies in an equilibrium between the cost of the debt and its benefits. REIT companies, however, are exempt from paying income tax, and the mandatory dividend payout of 90% constrains reinvestment.

The *pecking order theory*, "POT", was developed by Myers (1984) and Myers & Majluf (1984) and proposes that the capital structure is the result of a hierarchy of financing possibilities, whereby management prefers to raise new resources firstly through reinvestment, which is followed by new debt and lastly the issue of new equity. This explains, for instance, why profitable firms reinvest more and have less debt, whilst unprofitable firms are more leveraged (Bastos & Nakamura, 2009). Management preferences may differ from those of internal and external shareholders; thus, this preference hierarchy depends on transaction costs and

information asymmetry. As per Harrison et al. (2011), the REIT context impacts these assumptions, since (1) a pulverized investor base means fewer shareholder blocks, which results in less shareholder power; (2) real estate assets have lower information asymmetry, as they are tangible and can be satisfactorily market evaluated; and (3) a high mandatory dividend payout significantly reduces management discretion over cash flow allocation.

The *agency costs theory*, "ACT", as proposed by Jensen & Meckling (1976), adds a praxiological perspective and highlights the conflicts of interests that arise from the separation of ownership and management. Management has control over a firm's recourses and is comprised of people with their own personal preference, thus their actions may not align with shareholders' interests. Therefore, shareholders incur agency costs at company level to maximize management alignment and control. On top of the previously mentioned REIT features, this asset class has specific regulatory and disclosure requirements (Block, 2012; CVM, 2022), which ultimately increase stakeholder oversight and help to offset the disadvantages of a pulverized investor base (Harrison et al., 2011).

The *market timing theory*, "MTT", differs from POT and ACT as it rejects the significance of information asymmetry and conflicts of interest. MTT proposes that management can accurately assess firms' intrinsic value as they have access to privileged information, which gives them an edge to monitor the market and actively adjust the firm's capital structure to maximize shareholder returns (Boudry et al. 2010; Harrison et al. 2011). For example, new equity raisings may come first to take advantage of a high price-to-book ratio, also increasing debt when interest rates are low. The REIT also brings unique provisions to this theoretical lens: (1) its financial economic dynamic differs from that of regular companies, which formed the basis to develop MTT; (2) the high tangibility of its portfolio allows more leverage, as real estate is good collateral; and (3) new equity is raised in the context of a pulverized investor base.

The REIT literature has verified the prediction of TOT, POT, MTT and ACT theories mostly through 6 capital structure determinants: Tangibility, Size, Profitability, Conflicts of Interest, Growth Opportunities and Cost of Debt (Feng et al., 2007; Boudry et al., 2010; Harrison et al., 2011; Barclay et. al., 2013; Morri & Artegiani, 2015; Dogan et al., 2019). The predictions of the capital structure determinants are compiled in Table 1.

Table 1: Matrix of Theoretical Predictions per Determinant of Leverage.

Determinant	TOT	POT	MTT	ACT
Tangibility	Positive coefficient. Tangible assets are good debt collateral. This reduces credit risk, which allows more leverage.	Absent	Absent	Absent
Size	Positive coefficient. The larger the firm, the more sources of income it has. Less volatile cash flow means less credit risk; thus, size allows more leverage.	Negative coefficient. Larger firms are monitored more by external agents, which results in less information asymmetry and enhanced disclosure. Larger firms tend to leverage less.	Negative coefficient. Larger firms have more economies of scale, which also reduces costs related to new equity raising. Larger firms raise more new equity, thus leverage less.	Absent
Profitability	Positive coefficient. Profitable firms have better cash flow and debt payment capacity. Less credit risk allows more leverage.	Positive coefficient. Due to REIT's low reinvestment capacity, more profits mean more leverage capacity to raise new resources.	Absent	Absent
Conflicts of Interest	Absent	Positive coefficient. Pulverized investor base means fewer control blocks, which results in less control over management and more information asymmetry.	Absent	Positive coefficient. Leverage can be used to reduce management discretion over cash flow allocation.
Growth Opportunities	Negative coefficient. The more growth opportunities the firm has, the less leveraged it is, as management is less prone to new undertakings.	Positive coefficient. The more growth opportunities the firm has, the more external financing it needs, especially because of REITs' low reinvestment capacity.	Negative coefficient. When markets perform well or the price-to-book ratio is high, the firm is more likely to raise new equity.	Absent
Cost of Debt or Liability Structure	Absent	Absent	Positive coefficient. The lower the cost of debt, the more the firm can afford to leverage.	Negative coefficient. Opaque, complex, or atypical structures raise risks, which in turn results in higher debt costs.

Source: authors

The Matrix of Predictions outlines how the different theories predict the behaviour of these key capital structure determinants. It also highlights that there is no "one size fits all" theory – some theories make opposing predictions, and some are complementary. For example, Tangibility is expected to have a positive influence on leverage under TOT, which is the only theorical prediction. Size, however, features mixed predictions, and one theory offers a higher explanatory power: TOT suggests that larger REITs leverage more, while POT suggests the opposite. Profitability also has divergent expectations, with TOT linking higher profitability to increased leverage, while POT and MTT suggest that profitable firms prefer new equity raising. Conflicts of Interest are addressed by ACT and POT, both of which offer complementary insights: more leverage can be used to limit management discretion, and management prefers to raise debt rather than equity, respectively. Growth Opportunities is expected to negatively explain leverage by TOT and MTT, whilst POT predicts more leverage. Lastly, MTT and ACT

make predictions in opposite directions for Cost of Debt and Liability Structure, but they are complementary: lower interest rates favour leverage, and risky structures tend to require higher interest rates. This matrix provides a framework to evaluate the capital structure of Brazilian REITs in comparison to their international counterparts and was used to develop the conceptual model, as proposed in Section 3. Methodology and Data Setup.

2.2 Literature Results on the REIT Capital Structure Determinants

A relatively robust theoretical foundation has been established in the REIT capital structure literature, as researchers have built upon past results and enriched the literature with new findings. Ott et al. (2005) and Feng et al. (2007) were the first to deliver comprehensive in-depth studies on the subject. The findings regarding TOT and POT were initially mixed, but the authors validated the low reinvestment capacity of the American REIT: the distributed dividends featured an average 70% of Funds from Operations, "FFO", (Feng et al., 2007), and retained earnings financed only 7% of their investments, whilst industrial companies financed 70% of their capital expenditure with them (Ott et al., 2005). Later, Boudry et al. (2010) and Harrison et al. (2011) analysed market leverage, instead of change of accounting leverage, and verified MTT and ACT with new determinants and more variables. Their findings enriched the literature by rejecting mixed TOT and POT results and validating MTT. Barclay et al. (2013) compared the REIT capital structure with industrial and real estate companies, where TOT was rejected because the debt tax shield did not explain leverage. Morri & Artegiani (2015) contributed by analysing the European REIT context and adding more variables to MTT and ACT; their results validated MTT and generally converged with Boudry et al. (2010) and Harrison et al. (2011). Lastly, Dogan et al. (2019) evidenced that different regulatory provisions can explain different capital structures.

As per Table 1, the theoretical predictions may be conflicting or complementary, thus a comprehensive analysis of the determinants and literature is needed. Overall, despite methodology and modelling differences, the results over the capital structure determinants converge and they are shown in Table 2.

Tangibility. TOT predicts that Tangibility positively explains leverage, as real estate is good debt collateral: it has good market pricing, tends to preserve value over time, and has some liquidity. These predictions were validated by Feng et al. (2007), Harrison et al. (2011), and Dogan et al. (2019).

Size. According to TOT, size positively explains leverage because larger firms tend to have lower credit risk, as they have more sources of income. On the other hand, POT predicts that size will negatively explain leverage, as larger firms have more external oversight, which results in lower information asymmetry. TOT predictions have exhibited good explanatory capacity with REITs (Fama & French, 2002; Brown & Riddiough, 2003; Chikolwa, 2009; Harrison et al., 2011; Morri & Artegiani, 2015). POT was only validated by Dogan et al. (2019), but it is worth highlighting that they did not analyse information asymmetry, which is a key assumption that was previously rejected by Harrison et al. (2011).

Profitability. POT predicts that profitability will positively explain leverage, as REITs have low reinvestment capacity, and management is likely to prioritize debt over new equity. TOT also predicts that profitability will positively explain leverage because REITs have a strong cash flow. Most results explained leverage negatively, however, rejecting POT. Boudry et al. (2010) argued that a negative coefficient supports MTT, as highly profitable REITs have higher market-to-book ratios and this favours new equity raising. The MTT was further supported by the rejections of TOT and POT in Dogan et al. (2019), following their analysis of REITs in many countries and considering national regulatory requirements. One of their tests only verified countries that did not impose a mandatory dividend payout, maintaining that those with a full reinvestment capacity should have a positive coefficient; however, this proved not to be the case, and POT was rejected.

Growth Opportunities. TOT and MTT predict negative growth, and POT predicts positive growth. TOT predicts that firms with growth opportunities leverage less because they are not prone to new ventures (Myers, 1984). Most results supported TOT and MTT, as growth opportunities explained leverage negatively (Barclay et al., 2006; Chikolwa, 2009; Boudry et al., 2010; Harrison et al., 2011; Morri & Artegiani, 2015). Sufficient evidence was found that REITs (1) raise more new equity when the market is favourable, and especially when the price-to-book ratio is above 1,00x; and (2) REITs raise leverage when the cost of debt is lower. It is worth mentioning that POT was only validated by Feng et al. (2007), but they used change of accounting leverage as a dependent variable, and the literature argues that the market leverage level is the most adequate variable (Harrison et al, 2011; Morri & Artegiani, 2015).

Conflicts of Interest. POT predicts higher leverage, as firms with a pulverized investor base and lower control blocks tend to have more information asymmetry, and shareholders can use debt to reduce management discretion over the cash flow. Barclay et al. (2013) and Morri & Artegiani (2015) verified the relationship between investor base concentration and leverage by comparing listed companies and REITs, and their results rejected POT. TOT predicts that firms

with a lower debt service coverage ratio, “DSCR”, have a higher credit risk and a lower borrowing capacity, and thus should leverage less. The general model of Dogan et al. (2019), which considered all countries, rejected POT but did not support TOT. They then analysed REITs with low price-to-book ratios, in order to check whether the lower DSCR of those low performers explained leverage negatively, and TOT was validated.

Liability Structure & Debt Cost. Findings converge that present debt or equity types can explain future financing decisions. For example, REITs that concentrate liabilities in secured debt are prone to raise new equity, while those concentrated on unsecured debt tend to issue new debt on capital markets (Brown & Riddiough, 2003). REITs with access to capital markets have higher leverage, while larger REITs issue them more frequently (Faulkender & Petersen, 2006), and those who issue debt with external ratings are likely to issue preferred shares and capital market debt, instead of common equity or bank debt (Boudry et al., 2010). Lastly, the factors that increase credit risk strongly explain leverage negatively (Boudry et al., 2010; Harrison et al., 2011; Morri & Artegiani, 2015).

The synoptic analysis of the literature evidenced that some determinants have had mixed results, whilst others had good convergence on significance and direction. Tangibility and Size provided mixed results on TOT, but its predictions are still unlikely to be rejected because real estate is good collateral, and larger REITs tend to be less risky. On Profitability, Conflicts of Interest and Growth Opportunities, there is good evidence of a rejection of POT, which is consistent with evidence provided by Bouldry et al. (2010) and Harrison et al. (2011) that REIT is an asset class with low information asymmetry, since (1) REITs invest mostly in real estate; (2) REITs have predictable results; (3) the fact that investors control blocks to leverage is irrelevant; and (4) DSCR was only significant for Low Opportunity REITs. These determinants and Cost of Debt also validated MTT, by providing evidence that profitability and price-to-book favour new equity raisings, whilst lower debt cost and less risky liability structures positively explain leverage. This matrix and the synoptic analysis are used to compare the results of Brazilian capital structure with its international peers, as in section 4.1 Brazilian REIT Capital Structure Determinants.

Table 2 Determinants Results Matrix

Literature Reference	Tangibility	Size	Profitability	Conflicts of Interest	Growth Opportunities	Debt Cost & Liability Structure
Feng et al. (2007)	Coefficient was significant and negative to change in accounting leverage, thus rejecting TOT (p.23).	Coefficient was not significant to change in accounting leverage, thus rejecting TOT (p.23)	Coefficient was not significant to change in accounting leverage. TOT and POT were rejected (p.23).	Absent.	Coefficient was significant and positive to change in accounting leverage, thus rejecting TOT and validating POT (p.23).	Absent.
Boudry et al. (2010)	Absent.	Absent.	The more profitable the REIT, the more prone to raise new equity it is (p.24), thus validating MTT and rejecting TOT and POT.	REIT equity research forecasts proved to be highly precise. This served as evidence that REITs have low information asymmetry, thus POT was rejected (p.20).	When price-to-book ratio is above 1.00x, REITs are prone to raise new equity, thus validating MTT (p.20) and rejecting POT (p.26).	The higher the debt cost, the less prone the REIT is to new debt, thus validating MTT (p. 24).
Harrison et al. (2011)	Coefficient was significant and positive to market leverage, thus validating TOT (p.27).	Coefficient was significant and positive to market leverage in the second model (p.29), which validated TOT. The first model direction was also positive but was not significant (p.28).	Coefficient was significant and negative to market leverage (p.28), thus rejecting POT and TOT.	Coefficient was significant and negative to market leverage only in Low Growth Opportunity REITs (p.35). This was evidence that low performance REITs have higher credit risk and leveraged less, thus validating TOT, and rejecting POT.	Coefficient was significant and negative to market leverage, thus validating TOT and rejecting POT (p.27).	Coefficient was significant and negative to market leverage, showing that REITs with opaque or complex ownership structures leverage less, validating ACT (p.31).
Morri & Artegiani (2015)	Absent.	Coefficient was significant and positive to market leverage, validating TOT (p.13).	Coefficient was significant and negative to market leverage (p.12), thus rejecting POT and TOT.	Control blocks of investors do not significantly explain market leverage; thus, POT was rejected (p.13).	Coefficient was significant and positive to market leverage, validating TOT (p.13) and rejecting POT.	Coefficient was significant and negative to market leverage, thus validating MTT (p.12).
Dogan et al. (2019)	The coefficient in the general model was of low significance and was positive. The model per country had mixed results. Only 2 countries were significant, but had negative directions, which suggested a rejection of TOT (p.21-22).	Coefficient was significant and negative to market leverage, thus rejecting TOT (p.23).	It was significant and positive only in 2 countries (of 12), but the coefficient should have been higher in countries that did not have mandatory dividend payouts (and it was not), so POT was rejected, and TOT was validated (p.22).	Coefficient was significant and negative to market leverage, thus validating ACT and rejecting POT (p.23).	All 12 countries had significant and negative coefficient to market leverage, thus validating TOT (p.23) and rejecting POT.	Absent.
Synoptic Analysis	TOT had mixed results, but it is still likely that tangibility is positive to leverage, since real estate is good collateral.	TOT had mixed results, but its prediction that larger REITs are less risky was still not verified. POT was not validated.	Overall, MTT was validated, whilst TOT and POT were rejected.	Good evidence of low information asymmetry on REITs, which is key to a strong rejection of POT.	Results converge that Growth Opportunities negatively explain market leverage, validating TOT and MTT and rejecting POT.	Results converge that factors that increase debt costs negatively explain market leverage, thus validating MTT.

2.3 REIT Institutional Background and Unique Regulatory Provisions

The Real Estate Investment Trust (REIT) was created in 1960 in the USA, and one of the goals was to provide more funding to the real estate market, accelerating its development (Block 2012). The main strategy was to enable the pooling of resources from all kinds of investors, as wealthy or institutional investors already had access to private deals, but the rest did not. The exchange-listed REIT, especially, enabled the democratization of indirect real estate investment, as it provided a vehicle (1) managed by professionals; (2) of a size and scale that offer more portfolio diversification and cost-efficiency; (3) whose stocks have reasonable liquidity; and (4) that follow specific regulatory requirements and governance, with varying levels of supervision from regulatory agencies. In the 1990s, many European, Asian, and Latin American countries followed the US and created their own REIT legislation. Dogan et al. (2019) showed that some key regulatory provisions vary by country, such as minimum dividend payout, maximum leverage level, and the accounting treatment of profits from capital gains, but they ultimately converge regarding: real estate portfolio, income tax exemption and pulverized investor base.

The industry has grown rapidly and according to NAREIT there were 940 listed REITs worldwide in 2023, with a combined market capitalization of approximately USD 2.0 trillion[3]. Brazilian REITs ranked as the 8th largest market capitalization in world in 2023, yet to date the REIT literature[4] has never analysed its capital structure or the impacts of its unique regulatory provisions, such as the *mandatory semi-annual 95% payout of the Adjusted Funds from Operations, "AFFO"*. Put simply, the Brazilian AFFO represents the net profit (or loss) from a cash flow perspective. It consists of removing all non-cash impacts from the net profit and considering only the income that has been received and the costs, expenses or taxes paid (CVM, 2014, 2015). This cash flow method of calculating the distributable income is inherently different from Earnings Before Taxes, "EBT", as the latter is net of depreciation, provisions, rent linearization or delinquency and other accounting effects that do not have an immediate cash flow.

The semi-annual 95% payout of the AFFO makes the Brazilian REIT the most cash management constrained. For example, the American REIT must distribute 90% of its annual

[3] According to Statista and B3, the Top 10 Countries per REIT market cap are: 1st US REITs ($ 1.400 bi); 2nd Japan ($ 108 bi); 3rd United Kingdom ($ 73 bi); 4th Singapore ($ 69 bi); 5th Australia ($ 62 bi); 6th France ($ 41 bi); 7th Canada ($ 38 bi); 8th Brazil ($ 31 bi); 9th Belgium ($ 23 bi) and 10th Hong Kong ($ 18 bi).

[4] The Brazilian REIT literature has focused on performance and risk aspects, occasionally comparing it to other asset classes or foreign REITs and has not yet researched its capital structure or the impacts of its regulatory framework (Cosentino, 2011; Ferreira et al., 2014; Scolese et al., 2015. Yokoyama et al, 2016; Fernandes, 2020).

earnings before interest, but this represents only an average of 70% of its FFO (Feng et al., 2007). The Brazilian AFFO may differ from FFO, but the comparison is sufficient to prove that it is highly cash flow constrained. Moreover, its low cash retention feature directly influences capital expenditure and debt amortization strategies, because if the cash expenditure is higher than what can be retained[5], the Brazilian REIT will have to use cash, sell assets, or ultimately raise new equity or debt. Finally, unlike its international peers, the Brazilian REIT is an investment fund and in Brazil, such funds cannot access bank credit[6] (CVM, 2023). Their options consist in issuing securities with receivables or seller's finance.

2.4 Hypothesis Development

The hypothesis development was based on the following inferences: (1) the REIT capital structure is worth researching because it has a unique economic financial dynamic; (2) the optimal capital structure theory was developed in a non-REIT context and its applicability to REITs had to be verified; (3) the regulatory framework is relevant to the REIT capital structure and can explain differences between countries; (4) the Brazilian REIT capital structure and its unique mandatory payout of 95% of the AFFO have never been verified before, and this high mandatory payout may hamper the capability to retain earnings and deleverage; (5) TOT, POT, ACT and MTT provide contingent insights per determinant and can be complementary, thus a comprehensive analysis of their results is worthful. The following hypotheses were developed regarding the Brazilian REIT:

H0: Its capital structure determinants converge with international peers.

H1: The significance and direction of its capital structure determinants diverge from the literature.

H2: The change in retained earnings does not significantly explain a change in accounting leverage.

The null hypothesis, "H0", was developed conservatively and translates into assessing whether the differences are significant enough to make Brazilian REITs an outlier. This strategy was chosen because (1) the literature on REIT capital structure shows some maturity; and (2) this is the first analysis of the Brazilian REIT capital structure.

[5] If management wants to retain more than 5% of the AFFO, this has to be semi-annually approved at an investor's meeting. This is rarely done, because of transaction costs, the pulverized investor base, and the clientele effect.
[6] As per Article 101, item II of Resolução CVM 175 (2023).

3. METHOLOGY AND DATA SETUP

3.1 Quantitative Method Selection

We first analyse the explanatory capability of firm-specific variables from the key capital structure determinants, as per Dogan et al. (2019), see Table 1 and Table 2. To that end, the following OLS regression model was developed for the 1st Model:

$$Market\ Leverage\ i,t = \beta 0 + \beta 1 * Tangibility\ i,t + \beta 2 * Size\ i,t + \beta 3 * Profitability\ i,t + \beta 4 * Growth\ Opportunities\ i,t + \beta 5 * Conflicts\ of\ Interest\ i,t + \beta 6 * Cost\ of\ Debt\ i,t$$

The variable definitions are shown in Table 3. Market Leverage was selected as the dependent variable and only debt was considered, instead of total liabilities i.e., in order to favour analytical simplicity. Tangibility, Size and Growth Opportunities used standard definitions from the literature, whilst Conflicts of Interest, Profitability and Cost of Debt had a unique composition. Total Compensation was the sum of recurrent compensation, which is a percentage of the REIT market capitalization, and performance fees. Profitability used AFFO to Equity, which in practice is a dividend yield, since the former is distributable income, and the latter is market capitalization. Cost of Debt considered 1.5 years ahead of DI futures[7], because future interest rates have a significant negative correlation to REIT market price, and management considers these rates to time market decisions.

Table 3 Composition of the 1st Model

Determinant	Type	Variable	Code	Formula
Market Leverage	Dependent	Market Leverage	ML	Debt/ (Debt+Market Cap)
Tangibility	Independent	Real Estate Assets	REA	Real Estate Assets/Total Assets
Size	Independent	Logarithm of Total Assets	logTA	Logarithm of Total Assets
Conflicts of Interest	Independent	Logarithm of Total Compensation	logTC	Logarithm of Total Compensation
Profitability	Independent	AFFO to Market Cap	AFFOMKTCAP	AFFO/ (market price*issued shares)
Growth Opportunities	Independent	Market to Book Ratio	MBR	(Total Assets - Equity+Market Cap)/Total Assets
Cost of Debt	Independent	Future Interest Rate	FIR	1.5 year ahead of DI futures

The 2nd OLS regression model below uses an accounting identity used by Feng et al. (2007) to verify how the change in new equity, retained earnings and equity to assets explains the change

[7] DI is the Brazilian interbank deposit rate. The 1.5-year timeframe was set using a Spline interpolation, which calculated the future interest rate of a particular date as per the previous and the next vertices of DI futures.

in accounting leverage. This analysis is fruitful in this unique context, because (1) the successful follow-ons tend to depend on market conditions; (2) 95% of the AFFO must be distributed semi-annually, reducing the capacity to significantly retain earnings; and (3) regulations only allow them to raise new debt by issuing receivables-backed-securities or doing seller's finance, thus they have only few options to indebt.

$$\Delta D/A_{i,t} = \beta_0 + \beta_1 * \Delta NE_{i,t} + \beta_2 * \Delta RE_{i,t} + \beta_3 * \Delta EA_{i,t}$$

Table 4 Composition of the 2nd Model

Component	Type	Variable	Code	Formula
Accounting Leverage	Dependent	Change in Accounting Leverage	ΔAL	Δ Debt/Assets
New Equity	Independent	Change in New Equity	ΔNE	Δ Net New Equity/Assets
Retained Earnings	Independent	Change in Retained Earnings	ΔRE	Δ Retained Earnings/Assets
Equity to Assets	Independent	Change in Equity to Assets	ΔEA	Equity *t-1* * ((1/Assets *t*) - (1/Assets *t-1*))

Both OLS regression models were subjected to the Hausman Test in order to verify the applicability of fixed or random effects. Regarding the 1st model, the firm specific variables that did not achieve at least 95% of significance were removed. The 2nd model focuses on the variable ΔRE; thus, the first result is sufficient to analyse it and the removal of insignificant variables is not necessary.

3.2 Database setup

The database consisted of 53 Equity REITs, of which 49 were part of IFIX on December 31st, 2023; the other 4 were part of IFIX earlier in 2023 and were added to enlarge the database. Their financial data from 2017 to 2022 were extracted from annual audited financial statements and quarterly regulatory reports, which contain the semi-annual AFFO calculation. These documents comprise quality data that are publicly available and can be downloaded directly from CVM and the B3 website - features that ensure replicability. Market prices and future interest rates were extracted by Quantum Finance.

The 1st model database contained 259 annual data points from 53 Equity REITs, before their review. A total of 11 data were removed because: 1) 10 indirectly owned real estate assets and Tangibility was less than 20%; (2) 1 was an outlier of Profitability that was proven incorrect, after cross checking the quarterly regulatory report with the audited financial statements of that REIT. Of the remaining 248 data points, 87 had zero Market Leverage because they did not have debt at the time. Therefore, the adjusted database consisted of 161 data from 42 REITs

with positive Market Leverage. The 2nd model analysed change between years, therefore data from IPOs or single-data REITs were removed, so that it consisted of 221 data from 49 Equity REITs from IFIX.

It is important to highlight that the tremendous growth of the Brazilian REIT industry coincides with the timeline between 2017 and 2022 (B3, 2023), thus most of the sample was created in this timeframe, which hampered the efforts to collect more data with positive Market Leverage. Table 7 in the next section shows that, out of the 42 Equity REITs in the database of the 1st model, in 2017 only 5 had leverage, whilst in 2022 36 of them had leverage (88%). This difficulty of collecting data was also seen in the study by Morri & Artegiani (2015), which used European Equity REITs from EPRA/NAREIT Europe Index on December 31st, 2012; their database comprised 68 Equity REITs and the timeline between 2002 and 2012 provided only 528 annual data points.

4. DISCUSSION OF EMPIRICAL RESULTS

4.1 Brazilian REIT Capital Structure Determinants

The pooled linear model allows for the initial assessment of multicollinearity using the Variance Inflation Factor (VIF), and no variable had VIF above 10, thus no adjustments were made to the model. Afterwards, the Hausman Test was conducted to assess a fixed-effect or random-effect. The test confirmed a fixed effect, also confirmed by the F Test. The full model with all variables initially presented an explanatory capability of 25.54%, but some variables had to be removed to refine the results. The model was adjusted by removing the least significant variables, one at a time, until the most significant remained. The first item removed was Tangibility, followed by Size. Lastly, Cost of Debt was removed. As per Table 5, the most significant determinants in the final model were Conflicts of Interest, Profitability and Growth Opportunities, which offered an explanatory capability of 20.74%.

Table 5 1st Model Results

Market Leverage	Tangibility	Size	Conflicts of Interest	Profitability	Growth Opportunities	Cost of Debt	Constant	R^2
ML	REA	logTA	logTC	AFFOMKT CAP	MBR	FIR	β_0	
Full model	0.1317 (0.16)	0.0911 (1.04)	-0.1085* (-2.74)	0.6959 (2.51)	-0.2351* (-2.67)	0.4810 (1.34)	0.1741 (0.26)	25.54%
First Adjustment	-	0.0895 (1.04)	-0.1079* (-2.75)	0.6930 (2.51)	-0.2351* (-2.68)	0.4961 (1.44)	0.1935 (0.29)	25.78%
Second Adjustment	-	-	-0,0802* (-2,79)	0,7422* (2,73)	-0,2566** (-3,01)	0,4760 (1.39)	0,7370*** (3,62)	22.43%
Final model	-	-	-0.7025* (-2.52)	0,8152** (3.05)	-0,3253*** (-4,66)	-	0,8723*** (3.78)	20.74%

Robust standard errors are given in parentheses under the coefficients.
Significance at 10%, 5% and 1% levels are indicated as *, ** and ***, respectively.

Tangibility and Size were the least relevant and, coincidently, those are the ones with most mixed results in the REIT literature, as shown in Table 2[8]. Both coefficients were positive, at least, which resounds with TOT's prediction of being positive to leverage. The advantages of having a portfolio of assets that either have good debt collateral or are larger with more diversified sources of income and economies of scale are very difficult to reject. It is worth highlighting that Brazilian REITs operate in an emerging market context, which has historically higher interest rates and lesser availability of long-term credit (Brito et al., 2007), therefore all features that reduce credit risk are relevant to obtain lesser debt cost and longer maturity. As per Table 6, larger Brazilian REITs leverage more than smaller ones, and this may be because they obtain better credit conditions, as the Median Market Leverage of the 1st quartile is significantly lower than the 2nd. However, the 4º quartile has the lowest Median Market Leverage, thus it may be that TOT is relevant until the REIT reaches a certain size.

Table 6 Summary Statistics of Size and Market Leverage

Quartile	Data Points	Total Assets, R$	Median Market Leverage	Average Market Leverage
1	41	795,261,548	0.0958	0.1468
2	40	1,319,876,424	0.1817	0.2155
3	40	2,272,012,040	0.1134	0.1300
4	40	6,162,960,700	0.0911	0.1272
161 data points with Market Leverage > 0			0.1201	0.1548

The result for Cost of Debt was initially surprising, as it was not significant and had a positive direction. As per Table 7, the Brazilian context of this asset class must be considered, because (1) most Equity REITs from IFIX started to use leverage in 2019; (2) future interest rates turned out to be highly volatile, as in 2020 they were at a historical low of 3.6% and then in 2022 increased sharply to 13.1%; and (3) there is a negative correlation between REIT market

[8] Harrison et al. (2011) and Morri & Artegiani (2015) rejected TOT for Tangibility and Size, whilst Feng et al. (2007) and Dogan et al. (2019) validated TOT for both determinants.

capitalization and interest rates (market leverage increases if market price decreases). The positive direction of Cost of Debt in Brazil seems to be the result of market timing, because the Brazilian REITs from the sample started leveraging in 2019 and 2020, when interest rates were low, and markets had high liquidity. In 2021 and 2022, however, as we can see in Table 7, interest rates rose sharply, which contributed to further increased market leverage, as prices fell.

Table 7 REITs with Leverage from the Sample, Cost of Debt and Market Leverage per Year

Year	REITs with Leverage	Data Points with Leverage	Brazil's SELIC	Future Interest Rate	Average Market Leverage
2017	5	5	7,0%	7.4%	6.6%
2018	8	8	6,5%	6.9%	12.4%
2019	19	19	4,5%	4.9%	9.4%
2020	23	23	2,0%	3.6%	10.8%
2021	34	34	9,3%	11.5%	17.1%
2022	36	36	13,8%	13.1%	19.4%

Profitability and Growth Opportunities were the most significant capital structure determinants for the Brazilian REITs. The variable AFFO to market capitalization presented a strong positive coefficient, which explained higher market leverage and validated TOT. This result differed from the literature, but this may be explained by the usage of different metrics: Harrison et al. (2011), Morri & Artegiani (2015) and Dogan et al. (2019) used, respectively, FFO/Assets, EBIT/Assets and EBITDA/Assets. These numerators do not consider financial expenses, which is key for the REIT's distributable income, especially because US REITs have a historic accounting leverage above 50% (Feng et al., 2007). Therefore, based on Table 7, we assess that in Brazil, more profitability explains more leverage because of higher interest rates and lower availability of long-term credit. This means that only profitable REITs can afford higher financial expenses, and creditors have more bargaining power to lend only when credit risk is adequate. The REIT literature argues that profitability explains new equity raisings, but we asses that the Brazilian result does not reject this, especially because the result of Growth Opportunities was the most significant and converging. The reinvestment capability of the Brazilian REIT is negligible, which means that the AFFO to market capitalization metric is intrinsically linked to the market-to-book ratio – the most profitable are also the most likely to have higher ratios.

Lastly, Conflict of Interest was significant with a negative direction, which introduces to the literature the fact that compensation from the management can explain the REIT capital structure. All Brazilian REITs from IFIX set their compensation as a percentage of market capitalization and some apply a performance fee, but the former is recurrent and their most important source of income. Therefore, their baseline compensation is directly increased when

the REIT grows. The conflict of interest arises when new equity is raised without clear financial economic grounds – only for the sake of growing – and is badly allocated, reducing REIT's performance, or increasing risk.

Table 8 Synoptic Analysis of the Brazilian Results

Synoptic Analysis	Tangibility	Size	Conflicts of Interest	Profitability	Growth Opportunities	Cost of Debt
Brazilian Results	**Converges with REIT literature.** It had a positive coefficient, just like US REITS, but it was not significant, like in most of the literature. It is unlikely to reject TOT on this matter.	**Converges with REIT literature.** It had a positive coefficient, but it was not significant, which converges with the mixed results in the literature. Brazilian REITs tend to leverage more as they grow, until they are large and established, when they deleverage.	**Converges with REIT literature and adds new findings.** Converges on rejecting POT, because Brazilian REITs also have low information asymmetry[9] and management favours new equity raisings, instead of debt, as the former directly increases their compensation.	**Diverges from the REIT literature, but the emerging market context must be considered.** TOT was validated, diverging from the literature. However, this may be explained by the usage of different metrics and the historically higher interest rates and lower long-term capital availability in Brazil.	**Converges with the REIT literature.** Brazilian REITs can reinvest only 5% of their AFFO, which is negligible to finance organic growth. Therefore, its negative coefficient strongly supported MTT, where a higher market-to-book ratio brings opportunities to issue new equity.	**Diverges from the REIT literature, but the emerging market context must be considered.** The historically low-interest rate markets between 2017 and 2021 allowed the Brazilian REITs to raise debt for the first time and increase market leverage, which is consistent with MTT predictions.

Finally, as presented above in Table 8, a synoptic analysis of the REIT literature and the Brazilian REIT results was done in order to check whether the latter diverged with the former. Overall, the capital structure determinants in the Brazilian sample converged with the international literature, therefore H1 was rejected and H0 was not. The only divergence was Profitability and Cost of Debt, but the root cause may have been metric differences or the emerging market context. Most of the Brazilian REITs from IFIX started to leverage in 2019, which may also explain why their capital structure had never been researched before.

4.2 Components of Accounting Leverage Change

Firstly, the equation was analysed using the pooled model to check multicollinearity. The Variance Inflation Factor, "VIF", was calculated and all variables had a VIF lower than 10. Afterwards, the Hausman test was carried out to verify the applicability of fixed or random effects, and the latter was confirmed. A total of 221 data points from 49 REITs were analysed and Table 9 shows the results, which explained 52.29% of the change in accounting leverage. Higher explanatory capacity was expected, as the equation represents an accounting identity.

[9] All Brazilian REITs must report their monthly balance sheet, quarterly results, annual audited financial statements, and real estate property appraisal reports to a public CVM database. Moreover, it is market practice that almost all REITs listed in B3 publish a monthly managerial report "Relatório Gerencial", featuring comments by the management about the month's performance and updates regarding the portfolio.

Table 9 2nd Model Results

Change in Accounting Leverage	Change in New Equity	Change in Retained Earnings	Change in Equity to Assets	Constant	R^2
ΔAL	ΔNE	ΔRE	ΔEA	β_0	
Full model	-0.5465*** (-14.25)	-0.4148*** (-4.72)	-0.5400*** (-14.81)	0.0027 (0.47)	52.52%

Robust standard errors are given in parentheses under the coefficients.
Significance at 10%, 5% and 1% levels are indicated as *, ** and ***, respectively.

All remaining variables were significant and exhibited negative coefficients. Initial expectations were that Change in Retained Earnings (ΔREA) would not be significant, as the only way to retain more than 5% of the AFFO is through approval at an investors' meeting. This strategy is unlikely because of transaction costs, because IFIX REITs have a highly pulverized investor base, and the clientele effect for dividends is high. However, ΔREA was significant and the results rejected H2.

To understand this result required a close review of all financial statements from the sample. Surprisingly, the Retained Earnings mostly came from property fair value adjustments. In Brazil, properties owned by REITs do not incur depreciation and must be appraised annually by external consultants. Thus, if a property gains value over time, the resulting adjustment of fair value will transit through the income statement, ultimately resulting in profit (or loss). However, these profits do not include a cash flow, and thus remain as Retained Earnings until the asset is sold.

The rejection of H2 means that Equity REITs from IFIX tend to retain properties that have gained value in their portfolios. These retained earnings increase equity and decrease accounting leverage. Despite the clientele effect for dividends, the strategic preference seems to be to retain profitable properties, instead of selling them to maximize short-term dividends.

5. CONCLUSION

This study analysed the determinants of the capital structure of Brazilian REITs, and particularly focused on whether unique regulatory provisions, such as the semi-annual mandatory payout of 95% of AFFO, influenced leverage. To address this, two OLS regression models were used. The first model focused on standard determinants like size, profitability, and growth opportunities, while the second model verified if changes in retained earnings explained changes in accounting leverage. The data from 53 Brazilian REITs between 2017 and 2022 ensured a dataset that captured recent market dynamics.

Throughout the research, several challenges arose, such as the lack of previous Brazilian literature regarding the capital structure of REITs and, notably, the limited availability of historical data, as most of the REITs in the sample were only created or began leveraging between 2019 and 2020. Additionally, to understand how retained earnings explained deleveraging and the origin of these earnings, the REIT's audited financial statements had to be individually analysed. These constraints were addressed through a careful literature review, using data from public databases of quality, and a selection of established quantitative methodologies, which ensured that the analysis remained consistent with both the theoretical framework and the practical realities of the Brazilian REITs.

Overall, the findings of this study converged with the existing literature on REIT capital structure, thus H1 and H2 were rejected and H0 was not. Most determinants, such as tangibility, size, and growth opportunities, showed results consistent with the trade-off theory and market timing theory. However, a divergence was observed in the profitability determinant, where the positive relationship with leverage differed from its international peers. This can be attributed to (1) REIT literature using profitability metrics that do not account for interest expenses, such as EBITDA or EBIT, while we used AFFO; and (2) the emerging market context of higher interest rates and less long-term credit, where profitability is key to afford higher debt costs and stricter credit approvals. The verification that retained earnings explained deleveraging, despite the 95% AFFO payout, further contributed towards the convergence of the Brazilian results. This was relevant because the opposite had not yet been seen in REIT literature.

Additionally, this is a pioneering study on the Brazilian REIT capital structure, which paves the way for future research and highlights some of its unique regulatory requirements, which may have substantial effects on its financial economic dynamics. For instance, this verification sheds light on a specific characteristic of Brazilian REITs, i.e., (1) they tend to retain profitable properties instead of selling them, contradicting the clientele effect for dividends; (2) properties' fair value adjustments are the primary source of retained earnings, which is significant enough to explain deleveraging; (3) accounting profits or losses only impact the distributable income when they become cash flow (AFFO); and (4) investor's must be aware that when a profitable property is sold, accounting leverage may increase, as 95% of those profits will have to be distributed in the same semester.

Finally, management compensation was analysed for the first time as an REIT capital structure determinant and the result was promising, as it introduced an agency costs theory perspective. It negatively explained market leverage, which suggested that management prefers to raise new equity instead of debt, as the former surely increases recurrent compensation, whilst the latter

adds risk and may contribute to uncertain performance fees. Therefore, there are clear incentives to expand the REIT when market conditions allow, which does not exclude combining growth with new debt. This validation of agency costs theory also validates market timing and strongly rejects pecking order, consistent with Boudry et al (2010), Harrison et al. (2011), and Morri & Artegiani (2015). Lastly, Feng et al. (2007) and Harrison et al. (2011) also verified that REITs tend to combine new equity with new debt, corroborating that they tend to rebalance their capital structure after growing.

Future research could explore whether the dynamics observed in Brazilian REITs hold true in other countries, particularly whether profitability positively explains leverage in emerging markets and whether management compensation also negatively explains leverage. The validation of the latter in larger REIT markets, especially, would be a significant validation as to why REITs prefer to raise new equity over debt. Another research opportunity lies in examining the praxeological impact of using AFFO as the metric for distributable income, which may disincentivize selling loss-making assets. This could be verified by analysing the incidence of loss-making transactions by Brazilian REITs, because an extremely low incidence would be a strong indication that management avoids selling assets with losses. The negative impact on short-term dividend distribution would stress investors and impact market capitalization, which would ultimately also impact management compensation.

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