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CAPITAL STRUCTURE DETERMINANTS UNDER EXCLUSIVE REIT REGULATIONS: US AND TURKISH REITs

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Abstract. The purpose of this study is to determine the impact of these differences on capital structure of real estate investment trusts in the United States and Turkey. This paper includes 110 real estate investment trusts traded on the New York and Istanbul Stock Exchanges for the period from 2013 to 2022. Capital structure is proxied by book leverage and market leverage as dependent variables. Firm specific, financial market specific and macroeconomic factors are included in the model as independent variables. Findings indicate that negative relationships exist between firm age, level of capital market development, operating risk, and market leverage, while a positive relationship exists between the level of bond market development and market leverage for the United States and Turkey. US-REITs demonstrate a preference for equity financing over debt financing, given the more advanced capital markets. As REITs gain experience and mature within the sector, there is a tendency to place greater importance on internal resources and to rely less on external sources. This paper partially fills the literature gap by revealing the capital structures of REITs and their compliance with capital structure theories. The results of this research are consistent with trade off and pecking order theories.

Keywords: determinants of capital structure, panel data analysis, REITs, pecking order theory, trade off theory, agency theory.

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1. Introduction

Studies on modern capital structure theories have been conducted since 1958, examining the optimal capital structure and the effects of capital structure decisions on firm value. Several theories regarding the optimal capital structure have been proposed in the existing literature. Nevertheless, there is no consensus on the optimal capital structure or the factors that drive capital structure decisions at the firm or industry level. Capital structure decisions are crucial for firms, as they directly impact firm value through the cost of capital and capital budgeting. The capital structure and debt/equity composition are the most significant factors within the manager's control. Firms seek to attain an optimal capital structure through factors such as evolving market conditions, competitive structures, and tax regulations.

Studies on capital structure should address two critical questions. The initial consideration is whether a change in the capital structure would increase the value of the company. The existence of a relationship between the value of a company and its capital structure raises a further question. This question relates to determining the optimal capital structure. Modigliani and Miller (1958) proposed the debt irrelevance theorem to answer the first of these questions. Thus, there is no causal link between a firm's value and its capital structure, and financial debt can neither increase nor decrease a firm's value.

The study identifies the factors affecting the capital structure of real estate investment trusts (REITs) and tests their compatibility with the capital structure theories. The United States REITs (US-REITs) and Turkish REITs (TR-REITs) included in the study have different levels of capital markets with distinct regulations. Furthermore, the regulations and notices created for REITs include restrictive conditions in terms of asset structure, liability structure, and ownership structure. This study contributes to the literature that reveals the effects of different practices in US-REITs and TR-REITs on capital structure decisions.

2. Motivation

There are distinct regulations between the US and Turkish REITs in terms of taxation, dividend distribution, shareholding structure, asset structure formation, income structure conditions, borrowing limit, and the requirement to be traded on a stock exchange. In this regard, the study offers a valuable opportunity and makes a significant contribution to the existing empirical literature on capital

structure theories by examining the compliance of firms under exclusive intrinsic market dynamics and regulations with the assumptions of capital structure theories.

The US possesses a highly diversified economy, with a robust real estate market across multiple sectors. REITs are well integrated into the broader financial markets, contributing significantly to the economy. Conversely, the Turkish economy is confronted with a distinct set of challenges, including inflation, exchange rate volatility, and a less stable real estate market. The level of development of money and capital markets is very different in the US and Turkey. This situation has a considerable impact on the source of financing for investments and the capital structure of REITs. A comparison of the two economies can provide valuable insights into how TR-REITs adapt to these conditions, particularly about risk management and investor returns, as opposed to their US counterparts.

The motivation to compare the REIT market with the REIT market in the US is driven by several factors, which are rooted in differences in market maturity, regulatory environments, investor behavior, and economic conditions. In terms of market maturity and development, the US-REIT market is one of the oldest and most established globally, with a well-developed regulatory framework, a diverse range of property types (residential, commercial, industrial), and a large pool of institutional and retail investors. US-REITs were established in 1960 through legislation. By contrast, the TR-REITs market is emerging, having been established in 1995, and is still in its growth phase. A company's extensive experience in the sector is a crucial factor influencing capital structure decisions. Companies with a long history and strong reputation in their sector tend to have more access to funding. In accordance with the trade off theory, as older companies have already accumulated a wealth of information, they are less likely to encounter asymmetric information problems. The presence of low asymmetric information can facilitate the use of higher financial leverage.

In terms of regulatory and legal differences, the US has well-established rules, including tax benefits for REITs, making it an attractive model for investors. In contrast, Turkey's regulatory framework is still evolving, and a comparison of how REITs are governed in these two countries can highlight how differences in tax policies, disclosure requirements, and corporate governance affect performance and investor confidence. Although REITs are fully exempt from corporate income tax in Turkey, certain conditions apply to US-REITs. For this reason, REITs benefit from the tax shield effect in different ways due to tax exemptions. On the other hand, unlike TR-REITs, US-REITs are subject to a dividend distribution requirement. Furthermore, TR-REITs are subject to a borrowing limit of up to five times their equity, while no such limit exists for US-REITs. These differences could directly impact the capital structure decisions of real estate investment trusts in the US and Turkey. Appendix Table A1 contains a comparison of REITs in the US and Turkey.

It is submitted that Turkey's REIT market has much to gain from the observation of the US market's evolution with regard to regulatory practices, transparency, and financial innovation. Through a comparative analysis of these markets, policymakers and market participants can identify areas for enhancement, including the implementation of enhanced investor protection measures, the introduction of tax incentives, and the facilitation of market access for smaller investors.

By comparing the two markets, it is possible to gain an understanding of the challenges and opportunities of developing a REIT market in a rapidly developing economy such as Turkey, while drawing on the experience of a global leader such as the US.

3. Capital structure

REIT capital structure analysis is a stimulating issue for the financial literature because of two key unique traits of REITs. The first characteristic is that REITs benefit from tax exemption. As a consequence, although REITs bear the agency costs of debt and financial distress, they do not benefit from the tax shield as proposed by the trade off theory, one of the significant theories of capital structure. Therefore, it becomes crucial to review the validity of this theory for REIT firms. Secondly, REITs have dividend payout commitments. Since REITs allocate their internal resources to dividend payments, they must constantly borrow to finance new investments (Hardin & Wu, 2010).

According to Ross et al. (2016), the term internal growth rate is the maximum growth rate that can be achieved with no external financing of any kind. It refers to the growth that firms can achieve using only internal resources, such as undistributed profits, without the need to use external resources. However, dividend distribution, which is mandatory for REIT firms, does not enable them to achieve this internal growth. Instead, it causes them to operate at low cash asset levels. Ott et al. (2005) observed that the ratio of undistributed profits of REIT firms to investments is 7%, while the ratio of other firms is 70%.

Typically, investments are financed through the issuance of equity, debt, commercial paper, or bank loans. High financial leverage allows REITs to increase their profits when economic activity is booming and real estate is expanding. However, during an economic recession or a downturn in the industry, high levels of leverage can lead to significant financial losses. As long as the return on assets remains higher than the cost of borrowing, increasing financial leverage will increase the return on equity. The economic outlook and developments in the real estate sector have an impact on REITs' financing decisions. During periods of booming demand and high levels of economic activity in the sector, REITs tend to prefer equity financing, while in the opposite situation, they tend to choose debt financing (Ghosh et al., 1997).

Jaffe (1991) suggests different reasons why REIT firms use debt. Investors who do not find the firm's debt level

appropriate can reach their desired target capital structure by borrowing and lending through their portfolios. This approach finds parallels in the 'homemade leverage' approach proposed by Modigliani and Miller (1958).

The exemption from corporate tax granted to REITs prevents the possibility of benefiting from the tax shield effect of debt interest. According to the trade off theory, the optimum financial leverage ratio is formed at the point where the advantage provided by the tax shield of debt interest and the agency cost and bankruptcy cost are balanced. However, the exemption from corporate tax granted to REIT firms calls into question the validity of the trade off theory for the REIT sector. REITs incur the agency cost and financial distress cost through the use of debt, yet they are unable to benefit from the tax shield advantage, which serves to offset these costs. Consequently, REITs face challenges in competing in debt markets with firms that leverage the tax shield advantage (Howe & Shilling, 1988).

4. Literature review

Giacomini et al. (2017) analyzed the relationship among capital structure, risk, and return on equity for REITs operating in the US between 1990 and 2012. The study employed the Sharpe Ratio to measure performance. The panel data analysis revealed that companies in the REIT sector with high financial leverage had lower performance than those with low financial leverage. A positive relationship is observed between firm size and leverage, which is consistent with the trade off theory, while a negative relationship exists between profitability and debt to equity ratio, which is consistent with the assumption of the pecking order theory (Giacomini et al., 2017).

Dogan et al. (2019) examined 313 REITs from twelve countries, including the United States and Turkey, to explore the impact of country specific factors, firm specific factors, and legal regulations on REITs' capital structure. The research employed the variables of asset structure, profitability, growth opportunities, firm size, and interest coverage ratio as firm specific factors. The development of the stock and bond markets is considered a country specific factor that incorporates legal restrictions on financial borrowing and dividend distribution. According to the study, Turkey has the lowest gearing ratio compared to other countries. Furthermore, TR-REITs do not require dividend payouts, which makes equity financing more appealing than debt financing. Additionally, companies with high dividend payouts tend to have high leverage ratios. Alternatively, REITs operating in countries with borrowing limits and no requirement for dividend payouts have lower financial leverage. There is a negative correlation between firm size, growth opportunities, and leverage. In the US, a positive correlation exists between the level of development of both the stock and bond markets and financial leverage. For REITs in the US and Turkey, it is observed that debt levels increase with profitability in accordance with the trade off theory (Dogan et al., 2019).

REITs have an idiosyncratic structure regarding tax rules and payout requirements. Given these characteristics, the factors influencing REITs' capital structure decisions have been of concern in the financial literature. As the corporate tax burden increases, firms use more financial leverage to benefit from the tax shield effect (Pfaffermayr et al., 2013). Firms operate with higher financial leverage ratios to obtain tax deductions (Huang & Song, 2006). However, REITs are fully exempt from corporate income tax in Turkey and are subject to certain conditions in the United States. Although REITs cannot benefit from the tax shield effect due to the tax exemption, the dividend payout requirement in many countries results in a reduction of internal resources. This circumstance leads REITs to use external sources to finance their investments.

Morri and Parri (2017) analyzed the factors that affect the capital structure decisions of 74 US equity REITs. The impact of the financial crisis of 2008 has also been analyzed for the period of time between 2005 and 2014. Analysis revealed positive correlation between assets, economic downturn, and financial leverage. Growth opportunities and firm risk have a negative relationship with the financial leverage ratio in line with the trade off theory. However, there is no significant relationship between profitability, growth rate, and leverage ratio. The findings indicate that the trade off theory is efficient in the capital structure decisions of REITs in the United States (Morri & Parri, 2017).

Versmissen and Zietz (2017) examined US-REITs from 1993 to 2013, using the Generalized Method of Moments to determine whether they maintain the targeted debt ratio for their capital structure. The study aims to analyze the effects of firm size, growth opportunities, profitability, fixed asset structure, stock market performance, corporate structure, and median debt ratio on capital structure. Research indicates that there is a positive relationship between firm size, fixed asset ratio, and financial leverage ratio, consistent with the trade off theory. The target leverage ratio of REITs is around 60%, which fluctuates throughout the year. Despite their unique dividend payout obligations and corporate tax exemptions, REITs cannot benefit from the tax shield advantages of debt. However, REITs exhibit higher financial leverage compared to other industries (Versmissen & Zietz, 2017).

US-REITs exhibited higher financial leverage than TR-REITs during 1998–2007. This difference could be explained by the fact that REITs in Turkey do not have a dividend payout requirement. Furthermore, there are significant positive relationships between capital market development, firm size, growth opportunities, and the total financial debt to total assets ratio. Although the financial crisis of 2001 had a detrimental effect on short term debts, it had a positive impact in the long term. Conversely, the impact of inflation on debt ratios was negative (Erol & Tırtıroğlu, 2011).

Several endogenous and exogenous factors influence the decision on capital structure. The factors affecting the capital structure of 334 REITs operating in 20 different countries, including Turkey and the US, between 2005 and 2010 are examined using static and dynamic panel data analysis. The examined exogenous factors include changes in GDP and long-term interest rates, while the examined endogenous factors include profitability, fixed asset ratio, firm size, growth opportunities, firm risk, interest coverage ratio, and asset turnover rate. Financial leverage is positively correlated with fixed asset ratio, firm size, growth opportunities, and asset turnover rate, whereas it is negatively correlated with borrowing cost, GDP, and long-term borrowing rate (Rovolis & Feidakis, 2014).

Chikolwa (2011) performed an analysis of 34 Australian REITs during the period between 2003 and 2008 to investigate the impact of factors such as the return on assets, fixed asset ratio, firm size, growth opportunities, operating risk, and debt maturity structure on capital structure. The study found a negative correlation between debt ratios and operating risk, which is consistent with both the trade off and pecking order theories. Conversely, a positive correlation exists between the fixed asset structure and the firm size and gearing ratio, which pertains to the trade off theory (Chikolwa, 2011). Capozza and Seguin (2001) argue that large REITs achieve their optimal capital structure with higher leverage. They provide two justifications for this claim. First, all REITs have equal fixed costs by default, but larger REITs benefit more from higher leverage due to economies of scale. Second, larger firms have more diversification opportunities within their portfolios and thus lower bankruptcy risks than smaller firms. Therefore, larger firms have easier access to financing (Capozza & Seguin, 2001).

Harrison et al. (2011) analyzed the impact of factors such as asset structure, profitability, growth opportunities, firm size, liability structure, interest coverage ratio, and firm age on capital structure decisions between 1990 and 2008. The researchers found that firms had a financial leverage ratio of 48%. Financial leverage and property, plant, and equipment ratios correlate positively. However, they did not find a statistically significant relationship between firm age and capital structure. REITs with higher property, plant, and equipment investments tend to have higher financial leverage ratios. The assumptions of market timing and trade off theory are found to be valid for firms' capital structure decisions. REITs follow the market timing theory in determining their capital structure (Harrison et al., 2011).

During the period from 1998 to 2015, the ratio of total debt to total assets for the US-REITs was 50.4%, compared to 25.9% for other companies. Although REITs are exempt from corporate income tax if certain conditions are met, they have twice as much debt as other companies, resulting in the "*REIT debt puzzle*". This analysis examines the relationship between capital and asset structures, dividend distribution ratio, profitability, growth rate, firm size, and firm risk. The high level of tangible assets increases financial leverage due to their ability to serve as collateral. As profits increase, REITs tend to increase their use of internal resources. This allows REITs to operate with lower financial leverage. There is a negative relationship between business risk and financial leverage, whereas no significant relationship exists between firm size and dividend payout ratios, as suggested by the research findings (Breuer et al., 2023).

Morri and Beretta (2008) examined the factors influencing the capital structure of 112 US-REITs from 2002 to 2005. The independent variables included asset size, profitability, tangible asset structure, growth opportunities, firm risk, and geographical diversification of real estate investments. The study found that in making capital structure decisions, REITs follow the pecking order theory. Since profitable REITs can finance their assets internally, they have a lower level of financial leverage. REITs with high growth opportunities generally have higher financial leverage. REITs that have a high fixed asset ratio often have a greater amount of debt due to those assets being used as collateral. REITs that invest in residential real estate carry lower firm risk than those investing in office and commercial real estate, due to the less volatile nature of their cash flows. This allows REITs investing in residential real estate to have longer term financial liabilities and operate with higher financial leverage ratios (Morri & Beretta, 2008).

5. Data analysis

The study employs both time series and horizontal cross-sectional data collected between 2013 and 2022. Since data are repeated throughout the period, the econometric method used in the study is panel data analysis. Panel data involves the analysis of multiple variables over time (Wooldridge, 2006). Within the scope of panel data analysis, two primary types are identified. These are static and dynamic panel models. A static panel model examines the relationship between variables at a single point in time. It assumes that the current outcome dependent variable depends only on current explanatory variables, not on past outcomes. In contrast, the dynamic panel model incorporates lagged values of the dependent variable as regressors. It is based on the assumption that past outcomes influence current behaviour. Dynamic models include lagged dependent variables among the regressors. Many economic, financial, and macro models employ static or dynamic panels. The study's primary focus is on contemporaneous relationships; therefore, there is no requirement for the inclusion of lagged dependent variables. Therefore, static panel data is employed. Consequently, as the issue of delayed effects was not given consideration, the problem of one-period data loss was also prevented. The study analyzes data of REITs in the US and Turkey, including their time and horizontal cross-sectional dimensions. Given this characteristic, the panel data analysis method, which is widely used in the literature, is considered appropriate for the study.

Table 1. The US-REITs and TR-REITs shares in the global REIT market

	Number	Market capitalization (billion $)	Share of market capitalization (%)
Global REITs[1]	893	1.900	100,00
US All REITs[2]	206	1.271	66,89
NYSE REITs[3]	169	1.086	57,16
US-REITs in sample	80	925	48,68
TR-REITs[4]	39	13	0,69
TR-REITs in sample	30	10	0,50

Notes: NAREIT, Global REIT Approach to Real Estate Investing, 2023; [2] NAREIT, Monthly Statistical Report on the Real Estate Investment Trust Industry, 2023; [3] NAREIT, Monthly Statistical Report on the Real Estate Investment Trust Industry, 2023; [4] GYODER, Gosterge Turkey Real Estate Market, 2023; [1] Quarter Report, 2023.

5.1. Dataset

The study consists of a sample of 80 equity REITs listed on the NYSE with a total market capitalization of $925 billion. The US sample encompasses 85% of NYSE listed REITs and 48.68% of the global REIT sector in terms of market capitalization. For the TR-REIT sector, this study includes 30 out of 39 REIT companies traded on the ISE, for which consolidated financial statement data is available for the period between 2013 and 2022. The sample accounts for approximately 77% of the market capitalization of all TR-REITs (Table 1). The analysis focuses solely on equity REITs that have direct ownership of the real estate that generates revenue through leasing or selling.

The factors affecting capital structure are categorized as firm specific factors, financial market specific factors, and macroeconomic factors as independent variables. On the other hand, two different proxies for capital structure, book value of equity and market value of equity, are employed as dependent variables. The firm specific variables selected are asset size, fixed asset ratio, current ratio, return on assets, return on equity, growth opportunities, dividend payout ratio, firm age, bank subsidiary or affiliate status, outstanding shares ratio, and operating risk. Risk free interest rates and the consumer price index (CPI) are selected as macroeconomic variables. Financial market specific factors include the level of capital market development and the level of bond market development. The variables were identified among those used in the studies referenced in the *Literature Review* section. The variable that may affect the capital structure of REIT firms has been identified among these variables.

5.2. Data description

The financial leverage ratio represents the ratio of total short- and long-term debt to total assets. In addition, certain studies employ the market value of equity for the size of the firm's assets, while others consider the book value of equity. The main reason for this is that the capital structure cannot be expressed consistently in the case of large market value volatility. On the other hand, it is also observed that researchers use book value instead of market value due to the problems that may arise in obtaining data (Titman & Wessels, 1988).

Frank and Goyal (2009) assert that using the book value of capital to calculate leverage is an ex-ante assessment, while using the market value of capital is an ex-post assessment. There are also views that it is more feasible to determine the capital structure by considering the ex-ante valuation (Myers, 1977). In other studies, conducted to test the pecking order theory, the book value of equity is considered to represent the leverage ratio (Campello & Giambona, 2013; Chen et al., 2021; Erdinç & Sayılgan, 2020; Fama & French, 2002; Frank & Goyal, 2003; Rovolis & Feidakis, 2014). However, since the equity book value is a netting item on the balance sheet, it can take negative values. Therefore, certain studies consider the market value of equity in determining the financial leverage ratio (Bilgin & Dinç, 2019; Lemmon et al., 2008; Stamolampros & Symitsi, 2022; Welch, 2004; Yousef, 2019). The studies indicate two distinct approaches for analyzing financial leverage: using the book value of equity and the market value of equity (Erol & Tırtıroğlu, 2011; Giacomini et al., 2017; Harris & Roark, 2019; Harrison et al., 2011; Marts & Elayan, 1990; Morri & Cristanziani, 2009; Zarebski & Dimovski, 2012). Therefore, this paper provides two models that consider the book value of equity and the market value of equity for US and TR-REITs (Table 2).

Furthermore, the independent variables are categorized into firm specific factors, financial market specific factors, and macroeconomic factors. In the study, the logarithm of the asset size was employed as a representation

Table 2. Definition of financial leverage ratio and references

Definition	Symbol	Reference
$\frac{\text{Book value of debt}}{\text{Total book value of assets}}$	L_1	Chen et al. (2021) Erdinç and Sayılgan (2020) Rovolis and Feidakis (2014) Campello and Giambona (2013) Yousef (2019) Erol and Tırtıroğlu (2011) Frank and Goyal (2009) Fama and French (2002)
$\frac{\text{Book value of debt}}{\text{Market value of equity + Book value of debt}}$	L_2	Stamolampros and Symitsi (2022) Bilgin and Dinç (2019) Yousef (2019) Harrison et al. (2011) Erol and Tırtıroğlu (2011) Morri and Cristanziani (2009) Lemmon et al. (2008) Welch (2004)

of the asset size of the firms. The use of fixed assets as collateral for loans has been shown to reduce agency cost of debt. In this study, the ratio of fixed assets to total assets is used to represent the asset structure. Growth opportunities are defined as the potential benefits that enterprises will provide in the future through investments. The real value of future investment opportunities is contingent on the investment decisions taken by the firm's management. Firms with high growth opportunities derive their strength from intangible assets. In the case of financial difficulties, the less stable value of these assets may lead to significant losses. The market capitalisation of equity/book value equity ratio is commonly employed as a proxy in extant literature to indicate growth opportunities.

The study employs free float shares ratio[1] instead of the percentage of shares outstanding. The reason for the exclusive use of this variable in the context of the TR-REIT models can be attributed to the following factors. It is a prerequisite that the percentage of shares in issue of REITs operating in Turkey be a minimum of 25%. Nevertheless, in instances where REITs do not gain sufficient interest during the initial public offering phase, the shares are purchased by related entities and investors, which ultimately results in a low free float shares ratio. A lower free float shares ratio indicates a smaller number of shareholders in the firm, which in turn implies a smaller number of shareholders with voting rights in managerial decisions. During the research period, there was an average difference of 14% between the percentage of shares outstanding and free float shares ratios for TR-REITs. Consequently, the free float shares ratio, which serves as an indicator of the extent to which capital is widely distributed, is a more meaningful measure than the percentages of shares outstanding. As the difference between the free float shares ratio and the percentage of shares outstanding is more common in the Turkish market, it has been included solely for the TR-REIT models.

The unlevered beta, which is a proxy of the operating risk of the firm, is used as an indicator of operating risk. Unlevered beta is also referred to as asset beta. Firms with high operating risk are characterised as firms with high unlevered beta (Damodaran, 2015; Ooi, 1999). Asset beta cannot be observed directly. However, it can be derived from the calculated levered beta (Copeland et al., 2014). Levered beta is defined as a measure of the sensitivity of any stock return to changes in the return of the market portfolio. It is observed that high-risk firms with high asset beta tend to use less debt.

Firm age is transformed into a dummy variable and included in the models by taking into account the time elapsed since the firms started to operate as REITs. The median age is calculated as 11 years for TR-REITs and 32 years for US-REITs during the research period. The difference in the level of development of the US-REIT and TR-REIT sectors is defined by considering the median age. The dummy variable is included in the models as 1 in the case of firms that have been operating for the period of median age and above, and as 0 in other cases. The dummy variable of the firms that exceeded the median age during the period of data analysis was adjusted to change from 0 to 1.

In addition, analysis of the founders and main shareholders of REITs indicates that a significant number of REITs in Turkey were established by banking institutions. However, this is not the case in the United States. In the Turkish market, banks play the role of founding and controlling shareholders in seven of the 30 firms included in the scope of the research. To examine the impact of banks' corporate governance approach and high financial risk management capability on the capital structure design of REITs, the status of being a bank subsidiary or affiliate is included as a dummy variable in the models for the TR-REIT sample only.

In this study, the risk-free rate of return is employed as an interest rate indicator. For the purposes of this study, the government bond yields at the maturity with the highest trading volume have been selected for both the US and Turkey. The data set for Turkey comprises 2-year government bond yield information, whereas that for the US consists of 10-year government bond yield data. In order to determine the effects of the level of development of capital markets on capital structure decisions, the ratio of total capital market size of countries to gross domestic product is employed. Furthermore, in order to analyse the effects of the level of development of bond markets on capital structure formation, the ratio of countries' total international and domestic debt stocks to gross domestic product was used.

In the panel dataset containing all variables, an $A \times B$ matrix is created, where A is the number of observations and B is the number of independent variables for the US and the Turkey (Table 3).

The findings of the descriptive statistics indicate that TR-REIT firms exhibit lower levels of financial debt in their capital structures on average compared to their US counterparts. However, it is noteworthy that the variability in the level of debt of TR-REITs over the years is higher. The fixed assets ratio is higher for US-REITs, consequently resulting in their average current ratios being lower compared to TR-REITs. Along with profitability ratios, dividend distribution ratios are higher for US-REITs. On the other hand, the average firm risk level is found to be lower for US firms (Tables 4–5).

The sources of data collection are presented in Table 6.

[1] Free Float Shares = Total Shares – Treasury Stocks – Shares held by Strategic Entities

Table 3. Definition of independent variables

Variable type	Independent variables	Abbreviation (Symbol)	Definition
Firm specific factors	Asset size	AS	Log (AS)
	Fixed assets ratio	FAR	$\frac{\text{Total fixed assets}}{\text{Asset size}}$
	Current ratio	CR	$\frac{\text{Total current assets}}{\text{Current liabilities}}$
	Return on assets	ROA	$\frac{\text{Operating profit}}{\text{Asset size}}$
	Return on equity	ROE	Operating profit / Equity
	Growth opportunities	GO	$\frac{\text{Market capitalization of equity}}{\text{Book value of equity}}$
	Dividend payout ratio	DPR	Dividend / Net profit
	Firm age	FA	Year since establishment
	Subsidiary or associate of the bank	BNK	Dummy variable as 0 / 1
	Free float shares ratio	FFS	$\frac{\text{Floating stock number}}{\text{Total shares}}$
	Operating risk (Unlevered beta – Asset beta)	OR	$\frac{\beta_{\text{Leveraged}}}{1+\frac{\text{Total financial debt}}{\text{Market capitalization of equity}}}$
Macroeconomic factors	Risk free interest rate[1]	RF	US 10-year bond yield Turkey 2-year bond yield
	Inflation	CPI	Consumer prices index
Financial market specific factors	Level of capital market development	CM	Capital market size / GDP
	Level of bond market development	BM	Bond market size / GDP

Notes: For the risk-free rate, the yield of the most liquid government bonds with the highest trading volume in the secondary market was used. According to the efficient market hypothesis, government bonds with a high trading volume provide the market with more information and therefore offer the most accurate return. In contrast to the US, Turkish government bonds are traded in a relatively *"shallow market"* with a 10-year maturity. Therefore, the prices may be subject to *"noise"*. Turkish 2-year government bonds were preferred due to their higher trading volume and liquid market, which provides more accurate information for study.

Table 4. Descriptive statistics for dependent and independent variables (US-REITs)

Variables	Number of observation	Minimum	Median	1 quartile	3 quartile	Maximum	Mean	Std. dev.
L_1	795	0,007	0,466	0,403	0,542	0,855	0,473	0,123
L_2	795	0,002	0,323	0,261	0,410	0,753	0,337	0,112
AS	795	2,260	3,679	3,375	4,047	4,944	3,705	0,468
FAR	795	0,305	0,943	0,909	0,965	0,997	0,920	0,079
CR	795	0,048	1,778	0,961	3,059	47,524	2,909	4,151
ROA	795	–0,083	0,039	0,027	0,052	0,201	0,041	0,024
ROE	795	–0,871	0,080	0,051	0,118	1,429	0,109	0,130
GO	795	0,237	1,823	1,351	2,490	20,857	2,468	2,249
DPR	795	0,000	1,160	0,934	1,755	83,153	1,971	4,523
FA	795	0,000	1,000	0,000	1,000	1,000	0,511	0,500
OR	795	–0,252	0,431	0,293	0,616	1,627	0,479	0,289

Table 5. Descriptive statistics for dependent and independent variables (TR-REITs)

Variables	Number of observation	Minimum	Median	1 quartile	3 quartile	Maximum	Mean	Std. dev.
L_1	291	0,000	0,188	0,005	0,371	0,806	0,215	0,202
L_2	291	0,000	0,226	0,003	0,465	0,839	0,257	0,243
AS	291	0,911	3,069	2,563	3,423	4,672	3,026	0,681
FAR	291	0,001	0,855	0,638	0,935	0,996	0,749	0,260
CR	291	0,049	1,438	0,657	3,427	57,478	4,045	7,504
ROA	291	–0,206	0,027	0,009	0,050	0,453	0,040	0,073
ROE	291	–1,311	0,043	0,014	0,078	1,302	0,062	0,195
GO	291	0,109	0,707	0,445	1,289	28,534	1,228	2,046
DPR	291	0,000	0,000	0,000	0,038	1,618	0,107	0,269
FA	291	0,000	11,000	8,000	16,000	26,000	12,100	6,145
FFS	291	0,000	0,291	0,204	0,485	1,000	0,346	0,218
OR	291	–0,314	0,415	0,194	0,724	1,832	0,507	0,400

Table 6. Sources of variables

Variable	Source
Financial statement data[1]	Standard & Poor's (S&P) Capital IQ, Refinitiv Eikon and Public Disclosure Platform of Turkey
Stock market data[2]	Standard & Poor's (S&P) Capital IQ, Refinitiv Eikon, Central Bank of the Republic of Turkey and Is Investment
Market value of equity[3]	Standard & Poor's (S&P) Capital IQ
Free float shares ratio[4]	Central Securities Depository of Turkey
Turkey 2-year bond yield[5]	https://www.investing.com
US 10-year bond yield[6]	Federal Reserve Bank of St. Louis
US CPI[7]	Federal Reserve Bank of St. Louis
Turkey CPI[8]	Turkish Statistical Institute
Capital markets size[9]	Capital Market Board of Turkey The World Federation of Exchanges
GDP[10]	International Monetary Fund
Total debt securities[11]	Bank for International Settlements

Notes: [1] https://www.capitaliq.com; https://www.refinitiv.com/en; https://www.kap.org.tr

[2] https://www.capitaliq.com; https://www.refinitiv.com/en; https://www.kap.org.tr; https://evds2.tcmb.gov.tr/index.php?/evds/serieMarket/collapse_1/5854/DataGroup/turkish/bie_mkbrgn; https://www.isyatirim.com.tr/tr-tr/analiz/hisse/Sayfalar/Tarihsel-Fiyat-Bilgileri.aspx

[3] https://www.capitaliq.com

[4] https://www.vap.org.tr/fiili-dolasim-raporu

[5] https://www.investing.com/rates-bonds/turkey-2-year-bond-yield-historical-data

[6] https://fred.stlouisfed.org/series/DGS10#0

[7] https://fred.stlouisfed.org/series/CPIAUCNS#0

[8] https://data.tuik.gov.tr/kategori/getkategori?p=enflasyon-ve-fiyat-106

[9] Capital Markets Board International Economic and Financial Indicators Report; http://www.world-exchanges.org

[10] https://www.imf.org/external/datamapper/NGDPD@WEO/OEMDC/ADVEC/WEOWORLD/TUR
https://www.imf.org/external/datamapper/NGDPD@WEO/OEMDC/ADVEC/WEOWORLD/USA

[11] https://stats.bis.org/statx/srs/table/c1?p=20224&c=

5.3. Establishing hypotheses and panel regression models

This study aims to identify the factors that affect the capital structure of the US and TR-REITs. Two distinct models are established to predict the determinants of the financial leverage ratio. In the first model, the dependent variable is the book value of financial liabilities to total assets ratio (book leverage). In the second model, the market value of financial liabilities to total assets ratio (market leverage) is employed. The models for each country are as follows:

$$L_1=\beta_0+\beta_1 AS_{ij}+\beta_2 FAR_{ij}+\beta_3 CR_{ij}+\beta_4 ROA_{ij}+\ldots+\beta_{15} BM_{ij}+\varepsilon_{ij}\ ; \quad (1)$$

$$L_2=\beta_0+\beta_1 AS_{ij}+\beta_2 FAR_{ij}+\beta_3 CR_{ij}+\beta_4 ROA_{ij}+\ldots+\beta_{15} BM_{ij}+\varepsilon_{ij}\ , \quad (2)$$

where: β_0 – constant parameter; $\beta_{1\ldots15}$ – estimated coefficients; ε_{ij} – residual; *i* – each REIT company; *j* – refers to the time in years between 2013 and 2022.

The hypotheses were established for each model, US-REITs and TR-REITs. The hypotheses proposed for the regression models are as follows:

H1: *There is a relationship between firm specific, financial market specific, macroeconomic factors, and book leverage for US-REITs* (*US-L_1*).

H2: *There is a relationship between firm specific, financial market specific, macroeconomic factors, and market leverage for US-REITs* (*US-L_2*).

H3: *There is a relationship between firm specific, financial market specific, macroeconomic factors, and book leverage for TR-REITs* (*TR-L_1*).

H4: *There is a relationship between firm specific, financial market specific, macroeconomic factors, and market leverage for TR-REITs* (*TR-L_2*).

5.4. Testing panel data assumptions and estimating the model

Econometric models require that the time series be stationary, which means that they must contain a unit root. Analysis with non-stationary time series encounters the problem of pseudo regression (Sarıkovanlık et al., 2019). The panel dataset is tested using the unit root test proposed by Hadri (2000). This provides more robust results for panel data models with relatively short durations, depending on the data size studied (Hadri, 2000). Test results proved that all series are stationary and suitable for applying panel data analysis (Table 7).

It is also necessary to consider the relationship among independent variables when constructing panel regression models. The presence of a high correlation among independent variables results in a multicollinearity problem. The presence of multicollinearity among independent variables is tested by using the variance inflation factor, denoted as VIF. In general, the absence of multicollinearity among independent variables is indicated by a VIF value of less than 10 (Belsley et al., 1980). The models that include all the US variables do not exhibit multicollinearity issues among independent variables (Table 8). However, it is observed that the variance inflation factor (VIF) value for the inflation variable in the TR-REIT model exceeds 10, indicating the presence of multicollinearity. To address this issue, the independent variable of inflation is excluded from the TR-REIT models, as illustrated in Table 9.

The appropriate model must be selected to obtain robust results in panel data analysis. This requires several tests to determine the correct estimator. The degree of correlation between individual impacts and independent variables is the most critical factor when selecting the model. If a significant relationship is found between these factors, the fixed effects model should be used. The models are evaluated using the F test, Breusch and Pagan test, Lagrange Multiplier (LM) test, and Hausman test to find the most suitable estimator (Greene, 2008). The test results indicate that the fixed effects models are appropriate for all models (Table 10).

Table 7. Hadri (2000) unit root test results

Variables	US-REITs			TR-REITs		
	Z-statistic (*p*-value)	*Z*-statistic (*p*-value)	Result	*Z*-statistic (*p*-value)	*Z*-statistic (*p*-value)	Result
	Constant	Constant and trend		Constant	Constant and trend	
Financial leverage 1	12,915 (0,000)	20,432 (0,000)	I(0)	5,565 (0,000)	11,545 (0,000)	I(0)
Financial leverage 2	12,262 (0,000)	18,122 (0,000)	I(0)	6,699 (0,000)	9,435 (0,000)	I(0)
log (asset size)	17,058 (0,000)	18,085 (0,000)	I(0)	10,425 (0,000)	11,425 (0,000)	I(0)
Fixed assets ratio	14,015 (0,000)	27,652 (0,000)	I(0)	7,015 (0,000)	10,644 (0,000)	I(0)
Return on assets	10,530 (0,000)	26,276 (0,000)	I(0)	5,588 (0,000)	14,328 (0,000)	I(0)
Return on equity	4,628 (0,000)	32,065 (0,000)	I(0)	5,165 (0,000)	18,072 (0,000)	I(0)
Growth opportunities	9,375 (0,000)	16,730 (0,000)	I(0)	6,013 (0,000)	11,013 (0,000)	I(0)
Dividend payout ratio	10,098 (0,000)	23,915 (0,000)	I(0)	5,232 (0,000)	12,872 (0,000)	I(0)
Current ratio	9,145 (0,000)	14,128 (0,000)	I(0)	7,865 (0,000)	15,645 (0,000)	I(0)
Unlevered beta	4,957 (0,000)	25,582 (0,000)	I(0)	5,575 (0,000)	22,778 (0,000)	I(0)

Table 8. VIF values of independent variables (US-REITs)

Variable	VIF	R^2	Variable	VIF	R^2
log (asset size)	1,17	0,147	Firm age	1,05	0,046
Fixed assets ratio	2,16	0,537	Level of capital market development	8,27	0,879
Return on assets	1,77	0,436	Level of bond market development	5,16	0,806
Return on equity	3,45	0,710	Risk free rate	4,08	0,746
Growth opportunities	2,74	0,635	Inflation	4,58	0,782
Dividend payout ratio	1,03	0,032	Operating risk	1,78	0,437
Current ratio	2,21	0,548			
Mean VIF	3,03				

Table 9. VIF values of independent variables (TR-REITs)

Variable	VIF	R^2	VIF	R^2
log (asset size)	1,41	0,291	1,38	0,275
Fixed assets ratio	1,17	0,066	1,06	0,056
Return on assets	2,03	0,506	2,02	0,506
Return on equity	1,84	0,456	1,83	0,453
Growth opportunities	1,26	0,207	1,22	0,179
Dividend payout ratio	1,26	0,206	1,26	0,205
Current ratio	1,22	0,180	1,21	0,172
Firm age	1,38	0,276	1,38	0,274
Level of capital market development	4,84	0,793	1,37	0,272
Level of bond market development	6,22	0,839	1,30	0,233
Risk free rate	5,07	0,803	1,36	0,263
Inflation (*excluded*)	*14,42*	*0,931*	–	–
Subsidiary or associate of a bank	1,15	0,130	1,15	0,130
Free float shares ratio	1,20	0,166	1,16	0,141
Operating risk (unlevered beta)	1,57	0,365	1,37	0,271
Mean VIF	3,06		1,36	

Table 10. Test results for determination of estimators

		US-REITs				TR-REITs			
		US-L_1 Model		US-L_2 Model		TR-L_1 Model		TR-L_2 Model	
		Value	Result	Value	Result	Value	Result	Value	Result
F test	*F*-value	28,37	Fixed effects	15,09	Fixed effects	8,78	Fixed effects	13,49	Fixed effects
	p-value	0,000		0,000		0,000		0,000	
LM test	$chibar^2$	1333,97	Random effects	877,20	Random effects	87,17	Random effects	188,96	Random effects
	p-value	0,000		0,000		0,000		0,000	
Hausman test	chi^2	72,04	Fixed effects	54,56	Fixed effects	73,62	Fixed effects	41,88	Fixed effects
	p-value	0,000		0,000		0,000		0,000	

In order to ensure accurate and unbiased results in panel data analysis studies, specific conditions must be provided. If any condition is not satisfied, estimators are biased, and robust estimators should be used. In panel data analysis, it is also necessary to evaluate models for heteroskedasticity problem. This issue arises when the error term variances differ across cross sections, and their covariances are unequal to zero. The Greene (2008) LM, and Juhl and Sosa Escudero (2014) tests are employed to examine heteroscedasticity. According to test results, only TR-L_2 Model for TR-REIT shows no evidence of heteroscedasticity problem. It is concluded that there is a heteroskedasticity problem for the other models (Table 11).

Table 11. Greene (2008) LM, and Juhl and Sosa Escudero (2014) heteroscedasticity test results

Country	Model	Greene LM		Juhl & Sosa Escudero	
		chi^2	*p*-value	chi^2	*p*-value
US	US-L_1 Model	548,920	0,000	74,980	0,000
	US-L_2 Model	351,58	0,000	245,590	0,000
Turkey	TR-L_1 Model	136,76	0,000	56,210	0,001
	TR-L_2 Model	60,250	0,001	34,880	0,173

Table 12. Baltagi and Li (1995), White (1980), and Wooldridge (2002) autocorrelation test results

Country	Model	Baltagi and Li		White		Wooldridge	
		F-value	*p*-value	chi^2	*p*-value	chi^2	*p*-value
US	US-L_1 Model	28,370	0,000	526,307	0,000	78,504	0,000
	US-L_2 Model	15,090	0,000	628,864	0,000	97,654	0,000
Turkey	TR-L_1 Model	7,780	0,000	233,982	0,000	28,070	0,000
	TR-L_2 Model	13,490	0,000	200,059	0,000	14,072	0,001

The autocorrelation problem refers to the correlation between sequential error terms in a time series, and positively correlated error terms are generally observed in financial time series. The autocorrelation tests of Baltagi and Li (1995), White (1980), and Wooldridge (2002) are used to identify the autocorrelation problem. The results indicate that all models have an autocorrelation problem (Table 12).

Horizontal cross-sectional dependence is a crucial issue in panel data analysis. The Pesaran (2004) test is commonly used to assess horizontal cross-sectional dependence. Pesaran (2004) also suggests the use of the test for the evaluation of cross-sectional dependence when the time interval is short and the number of units is significant (Tatoğlu, 2021). Pesaran test results illustrate that only the US-L_2 Model has cross section dependence problem. Conversely, there is no horizontal cross section dependence problem for the other models (Table 13).

Table 13. Pesaran (2004) cross sectional dependence test results

Country	Model	Pesaran	
		F-value	*p*-value
US	US-L_1 Model	1,508	0,132
	US-L_2 Model	7,350	0,000
Turkey	TR-L_1 Model	–0,752	0,452
	TR-L_2 Model	0,077	0,939

5.5. Model outputs

Based on the tests employed, the models exhibit heteroscedasticity, autocorrelation, and cross-sectional dependence problems. In this case, standard errors must be estimated by using robust standard errors. Driscoll and Kraay (1998) approach proposes robust estimators when heteroskedasticity, autocorrelation, and cross sectional dependence are together. Furthermore, the Driscoll-Kraay estimator can serve as a reliable estimator for both fixed and random effects models in panel data analysis, provided that the cross-sectional dimension *C* exceeds the time dimension *T* (*C*>*T*). The standard errors obtained using the Driscoll-Kraay methodology are robust against all general forms of spatial and periodic correlation (Hoechle, 2007). Since all deviations from the assumptions can be eliminated by adjusting the standard errors in a single step, the Driscoll-Kraay robust estimator is employed to estimate the parameters in the research models. Driscoll-Kraay robust estimator for US-L_1 Model considers the book value of debt for US-REITs. It indicates a significant relationship between the book leverage and the independent variables. US-L_1 Model has an R^2 value of 0.167. Therefore, the independent variables included in the model account for 16.7% of the change in the book leverage. According to the results of the analysis, there are statistically significant relationships between the book leverage and firm asset size, fixed assets ratio, return on assets, return on equity, growth opportunities, dividend payout ratio, capital market, and bond market development levels, and operating risk (Appendix Table A2).

Driscoll-Kraay robust estimator for US-L_2 Model considers the market value of debt for US-REITs. It indicates a significant relationship between the market leverage and the independent variables. However, four of the variables in the model are insignificant (Appendix Table A3).

Nevertheless, to analyze the relationship between the dependent and independent variables properly, the independent variables found to be insignificant in US-L_2 Model are removed and US-L_2 Model A is created in which all independent variables are significant (Table 14). US-L_2 Model

A has an R^2 of 0.28, which is higher than US-L_2 Model's R^2 of 0.167. The analysis reveals a significant positive relationship between the market leverage and return on equity, dividend payout ratio, and bond market development level. Conversely, a significant negative relationships exist between asset size, return on assets, growth opportunities, firm age, level of capital market development, operating risk, and market leverage. Among the models established for US-REITs, US-L_2 Model A is used for the analysis as it has a higher R^2 and all independent variables are statistically significant.

Driscoll-Kraay robust estimator for TR-L_1 Model considers the book value of debt for TR-REITs. It indicates a significant relationship between book leverage and the independent variables. TR-L_1 Model has an R^2 value of 0.344. Therefore, the independent variables included in the model account for 34.4% of the change in the book leverage. According to the results of the analysis, there are statistically significant relationships between asset size, fixed asset ratio, growth opportunities, dividend payout ratio, level of development of capital markets and bond markets, business operating risk and book leverage (Appendix Table A4).

Driscoll-Kraay robust estimator for TR-L_2 Model considers the market value of debt for TR-REITs. It indicates a significant relationship between market leverage and the independent variables. However, several variables in the model are insignificant (Appendix Table A5).

Table 14. Driscoll-Kraay robust estimator analysis results (US-L_2 Model A)

Dependent variable = $L_2 = \dfrac{\text{Book value of debt}}{\text{Market value of equity + Book value of debt}}$

Independent variables	Coefficient	Standard error	*t*-statistic	*p*-value ($p>\|z\|$)	Statistical significance
log (Asset size)	–0,029	0,015	–2,405	0,039	%5
Return on assets	–1,809	0,202	–8,930	0,000	%1
Return on equity	0,346	0,125	2,770	0,022	%5
Growth opportunities	–0,025	0,006	–4,060	0,003	%1
Dividend payout ratio	0,001	0,000	3,370	0,008	%1
Firm age	–0,042	0,017	–2,420	0,039	%5
Level of capital market development	–0,063	0,014	–4,370	0,002	%1
Level of bond market development	0,235	0,051	4,600	0,001	%1
Operating risk (unlevered beta)	–0,079	0,021	–3,315	0,008	%1
Constant (c)	0,168	0,106	1,590	0,147	–
Observation: 795				F(8, 9)	= 358,12
Period number: 10				Prob > F	= 0,000
Group number: 80				R^2	= 0,280

Table 15. Driscoll-Kraay robust estimator analysis results (TR-L_2 Model A)

Dependent variable = $L_2 = \dfrac{\text{Book value of debt}}{\text{Market value of equity + Book value of debt}}$

Independent variables	Coefficient	Standard error	*t*-statistic	*p*-value ($p>\|z\|$)	Statistical significance
log (Asset size)	0,046	0,024	1,950	0,082	10%
Dividend payout ratio	–0,082	0,033	–2,470	0,036	5%
Current ratio	–0,002	0,001	–2,620	0,028	5%
Firm age	–0,129	0,025	–5,110	0,001	1%
Level of capital market development	–0,566	0,172	–3,300	0,009	1%
Level of bond market development	1,600	0,081	19,700	0,000	1%
Operating risk (unlevered beta)	–0,219	0,020	–11,030	0,000	1%
Constant (c)	–0,051	0,058	–0,880	0,402	–
Observation: 291				F (7, 9)	: 2389,97
Period number: 10				Prob > F	: 0,000
Group number: 30				R^2	: 0,482

Nevertheless, to analyze the relationship between the dependent and independent variables properly, the independent variables found to be insignificant in TR-L_2 Model are removed and TR-L_2 Model A is created in which all independent variables are significant (Table 15). TR-L_2 Model A has an R^2 of 0.482, which is higher than TR-L_2 Model's R^2 of 0.344.

The analysis indicates a substantial positive correlation between market leverage and firm asset size, as well as bond market development level. Conversely, a significant negative relationship exists between dividend payout ratio, firm age, level of capital market development and operating risk, and market leverage. Among the models established for TR-REITs, TR-L_2 Model A is used for the analysis as it has a higher R^2 and all independent variables are statistically significant.

5.6. Results

This study partially fills the literature gap by revealing the capital structures of REITs and their compliance with capital structure theories. The striking point is that despite the significant differences in the intrinsic market dynamics of the US-REIT and TR-REIT markets, a comparative analysis indicates that REITs' capital structures are similarly affected by specific factors. The main findings can be summarized as follows:

- The ability to use fixed assets as collateral for loans simplifies the process for firms to acquire debt financing. Allowing fixed assets to be pledged as collateral reduces the lender's agency costs of borrowing. The findings of the study, consistent with agency theory, demonstrate that the fixed asset ratio exhibits a positive relationship with only book leverage.
- As REITs gain more experience and age in the sector, they tend to rely less on external resources and more on internal resources. REITs with a long-established history can generate more internal resources due to their larger market share. Thus, older companies may have lower financial leverage ratios.
- US companies prefer to finance assets with equity rather than debt, given the more advanced capital markets in the US, large cap REITs have lower probability of default than small cap REITs. Furthermore, large cap REITs have lower information costs when compared to small cap REITs. According to Myers and Majluf (1984), large companies have an advantage over small companies in terms of information asymmetry issues since they exhibit greater transparency in information disclosure.
- The concentration of large groups in the shareholding structure and their excessive control may result in moral hazard issues when it comes to the decisions taken by the firms. On the other hand, real estate investments are prone to adverse selection issues stemming from asymmetric information. According to the results, there is no significant relationship between the free float ratio and capital structure for the TR-REIT sector. REITs' financial management capabilities, professional asset and portfolio diversification principles, transparent management practices, and risk management strategies effectively mitigate adverse selection problems arising from information asymmetries. This incentivizes investor participation in REITs, thereby promoting growth and development within the REIT sector (Capozza & Seguin, 1999).
- The financial leverage ratios of REITs decrease as the volatility of their cash flows increases. Findings demonstrate a negative correlation between the level of operating risk and financial leverage ratio for both US-REITs and TR-REITs.
- The research findings indicate that inflation and risk-free interest rate factors have no significant impact on the capital structure of US-REITs and TR-REITs. The risk-free interest rate, regarded as a key risk indicator for countries, is expressed as a determinant of borrowing costs. Consequently, it can be concluded that fluctuations in interest rates do not impact the capital structures of REITs.

A comprehensive table has been provided in Table 16 to illustrate the relationship between the research results and the capital structure theories in accordance with the final models that have been established for US-REITs and TR-REITs.

Table 16. Correlation of the research results with capital structure theories

Variable	Correlation for US-REITs	Compatible theory[2]	Correlation for TR-REITs	Compatible theory
log (asset size)	(–) significant	POT	(+) significant	TOT
Dividend payout ratio		X	(–) significant	TOT
Firm age	(–) significant	POT	(–) significant	POT
Level of capital market development	(–) significant	POT	(–) significant	POT
Level of bond market development	(+) significant	X	(+) significant	x
Operating risk	(–) significant	TOT & POT	(–) significant	TOT & POT
Fixed assets ratio	(+) significant	TOT & AT	(+) significant	TOT & AT
Return on assets	(–) significant	POT	not significant	x
Return on equity	(+) significant	TOT & AT	not significant	x
Growth opportunities	(–) significant	TOT	not significant	x

[2] The abbreviation TOT stands for Trade off Theory, POT stands for Pecking Order Theory and AT stands for Agency Theory.

Once the results have been evaluated collectively, findings indicate that the pecking order theory is more effective than the trade off theory in explaining the factors that affect the capital structure of the US-REITs. Additionally, the outcomes are consistent with the assumptions of agency theory for the US-REITs. For Turkish counterparts, trade off and pecking order theories are equally effective. The paper concludes that there is no consensus on the theories that explain the factors that affect the capital structure of REITs. It is necessary to combine different theories to identify the drivers of REITs' capital structure. Further research could assess whether these findings and the assumptions of capital structure theory are compatible with REITs in other countries.

6. Conclusions

In this paper, we study the capital structures of the US-REITs and TR-REITs over a time series from 2013 to 2022, in order to understand the determinants of financial leverage ratio. The findings presented have enabled the establishment of significant conclusions in the decision-making processes related to capital structure for REITs. It is important to note the positive relationship between fixed asset ratios and only book leverage for US-REITs and TR-REITs. It is therefore recommended that REITs explore opportunities to use their fixed assets effectively as collateral to access more affordable and flexible debt financing. This could reduce borrowing costs and improve capital structure without increasing financial risk. Furthermore, as REITs reach a more developed stage of their existence, it is recommended that they place a greater emphasis on the implementation of strategies that are designed to enhance their internal resource generation. This can assist in reducing their reliance on external financing.

The utilisation of market share and the expertise accumulated over time can assist older REITs in maintaining a balanced capital structure, thereby ensuring financial sustainability and resilience during periods of financial uncertainty. It is submitted that smaller REITs may need to address the information asymmetry issue more directly through increased transparency and better investor relations. Conversely, larger REITs should leverage their capacity to secure lower-cost debt financing, given their reduced default risk. Companies should tailor their financing strategies to align with their specific corporate dimensions to ensure that capital structure management is optimised.

In order to mitigate the risks of moral hazard and adverse selection that can arise from concentrated ownership, REITs should focus on strengthening their governance structures. This may entail the reduction of excessive control by major shareholders and the enhancement of transparency in decision-making processes. The promotion of professional asset management and the strict adherence to risk management principles has the potential to enhance investor confidence and to attract a greater number of participants to the sector.

REITs with higher cash flow volatility need to adopt more conservative leverage strategies in order to ensure their financial stability. The maintenance of an equilibrium between debt and equity, based on operating risk, will assist in the reduction of exposure to financial distress during periods of economic downturns, whilst concomitantly increasing long-term viability. Although inflation and risk-free interest rates have limited effects on REIT capital structures, fluctuations in interest rates should nevertheless be monitored. It is essential for REITs to be prepared for shifts in borrowing costs and adjust their financing strategies accordingly, especially during periods of significant interest rate changes, in order to avoid unnecessary financial strain.

By addressing these key areas, both the US-REIT and TR-REIT markets can strengthen their capital structures, enhance financial performance, and support sustainable growth in a competitive real estate investment environment.

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APPENDIX

Table A1. Comparison of the US-REITs and TR-REITs

	US-REITs	TR-REITs
Enacted year	1960	1995
Corporation structure	REIT must be a corporation, trust or association which is managed by one or more trustees or directors. REIT ownership must be proven by transferable shares or by transferable certificates of beneficial interest.	REIT must be established as an incorporated company.
Shareholder requirements	REIT must have at least 100 individual or institutional shareholders within one year of its establishment. Furthermore, no more than 5 shareholders are allowed to own more than 50% of the total number of shares in a REIT. This rule is commonly referred to as the "5/50 test"	No more than 5% of the capital or voting rights of a company may be held by the REIT.
Asset structure requirements	■ At least 75% of the fund's assets must be invested in real estate assets, cash and cash equivalents (including certain receivables) or government bonds. ■ Investments in marketable securities must not exceed 25% of total assets. ■ Taxable securities of REIT subsidiaries and affiliates may account for a maximum of 20% of the total assets. ■ Investments in securities of any single issuer must not exceed 5% of total assets. ■ Up to 10% of the outstanding vote or value of the securities of any one issuer may be held.	■ At least 51% of its assets must consist of real estate, real estate projects, and real estate backed rights. ■ The REIT may invest up to 49% of its total assets in capital market instruments, reverse repurchase agreements, Takas money market transactions, and subsidiaries, and may hold up to 10% of its total assets in Turkish Liras or foreign currency deposits/participation accounts for investment purposes. ■ The partnership may invest a maximum of 49% of its total assets in foreign real estate, capital market instruments based on real estate, and companies that are exclusively involved in real estate activities and incorporated abroad. ■ No investment in a single entity shall exceed 10% of the total assets.
Leverage restrictions	No legal restrictions.	Borrowing is limited to five times shareholders' equity.
Dividend distribution obligations	The Internal Revenue Code (IRC) requires that at least 90% of taxable annual net income be paid as dividends each year. The requisite payout ratio was 95% from 1980 to 2001.	There is no obligation for dividend distribution.
Public disclosure requirements	It is not mandatory for it to be publicly traded.	At least 25% of the shares must be publicly traded.
Listing requirements	There is no requirement to list or trade a company's stocks on the stock exchange.	Publicly traded stocks are required to be listed and traded on the stock exchange.
Income source requirements	The 75% test exclusively consists of income from real estate. A REIT must have at least 75% of its gross income generated from rents from real estate, interest on obligations secured by mortgages on real estate, dividends from other REITs, and gains from the sale or other disposition of real estate. Other non-business sources of income (such as dividend income, interest income, and gains from the sale or disposition of stocks and securities) must be at least 95% of total gross income. All real estate income derived from the 75% test is encompassed within the 95% test. Only the remaining 5% of the income source that does not meet the above criteria may be from non-operating income sources.	There are no special requirements.
Corporate tax/withholding tax	If the specified IRC conditions are met for each accounting period, distributed dividends may be deducted from the tax base.	They are exempt from corporate tax without any conditions.

Table A2. Driscoll-Kraay robust estimator analysis results (US-L_1 Model)

Dependent variable = L_1 = Book value of debt / Total book value of assets					
Independent variables	Coefficient	Standard error	*t*-statistic	*p*-value ($P>\|z\|$)	Statistical significance
log (Asset size)	–0.039	0.020	–1.970	0.081	%10
Fixed assets ratio	0.186	0.079	2.350	0.043	%5
Return on assets	–0.606	0.112	–5.390	0.000	%1
Return on equity	0.104	0.054	1.930	0.086	%10
Growth opportunities	0.009	0.001	6.430	0.000	%1
Dividend payout ratio	0.001	0.000	3.600	0.006	%1
Current ratio	–0.000	0.001	–0.240	0.815	–
Firm age	–0.032	0.022	–1.480	0.173	–
Level of capital market development	–0.064	0.020	–3.220	0.011	%5
Level of bond market development	0.210	0.062	3.390	0.008	%1
Risk free rate	–0.469	0.434	–1.080	0.308	–
Inflation	0.079	0.072	1.100	0.300	–
Operating risk (unlevered beta)	–0.043	0.012	–3.570	0.006	%1
Constant (c)	0.171	0.155	1.100	0.298	–
Observation: 795				F(13, 9)	: 416,20
Period number: 10				Prob > F	: 0,000
Group number: 80				R^2	: 0.167

Table A3. Driscoll-Kraay robust estimator analysis results (US-L_2 Model)

Dependent variable = $L_2 = \dfrac{\text{Book value of debt}}{\text{Market value of equity + Book value of debt}}$					
Independent variables	Coefficient	Standard error	*t*-statistic	*p*-value ($P>\|z\|$)	Statistical significance
log (Asset size)	–0.041	0.021	–1.990	0.078	%10
Fixed assets ratio	0.191	0.113	1.690	0.125	–
Return on assets	–1.590	0.153	–10.400	0.000	%1
Return on equity	0.289	0.112	2.580	0.030	%5
Growth opportunities	–0.023	0.005	–4.190	0.002	%1
Dividend payout ratio	0.001	0.000	4.140	0.003	%1
Current ratio	–0.001	0.002	–0.530	0.606	–
Firm age	–0.045	0.019	–2.390	0.041	%5
Level of capital market development	–0.134	0.039	–3.390	0.008	%1
Level of bond market development	0.524	0.113	4.660	0.001	%1
Risk free rate	1.114	1.047	1.060	0.315	–
Inflation	0.263	0.334	0.790	0.451	–
Operating risk (unlevered beta)	–0.071	0.017	–4.190	0.002	%1
Constant (c)	–0.384	0.125	–3.060	0.014	%5
Observation: 795				F (13, 9)	: 485,53
Period number: 10				Prob > F	: 0,000
Group number: 80				R^2	: 0,373

Table A4. Driscoll - Kraay robust estimator analysis results (TR-L_1 Model)

Dependent variable = L_1 = Book value of debt / Total book value of assets					
Independent variables	Coefficient	Standard error	*t*-statistic	*p*-value ($P>\|z\|$)	Statistical significance
log (Asset size)	0.051	0.022	2.370	0.042	%5
Fixed assets ratio	–0.083	0.041	–2.040	0.072	%10
Return on assets	–0.131	0.280	–0.470	0.652	–
Return on equity	0.034	0.107	0.320	0.754	–
Growth opportunities	0.010	0.003	3.440	0.007	%1
Dividend payout ratio	–0.074	0.026	–2.830	0.020	%5
Current ratio	–0.002	0.000	–5.120	0.001	%1
Firm age	–0.044	0.030	–1.460	0.179	–
Level of capital market development	–0.409	0.101	–4.070	0.003	%1
Level of bond market development	1.573	0.063	25.170	0.000	%1
Risk free rate	0.007	0.114	0.060	0.953	–
Subsidiary or associate of the bank	0.265	0.154	1.720	0.119	–
Free float shares ratio	–0.056	0.064	–0.870	0.409	–
Operating risk (unlevered beta)	–0.147	0.019	–7.600	0.000	%1
Constant (c)	–0.206	0.071	–2.910	0.017	%5
Observation: 291				F (14, 9)	: 2370,23
Period number: 10				Prob > F	: 0,000
Group number: 30				R^2	: 0,344

Table A5. Driscoll-Kraay robust estimator analysis results (TR-L_2)

Dependent variable = $L_2 = \dfrac{\text{Book value of debt}}{\text{Market value of equity + Book value of debt}}$					
Independent variables	Coefficient	Standard error	*t*-statistic	*p*-value ($P>\|z\|$)	Statistical significance
log (Asset size)	0.073	0.035	2.100	0.065	%10
Fixed assets ratio	–0.042	0.044	–0.950	0.368	–
Return on assets	0.054	0.171	0.320	0.759	–
Return on equity	–0.041	0.053	–0.760	0.465	–
Growth opportunities	–0.007	0.004	–1.600	0.144	–
Dividend payout ratio	–0.080	0.029	–2.760	0.022	%5
Current ratio	–0.002	0.001	–3.010	0.015	%5
Firm age	–0.126	0.027	–4.700	0.001	%1
Level of capital market development	–0.526	0.167	–3.150	0.012	%5
Level of bond market development	1.616	0.072	22.560	0.000	%1
Risk free rate	–0.120	0.120	–1.000	0.343	–
Subsidiary or associate of the bank	0.061	0.123	0.490	0.633	–
Free float shares ratio	–0.059	0.064	–0.920	0.384	–
Operating risk (unlevered beta)	–0.219	0.021	–10.340	0.000	%1
Constant (c)	–0.083	0.078	–1.060	0.317	–
Observation: 291				F(14, 9)	: 610,64
Period number: 10				Prob > F	: 0,000
Group number: 30				R^2	: 0,497