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Asset Turnover, Capital Structure, and Financial Performance: A Study on Real Estate Companies in Türkiye (2020–2024)

Varlık Devir Hızı, Sermaye Yapısı ve Finansal Performans: Türkiye'deki Gayrimenkul Şirketleri Üzerine Bir İnceleme

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ABSTRACT

This study explores the drivers of financial performance among Turkish Real Estate Investment Trusts (GYOs) during a period of economic turbulence (2020–2024). Focusing on the roles of asset turnover, capital structure, and liquidity, the study analyzed a balanced panel data of 23 firms using a quantitative approach, fixed-effects panel regression models, supported by comprehensive diagnostic tests and robustness checks. Our findings reveal that asset turnover has a significant impact on return on assets, underscoring the importance of efficient asset utilization in the Turkish real estate sector. Liquidity shows a negative effect on performance in profitable firms, though this result is sensitive to outliers, suggesting cautious interpretation. Capital structure, measured by leverage, shows no consistent impact. Robustness checks, including outlier adjustments and controls for economic shocks, confirm the primary role of asset turnover. The study contributes to the literature by providing novel evidence from an emerging market, highlighting the interplay of operational efficiency and liquidity under economic turbulence. These insights inform investors and policymakers navigating Türkiye's real estate dynamics, emphasizing strategies to optimize asset use while managing liquidity. They also suggest avenues for future research into firm-specific and macroeconomic factors.

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ÖZ

Bu çalışma, ekonomik dalgalanma döneminde (2020–2024) Türkiye'deki Gayrimenkul Yatırım Ortaklıklarının (GYO'lar) finansal performansını etkileyen unsurları incelemektedir. Varlık devir hızı, sermaye yapısı ve likiditenin rolleri üzerine odaklanan araştırma, 23 firmanın dengelenmiş panel verisi kullanılarak gerçekleştirilmiş ve nicel bir yaklaşım benimsenmiştir. Sabit etkiler panel regresyon modeli uygulanmış; kapsamlı tanısal testler ve sağlamlık kontrolleri ile desteklenmiştir. Bulgularımıza göre, varlık devir hızı, aktif kârlılığı üzerinde anlamlı ve olumlu bir etki yaratmakta, bu da Türkiye gayrimenkul sektöründe varlıkların etkin kullanımının önemini ortaya koymaktadır. Likidite, kârlı firmalarda finansal performansı olumsuz etkilemektedir; ancak bu sonuç aykırı gözlemlere duyarlıdır, bu nedenle dikkatli yorumlanmalıdır. Sermaye yapısı (kaldıraç oranı ile ölçülmüştür) ise tutarlı bir etki göstermemektedir. Aykırı değer ayarlamaları ve ekonomik şoklara yönelik kontroller içeren sağlamlık analizleri, varlık devir hızının birincil belirleyici olduğunu doğrulamaktadır. Bu çalışma, gelişmekte olan bir piyasa bağlamında operasyonel verimlilik ve likidite arasındaki etkileşimi vurgulayarak literatüre özgün katkılar

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Introduction

Real estate has been a strong performer in the first decade of the new millennium, earning its way into a differentiated portfolio of stocks, bonds, and private equity. Asset allocators have incorporated it further into pension fund policy portfolios, and investors without fixed allocations have the real estate industry to their investment choices (Hudson-Wilson et al., 2003). An essential investment vehicle for actual real estate ownership and lending is a real estate investment trust (Payne & Waters, 2007).

A recent study was conducted to determine the main determinants affecting the profitability of real estate investment trust (REIT) companies in Malaysia and Türkiye from Q1 of 2013 to Q1 of 2022. The results showed that some factors significantly affected the profitability of assets and equity. The report sheds light on the factors that influence performance in different nations and emphasizes the growing importance of REITs as investment vehicles in emerging regions. (Coşkuner et al., 2024).

According to Jolly & Singla (2020), the study analyzes data from 67 Indian firms over 15 years, focusing on profitability. Results show industrial construction firms are the most profitable, followed by real estate firms, influenced by liquidity, efficiency, and leverage, while infrastructure firms show lower profitability. Using panel data from their financial statements in eight mining companies listed on the Indonesia Stock Exchange between 2008 and 2017, Zaman's (2021) study examines the relationship between Return on Assets (ROA) and the Debt to Total Asset Ratio (DAR), Current Ratio (CR), and Total Asset Turnover (TATO). The analysis found that TATO has a significant impact on ROA, with a very strong statistical significance ($p = 0.00000$).

According to a recent conceptual study, real estate crowdfunding (RECF) has the potential to revolutionize the real estate finance sector and fits with the fundamental characteristics of disruptive technologies(Montgomery et al., 2018). Although conceptually fascinating, the studies are devoid of market-specific analysis and empirical support. By changing how real estate companies access and manage financial resources, RECF's disruptive potential may have an impact on important financial measures like asset turnover (TATO), capital structure (DER), profitability (ROA), and liquidity (CR). This study fills that gap by examining Turkish real estate companies between 2020 and 2024. According to Tekin (2021), the study evaluates the financial performance of real estate investment trust (REIT) companies in Türkiye using advanced decision-making techniques. It finds that profitability and debt ratios significantly impact performance rankings. The current research used panel data analysis to explore how liquidity, efficiency, and leverage affect profitability in Turkish REITs between 2020 and 2024.

Literature review

Asset Turnover (TATO) is an important variable in measuring a company's effectiveness in making revenue from its assets. Studies have proven a positive relationship between asset turnover and financial performance in different industries, including real estate. For instance, (Ahmed Abo Alkomsan, 2024; Ayrancı & Gürel, 2020; Islamoglu et al., 2015; Mujariyah, 2016; Newell et al., 2010; Özcan & Gurol, 2020) discovered that Total Assets Turnover considerably affects return on assets (ROA) in the real estate industry, showing that increased asset turnover boosts profitability. The fact that asset turnover is a major factor influencing financial performance has also been supported by research conducted in other industries, such as the consumption sector (Nurlaela et al., 2019a). Also, Fairfield & Yohn (2001) examined the predictive power by dividing the firm's profitability by asset turnover and profit margin. Also, some studies have shown that asset turnover has a positive but not significantly positive effect on profitability.

A company's capital structure is a key factor in determining its financial performance, and the Debt-to-Equity Ratio (DER) is commonly applied to measure this relationship. In real estate companies, capital structure has a significant impact on both firm value and profitability. For instance, (Ahmed Abo Alkomsan, 2024; Cahyarani & Kusmayadi, 2024) noted that capital structure is crucial to profitability and found that higher debt levels have a negative impact on profitability in real estate firms, while

efficiency and liquidity had positive effects. These findings highlight the need to maintain an optimal capital structure to improve financial performance.

Susyanti & Wahono (2018) real estate companies that have greater liquidity also have superior financial performance. However, the benefits of liquidity on long-term shareholder value can vary, emphasizing the need for further research to assess its broader impact on company stability and growth. Also, their study found no significant changes in current ratio (CR), quick ratio (QR), or financial performance. CR has a negative and significant impact (Rahman & Sutisna, 2023; Daryanto et al., 2018). Also, Abebe Zelalem & Ali Abebe (2022) concluded that liquidity has a strong positive influence on profitability.

Damayanti & Chaerudin (2021). The study examined how profitability (ROA) was affected by liquidity (CR), capital structure (DER), and efficiency (TATO) in multi-industrial manufacturing companies that were listed on the Indonesia Stock Exchange between 2015 and 2019. Debt ratio has a strong and significant influence on firm financial performance (Saleh et al., 2017). Multiple regression analysis revealed that while the three variables together explained 34.4% of the variation in ROA, CR and TATO each had a substantial individual impact on ROA; however, there was a partial impact, which only occurred on CR and TATO on ROA.

Although research has evaluated the effects of capital structure, liquidity, and asset turnover separately on real estate firms, little of it combines these factors to offer a comprehensive picture of their combined impact. Although there was no discernible correlation between asset turnover and profitability, Qi Shi's (2023) research highlighted the importance of capital structure in influencing profitability. This demonstrates how intricate these linkages are and implies that to fully comprehend their combined impact on the financial performance of real estate companies, a more thorough methodology combining all these variables is required.

In the Turkish context, research on REITs has primarily focused on external performance indicators such as stock returns and market value. For instance, Çelik & Arslanli (2022) examined the impact of macroeconomic variables and firm-specific factors on the market value of Turkish REITs, finding that high leverage (measured by DER) had a negative effect. Similarly, Erol & Tirtiroglu (2011) found that Turkish REITs with a development orientation and larger total assets tend to carry more debt, suggesting a cautious approach is needed when using leverage as a financial strategy. However, these studies did not directly address how DER affects internal performance metrics such as ROA. Furthermore, while asset size and growth have been considered, variables like Total Asset Turnover (TATO) and Current Ratio (CR) have been overlooked, limiting a full understanding of operational efficiency and liquidity within Turkish REITs.

Given these limitations, there is a notable research gap in evaluating how internal financial variables influence the profitability of Turkish REITs. Most local studies have not examined ROA as a dependent variable, despite its importance in measuring how efficiently a firm utilizes its resources. This study contributes to the literature by focusing on internal performance, specifically analyzing how TATO, DER, and CR affect ROA. By shifting the focus from market-based indicators to internal efficiency metrics, this research provides new insights into how Turkish REITs can enhance financial performance through improved asset utilization, leverage control, and liquidity management.

Methodology

Table 1: Operational Definition of Variables

Variable	Description
ROA (Return on Assets)	is a measure of a company's profitability relative to its total assets. Assets.
DER (Debt-to-Equity Ratio): It is a financial ratio that shows the relative proportion.	Of the shareholder's equity and debt employed to finance a company's assets.
CR (Current Ratio):	A liquidity ratio that evaluates a company's ability to pay short-term obligations with its short-term assets.
TATO (Total Asset Turnover)	is A financial system of measurement that measures the efficiency of a company's use of its assets in producing revenue.

Nurlaela et al., 2019(b)*

Data Description and Sample Selection

The dataset for this study is sourced from Borsa Istanbul real estate companies that report their financial statements in KAP (Kamuyu Aydınlatma Platformu), comprising 115 observations (111 for the Debt-to-Equity Ratio due to 4 missing values) of 23 real estate companies (GYO, Gayrimenkul Yatırım Ortaklıklar) that published their financial statements in KAP from 2020 to 2024 and checked the financial statement data on a stock analysis website. The dataset includes 115 observations from 23 Turkish Real Estate Investment Trusts (GYOs) from 2020 to 2024, with 111 observations for the Debt-to-Equity Ratio (DER) due to 4 missing values. The non-negative ROA sample comprises 98 observations (115 minus 17 negative ROA observations) across 22 firms, as one firm had all negative ROA observations. In the non-negative ROA regression models (Table 3B), 95 observations are used, as three observations (from firms with Company-ID 13, 16, and 19) were excluded due to missing DER values.

Model specification

The study applied a fixed-effects panel regression model to investigate the impact of capital structure (debt-to-equity ratio, DER), liquidity (current ratio, CR), and asset turnover (total asset turnover, TATO), as stated by previous studies (Ayrancı & Gürel, 2020; Islamoglu et al., 2015; Nurlaela et al., 2019c; Özcan & Gurol, 2020; Rachman et al., 2023), on financial performance (return on assets, ROA), and the baseline model is

$$\mathbf{ROA}_{it} = \beta_0 + \beta_1 \mathbf{DER}_{it} + \beta_2 \mathbf{CR}_{it} + \beta_3 \mathbf{TATO}_{it} + \alpha_i + \varepsilon_{it}$$

where:

$\mathbf{ROA}_{it}$: Return on Assets for firm i at time t.

$\mathbf{DER}_{it}$: Debt-to-Equity Ratio.

$\mathbf{CR}_{it}$: Current Ratio.

$\mathbf{TATO}_{it}$: Total Asset Turnover.

β_0: Intercept.

β_1, β_2, β_3: Coefficients for DER, CR, and TATO.

α_i**:** Firm-specific fixed effects.

ε_{it}: Error term.

To focus on possible heteroskedasticity, the model used robust standard errors clustered by firm, following Baltagi et al. (2010). Several model variations were directed to certify robustness: a non-negative ROA model (without 17 negative ROA observations), the inclusion of year fixed effects (2021–2024) to control for macroeconomic shocks, winsorization at the 1st and 99th percentiles to mitigate the influence of outliers, and a non-linear specification including the squared Current Ratio (CR^2) to measure potential non-linear effects of liquidity (see Table 4).

Diagnostic and Robustness Checks

A series of diagnostic tests was made to ensure the robustness and validity of the panel regression model. The proper model specification was established using the Breusch-Pagan (1980) test for heteroskedasticity and the Hausman (1978) test for model selection. The Wooldridge (2002) test for autocorrelation was enacted to measure serial correlation in the error terms, while the Ramsey RESET test was employed to assess functional form misspecification. Furthermore, multicollinearity was evaluated using the Variance Inflation Factor (VIF), and t-tests for potential selection bias were performed on the key variables of interest.

The fixed-effects model was assessed using Stata 17, with robust standard errors clustered by firm to correct heteroskedasticity. A non-negative ROA model was assessed by excluding the 17 observations with negative ROA (accounting for 14.78% of the sample) to focus on non-negative firms. Additional robustness checks incorporated the inclusion of year fixed effects for 2021–2024 (with 2020 omitted), winsorization at the 1st and 99th percentiles to address outliers, and the incorporation of CR^2 to test for non-linear effects of liquidity. Diagnostic results are presented in Tables 2 and 3.

Model Interpretation and Robustness

The non-negative ROA model was employed to account for the apparent attributes of the profitable subset of firms. The exclusion of firms with negative ROA—mainly those facing firm-specific shocks such as declines in the commercial property market—confirms that the model focuses on the more characteristic subset of financially stable firms (Golec, 1994; Newell et al., 2010). T-tests comparing DER, CR, and TATO between the negative and non-negative ROA groups show no significant selection bias ($p > 0.35$, Table 4), supporting the use of the non-negative ROA model.

To control for time-specific macroeconomic shocks in the fixed-effects panel regression models, year fixed effects for 2021–2024 were entered, with 2020 as the reference year, as reported in Table 3. This choice was inspired by 2020's role as the study's starting point and the start of the COVID-19 pandemic, a significant economic shock that disrupted Turkish GYO performance, with 4 negative ROA cases recorded (Table 5). This approach is consistent with short-panel REIT studies (Ayrancı & Gürel, 2020).

Further robust checks were directed to assess the model's reliability. The inclusion of year fixed effects for 2021–2024, designed to control for macroeconomic shocks such as the COVID-19 pandemic or inflationary pressures, generated no significant results ($p > 0.16$, Table 3), signifying that GYO income structures continued to be stable during the study period (Morri & Beretta, 2008). Winsorizing the data at the 1st and 99th percentiles helped ease the influence of outliers, particularly in the Current Ratio (CR), whose extreme values (e.g., max = 161.335) were associated as influential. After winsorizing, the impact of CR was diminished ($p = 0.461$, Table 4), proving that outliers had previously determined its implication in the model.

The non-linear description including CR^2 was tested for potential non-linear effects of liquidity on financial performance, but no statistically significant results were found ($p = 0.679$, Table 4), suggesting that a linear relationship between liquidity and financial performance clutches for this dataset (Greene, 2012). Cook's Distance analysis was also performed to discover influential observations, confirming that the results were not improperly affected by extreme data points (Fox, 2015).

Analysis and discussion

Table 2: Summary Statistics of Financial Variables

Variable	Sample	Obs	Mean	Std. Dev.	Min	Max	Skewness	Kurtosis
ROA	Full	115	0.024	0.042	-0.125	0.213	0.928	10.206
	Negative	*17*	*-0.029*	*0.040*	*-0.125*	*-0.001*	*-1.701*	*4.308*
DER	Full	111	0.288	0.706	0.000	4.850	4.262	22.922
CR	Full	115	5.167	15.512	0.064	161.335	9.043	90.979
TATO	Full	115	0.156	0.173	0.011	0.884	2.133	7.263

Table 2 presents summary statistics for 23 Turkish Real Estate Investment Trusts (GYOs) between 2020 and 2024, covering 115 observations (111 for DER). The average return on assets (ROA) is 2.4%, with a right-skewed distribution and evidence of extreme positive outliers. A subsample of 17 firms with negative ROA (mean = -2.9%) shows modest losses, mostly concentrated in a few firms. The debt-to-equity ratio (DER) has a low mean (0.288) but exhibits high skewness and kurtosis, suggesting substantial variation in leverage. The current ratio (CR) displays extreme outliers, with an average of 5.167 and a maximum value exceeding 161, indicating severe liquidity disparities. Total Asset Turnover (TATO) averages 0.156 and shows moderate variation across firms. Overall, the data reveal modest profitability, substantial heterogeneity in financial structures, and the presence of influential outliers, supporting the use of fixed-effects models and robust standard errors.

The descriptive statistics underscore the financial dynamics of Turkish GYOs during a turbulent period marked by the COVID-19 pandemic and Türkiye's 2022 inflation peak of 85% (Saribekyan, 2023). The modest ROA (2.4%) aligns with studies on emerging markets (Mujariyah, 2016), where economic turbulence constrains returns. The 17 negative ROA cases, concentrated in specific firms, suggest firm-specific factors like property type (e.g., commercial vs. residential) or management inefficiencies, supporting the fixed-effects approach. DER's variability and extreme values reflect GYO regulations allowing strategic borrowing, but its insignificance in regressions ($p > 0.38$, Table 3) suggests limited impact on performance, consistent with mixed findings on leverage (Morri & Beretta, 2008). CR's extreme outliers (max = 161.335) indicate liquidity disparities, potentially reflecting cash hoarding or inefficient asset use, with its significance in non-negative models ($p = 0.022$, Table 3) vanishing after winsorizing ($p = 0.461$), highlighting outlier sensitivity. TATO's moderate variability and consistency in p-value ($p < 0.05$, Table 3) underscore asset efficiency as a key driver of GYO profitability, aligning with real estate literature emphasizing operational efficiency (Bauer et al., 2010). These findings inform investors and policymakers, suggesting a focus on asset utilization over leverage or excessive liquidity. However, the high skewness and kurtosis, particularly for CR, and the low R-squared (0.0949–0.1693, Table 3) indicate potential missing control variables (e.g., firm size, inflation), as flagged by the Ramsey RESET test ($p = 0.0042$, Table 4), warranting future research into macroeconomic and firm-specific factors**.**

Table 3A: Fixed-Effects Regression Results (Full Sample)

Variable	Full	Year FE (Full)	Wins. (Full)	Non-Linear (Full)
DER	0.0044 (0.0055)	0.0056 (0.0060)	0.0056 (0.0064)	0.0058 (0.0066)
CR	-0.00002 (0.0001)	-0.00001 (0.0001)	0.0004 (0.0007)	0.0014 (0.0028)
TATO	0.1239** (0.0545)	0.1306** (0.0540)	0.1312** (0.0529)	0.1291** (0.0551)
CR^2	–	–	–	-0.00004 (0.0001)
Constant	0.0043 (0.0088)	0.0048 (0.0079)	0.0011 (0.0099)	-0.0007 (0.0107)
R^2 Within	0.2040	0.2161	0.2230	0.2240
R^2 Overall	0.0949	0.0987	0.1070	0.1168
Observations	111	111	111	111
Groups	23	23	23	23

Notes: Standard errors (in parentheses) are robust, clustered by Company-ID. *p<0.10, **p<0.05, ***p<0.01

Table 3B: Fixed-Effects Regression Results (Non-Negative Sample)

Variable	(+ROA)	Year FE (Non-Neg.)	Wins (Non-Neg.)
DER	0.0039 (0.0052)	0.0053 (0.0056)	0.0045 (0.0065)
CR	-0.0003** (0.0001)	-0.0002** (0.0001)	-0.0007 (0.0010)
TATO	0.0721 * (0.0379)	0.0647 * (0.0354)	0.0823 * (0.0408)
CR^2	–	–	–
Constant	0.0226*** (0.0064)	0.0163** (0.0065)	0.0225** (0.0090)
R^2 Within	0.1634	0.1880	0.1761
R^2 Overall	0.1693	0.1583	0.1677
Observations	95	95	95
Groups	22	22	22

Notes: Standard errors (in parentheses) are robust, clustered by Company-ID. *p<0.10, **p<0.05, ***p<0.01

Table 3A-3B presents fixed-effects regression results examining the impact of Debt-to-Equity Ratio (DER), Current Ratio (CR), and Total Asset Turnover (TATO) on Return on Assets (ROA) for a balanced panel of 23 Turkish Real Estate Investment Trusts (GYOs) from 2020 to 2024, with 111 observations in the full sample (95 in the non-negative ROA subsample). Notes: This table reports regression results for the non-negative ROA sample (95 observations, 22 firms), examining the impact of Debt-to-Equity Ratio (DER), Current Ratio (CR), and Total Asset Turnover (TATO) on Return on Assets (ROA). Three observations (Company IDs 13, 16, and 19) were excluded from the 98 non-negative ROA observations due to missing DER values.

The table compares five models: baseline (full sample), non-negative ROA (excluding 17 negative ROA cases), year fixed effects (full and non-negative), winsorized (outliers trimmed at 1st/99th percentiles), and non-linear (including CR^2). TATO is consistently significant across models, in line with Melihatin et al. (2024) and YESHITLA (2022), with coefficients ranging from 0.0647 ($p = 0.082$, non-negative year fixed effects) to 0.1312 ($p = 0.021$, full winsorized), indicating that higher asset turnover enhances profitability. CR is significant only in non-negative models (coefficient = -0.0003, $p = 0.022$ in baseline non-negative; -0.0002, $p = 0.038$ in year fixed effects), but this effect disappears after winsorizing ($p = 0.461$), suggesting sensitivity to outliers. DER is insignificant in all models ($p > 0.383$), implying minimal leverage impact. Year fixed effects (2021–2024, 2020 omitted) are insignificant ($p > 0.16$),

indicating limited influence of economic shocks. Within R-squared values range from 0.1634 (non-negative baseline) to 0.2240 (non-linear full), while overall R-squared remains low (0.0949–0.1693), reflecting firm-specific heterogeneity (rho = 0.3254–0.6689). The models use robust standard errors clustered by firm, addressing heteroskedasticity noted in Table 2 (e.g., CR skewness = 9.043). These results highlight TATO's robust role in driving ROA, CR's context-specific and outlier-driven effect, and DER's negligible influence, validated across multiple specifications.

The regression results in Table 3 highlight the essential role of asset turnover in improving financial performance among Turkish GYOs. During a volatile period (2020–2024), marked by the COVID-19 pandemic and Türkiye's 2022 inflation peak of 85% (Turkish Statistical Institute, 2022). TATO's consistent importance ($p < 0.05$ in most models) also aligns with real estate literature emphasizing operational efficiency as a profitability driver (Ayrancı & Gürel, 2020; Bauer et al., 2010; Islamoglu et al., 2015; Mujariyah, 2016; Nurlaela et al., 2019b; Özcan & Gurol, 2020; Rachman et al., 2023), particularly in emerging markets where asset utilization mitigates economic uncertainty. CR's negative effect in non-negative models ($p = 0.022$) suggests that high liquidity may reduce profitability by tying up capital in low-yield assets, a finding consistent with studies on liquidity trade-offs in real estate (Morri & Beretta, 2008; Permata et al., 2025). But its loss of significance after winsorizing ($p = 0.461$) confirms that extreme outliers (e.g., CR max = 161.335, Table 2) steer this effect, emphasizing the need for careful interpretation. DER's insignificance ($p > 0.383$) contrasts with studies linking leverage to performance in less-regulated markets (Mujariyah, 2016). The insignificant year fixed effects suggest that macroeconomic shocks had a limited direct impact due to GYOs' stable rental income structures. The low overall R-squared (0.0949–0.1693) and Ramsey RESET test ($p = 0.0042$, Table 4) imply potential missing variables, such as firm size or inflation rates, limiting explanatory power. These findings may apprise investors to order asset efficiency and manage liquidity carefully, while policymakers may consider regulatory adjustments to optimize GYO performance. Future research should discover additional covariates and nonlinear dynamics to address model misspecification.

Table 4: Validation of Fixed-Effects Model

Test	Statistic	p-value
Hausman Test	$\chi^2(3) = 11.73$	0.0083
Breusch-Pagan Test	$\chi^2(1) = 190.23$	0.0000
VIF (Mean)	1.01	–
Wooldridge Test	$F(1, 22) = 0.739$	0.3994
Ramsey RESET Test	$F(2, 83) = 5.85$	0.0042
Selection Bias (T-tests)	— DER: $t = -0.0339$	0.9730
	— CR: $t = -0.9257$	0.3566
	— TATO: $t = 0.1850$	0.8536

Notes: This table reports diagnostic tests for the fixed-effects model. χ^2 denotes chi-squared statistics, F denotes F-statistics, and t denotes t-statistics.

Table 4 reviews diagnostic and robustness tests confirming the fixed-effects regression model used to inspect the influence of Debt-to-Equity Ratio (DER), Current Ratio (CR), and Total Asset Turnover (TATO) on Return on Assets (ROA) for 23 Turkish Real Estate Investment Trusts (GYOs) from 2020 to 2024, with 111 observations in the full sample.

The Hausman test (chi2(3) = 11.73, p = 0.0083) validates the suitability of fixed-effects over random-effects models, revealing significant firm-specific effects (rho = 0.3254). The Breusch-Pagan test (chi2(1) = 190.23, p = 0.0000) detects heteroskedasticity, supporting the use of robust standard errors clustered by firm, particularly given CR's extreme outliers (max = 161.335, Table 2). The Variance Inflation Factor (VIF = 1.01) rules out multicollinearity among DER, CR, and TATO,

confirming independent variable effects. The Wooldridge test ($F(1,22) = 0.739$, $p = 0.3994$) indicates no first-order autocorrelation, encouraging model stability over the 2020–2024 period. The Ramsey RESET test ($F(2,83) = 5.85$, $p = 0.0042$) indicates probable model misspecification due to missing control variables. T-tests comparing DER, CR, and TATO between negative (17 observations) and non-negative (98 observations) ROA samples display no significant differences ($p > 0.35$; DER: $p = 0.9730$, CR: $p = 0.3566$, TATO: $p = 0.8536$), confirming no choice bias in the non-negative ROA model. These diagnostics validate the model's econometric soundness while emphasizing misspecification as a limitation.

The diagnostic and robustness tests in Table- 4 affirm the reliability of the regression results (Table 3) for Turkish GYOs, ensuring their pertinency to real estate finance in an developing market context marked by economic turbulence, including the COVID-19 pandemic and 2022 inflation peak of 85% (Turkish Statistical Institute, 2022). The Hausman test's confirmation for fixed-effects aligns with prior panel studies on real estate firms, where firm-specific factors like property portfolios drive performance (Bauer et al., 2010). The detected heteroskedasticity, focused through robust standard errors, reflects data challenges noted in Table 2 (e.g., CR skewness = 9.043), common in emerging markets with variable liquidity (Morri & Beretta, 2008). The absence of multicollinearity and autocorrelation underpins the model's suitability for analysing TATO's significant effect ($p < 0.05$, Table 3) and CR's outlier-driven implication in non-negative models ($p = 0.022$). But the Ramsey RESET test ($p = 0.0042$) shows likely missing control variables, such as firm size or macroeconomic factors (e.g., inflation rates), which may explain the low R-squared (0.0949–0.1693, Table 3). The lack of selection bias proves the non-negative ROA model's findings, improving generalizability. These results direct investors to trust TATO's role in profitability and approach CR's results thoughtfully due to outliers. Policymakers may deliberate on data standardization to alleviate heteroskedasticity. Future research should incorporate further covariates to address misspecification and develop model explanatory power.

Table 5: Distribution of Negative ROA by Year and Company

Year	Negative ROA Count	Percentage of Total (%)
2020	4	23.53
2021	4	23.53
2022	3	17.65
2023	4	23.53
2024	2	11.76
Total	17	100.00

Notes: The table shows the count and percentage of companies with negative ROA by year, with the total across 2020–2024.

Table 5 considers the allocation of 17 negative ROA cases (14.78% of 115 observations) among 23 Turkish Real Estate Investment Trusts (GYOs) from 2020 to 2024. Negative ROAs were evenly spread across years, with no single year leading, though an insignificant decline is noted by 2024. Over half of the negative ROA cases are concentrated in a few firms, suggesting firm-specific issues rather than purely macroeconomic shocks like the COVID-19 pandemic or Türkiye's 2022 inflation spike. This firm-level intensity supports the use of fixed-effects modelling and highlights the role of firm heterogeneity in financial performance. The decline in negative ROAs may hint at the sector regaining. For investors and policymakers, the table underlines the importance of addressing specific firm exposures. However, the small number of negative cases limits broader inferences, pointing to a need for further research into continuing underperformance drivers.

Table 6: Outlier Analysis (Cook's Distance)

Statistic	Value	Observations	Implication
Mean	0.0270	111	Low average influence
Std. Dev.	0.1078	111	High variability
Maximum	0.8717	1	Significant outlier (e.g., CR = 161.335)
95th Percentile	0.1471	5	Influential points affect CR.
Skewness	5.7305	111	Right-skewed distribution
Kurtosis	39.6347	111	Heavy-tailed, extreme outliers

Notes: The table summarizes the distribution of a variable across 111 observations, highlighting central tendency, variability, and shape.

Table 6 uses Cook's Distance to discover significant data points in the fixed-effects regression model of ROA among Turkish GYOs (2020–2024). While the average influence is low (mean = 0.0270), a maximum value of 0.8717 and a 95th percentile of 0.1471 show five influential observations, primarily pushed by extreme values in the current ratio (CR). High skewness (5.73) and kurtosis (39.63) verify a heavy right-tailed distribution, consistent with CR's outliers noted in Table 2. These influential points explain CR's conflicting effect in the regression and highlight the importance of winsorizing, which neutralizes CR's effect while preserving TATO's robust impact. The results weigh the need for outlier management and robust error handling to confirm reliable inference. For investors and policymakers, the findings are cautious against over-interpreting liquidity ratios without data adjustments. Future studies should search for the causes of outliers—such as firm characteristics or external shocks—to enhance model reliability and extend insights into real estate performance in emerging markets.

Limitations of the Study

1. Data and Sample Constraints: The study uses 111 observations (95 in non-negative ROA models) across 23 Turkish GYOs (22 in non-negative models), limiting generalizability to other sectors or regions. The focus on GYOs may not capture broader real estate dynamics.
2. Missing Control Variables: There are potential missing control variables causing omitted variable bias, as suggested by the Ramsey RESET test ($p = 0.0042$, Table 4).
3. Outliers: Extreme CR values (max = 161.335, Table 2; Cook's D max = 0.8717, Table 6) influence CR's significance ($p = 0.022$, Table 2), requiring winsorizing to ensure robustness.
4. Negative ROA Subsample: The 17 negative ROA cases (Table 5), concentrated in some companies, limit insights into loss drivers due to their small proportion (14.78%).
5. Short Time Horizon and Data Gaps: The 2020–2024 period may not capture long-term effects, and minor data gaps (e.g., 4 missing DER observations, Table 2) may reduce robustness.

Conclusion

This study presents constructive insights into the financial performance of Turkish Real Estate Investment Trusts (GYOs) during the economically unstable period of 2020–2024. The result highlights the crucial role of asset turnover (TATO) as a reliable and significant driver of return on assets (ROA), pointing out the value of efficient asset utilization in improving profitability within the Turkish real estate sector. The robust statistical significance of TATO throughout various model specifications ($p <$

0.05) underscores its critical effect, aligning with prior literature that emphasizes operational efficiency in rising markets (Ayrancı & Gürel, 2020; Bauer et al., 2010). On the contrary, liquidity (CR) exposed a negative effect on outcomes in non-negative and profitable firms, but this outcome was sensitive to outliers, requiring careful analysis. Capital structure (DER) exhibited no coherent impact on financial performance, suggesting that leverage plays a limited role in driving profitability for Turkish GYOs during this period. Robustness checks, including outlier corrections and controls for macroeconomic shocks like the COVID-19 pandemic and Türkiye's 2022 inflation peak, strengthened the domination of asset turnover. However, the low R-squared values (0.0949–0.1693) and evidence of model misspecification (Ramsey RESET test, $p = 0.0042$) indicate that additional factors, such as firm size or macroeconomic variables, may further explain result variations. These findings contribute to the literature by offering novel evidence from an emerging market context, weighing the interplay of operational efficiency and liquidity under economic turbulence.

Recommendations

Based on the study's findings, some recommendations are proposed for stakeholders in the Turkish real estate sector. GYO (Real Estate Investment Trust) managers should focus on enhancing asset utilization by restructuring internal processes, concentrating on high-yield assets, and diversifying or restructuring underperforming ones. Investors, in turn, are advised to prioritize GYOs with high asset turnover ratios, as these are often linked to greater profitability.

Liquidity management also involves careful consideration. Both GYO managers and investors should exercise caution, as excessively high current ratios may adversely affect profitability and key performance indicators. A balanced approach to liquidity can help maintain operational efficiency without compromising financial health.

In terms of financing, GYO managers should carefully assess their debt strategies to ensure sustainable growth. Policymakers are encouraged to revise existing borrowing limits and consider regulatory adjustments that foster balanced capital structures and support long-term financial stability within the sector.

Finally, future research should dig deeper into firm-specific factors and macroeconomic variables that influence GYO performance. It should also explore potential non-linear relationships and emerging trends, such as real estate crowdfunding. These recommendations aim to provide practical guidance to investors, managers, and policymakers navigating Türkiye's evolving real estate landscape.

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