Dipartimento di Economia e Finanza

Indirizzo Banche ed Intermediari Finanziari

The effect of financial leverage on real estate investment performance

Relatore:
Prof.Gaetano Casertano
Correlatore:
Prof.Francesco Baldi

Candidato:
Giuseppe D'Esposito
Matricola: 782991

Anno Accademico 2024/2025

Contents

Introduction

Financial leverage plays a pivotal role in real estate investment, acting as both a catalyst for higher returns and a source of elevated risk. By allowing investors to amplify exposure through borrowed capital, leverage enhances return on equity (ROE) when asset yields exceed borrowing costs. Yet, the same mechanism can intensify losses and increase financial vulnerability during downturns, particularly when the cost of debt rises or asset values fall. This dual nature of leverage—return-enhancing in favorable markets and risk-amplifying in adverse conditions—has long made it a critical yet delicate tool in the financial management of real estate firms. The importance of leverage is especially pronounced in the real estate sector due to its unique characteristics: relatively predictable cash flows, the use of tangible collateral, and significant capital requirements. These features make real estate assets well-suited to debt financing, and most real estate companies—whether public Real Estate Investment Trusts (REITs) or private equity funds—employ some level of leverage to meet investor return expectations. Nevertheless, the optimal use of leverage remains an open question. How much debt is too much? Can leverage systematically improve performance without compromising resilience? And do these dynamics vary between public and private investment vehicles? This thesis investigates these issues by analyzing how financial leverage influences the performance of real estate investment firms, focusing on profitability, volatility, and risk-adjusted returns across varying market conditions and organizational structures. The study combines theoretical foundations and empirical evidence, concentrating on the period from 2019 to 2023—a timeframe that captures the pre-pandemic baseline, the COVID-19 shock, the post-pandemic recovery, and the sharp monetary tightening cycle of 2022–2023. These distinct phases provide a valuable context to examine how leverage operates in both expansionary and contractionary financial regimes, and how different firms adapt their capital structures in response. The theoretical basis of the thesis draws on classic corporate finance frameworks, including the Modigliani–Miller propositions, the trade-off theory, and the pecking order theory. While Modigliani and Miller posit that capital structure is irrelevant in frictionless markets, real-world conditions such as taxes, bankruptcy costs, and asymmetric information render leverage decisions highly consequential. In the real estate sector, trade-off theory suggests that firms aim to balance the benefits of debt—particularly tax advantages and lower capital costs—with the risks of financial distress. Simultaneously, pecking order theory helps explain firms' preferences for internal financing and debt over equity, particularly in contexts where equity issuance may signal negative information to the market. Empirical evidence suggests that leverage can positively affect performance up to a point, beyond which the risks outweigh the benefits. Studies indicate a non-linear relationship: moderate leverage often enhances returns, but excessive debt can lead to underperformance and heightened volatility. This phenomenon appears to differ across investment vehicles. Public REITs, which are subject to market scrutiny and regulatory limits, tend to maintain more conservative leverage ratios. In contrast, private real estate funds—especially those pursuing opportunistic or value-add strategies—frequently employ higher levels of leverage to achieve aggressive return targets. Yet, during periods of stress, such as the 2008 financial crisis or the recent interest rate hikes, these heavily levered structures often face liquidity constraints and refinancing risks. In light of these considerations, this research offers a comprehensive econometric analysis based on a panel dataset of 100 real estate firms operating in Europe and North America. By analyzing data over five years, the study evaluates the relationship between leverage and key performance indicators, including ROE, total shareholder return, and the Sharpe ratio. The analysis pays particular attention to how this relationship evolves under changing macro-financial conditions and seeks to determine whether a target range of leverage can be identified that consistently delivers superior performance.

Furthermore, the thesis compares the behavior and outcomes of public and private investment structures, assessing their respective resilience and return profiles under normal and stressed environments. The analysis reveals that while higher leverage may boost returns during periods of low interest rates, it becomes detrimental when borrowing costs rise, especially for firms lacking access to diversified funding sources. Public REITs, with their transparency, access to equity markets, and generally lower debt exposure, show greater flexibility and resilience. Private funds, although capable of delivering higher returns through leverage, appear more vulnerable to financial tightening and asset repricing. Taken as a whole, this thesis contributes to the literature by offering an updated and nuanced understanding of financial leverage in real estate. It highlights how leverage decisions are context-dependent, shaped not only by internal capital structure preferences but also by broader macroeconomic forces. The findings provide valuable insights for real estate investors, managers, and policymakers, helping to inform capital allocation strategies and risk management practices in an increasingly volatile environment.

Chapter 1

Leverage, Real Estate Vehicles, and Market Dynamics in Europe

1.1 Leverage in Real Estate: Theoretical and Empirical Foundations

In real estate, **leverage** refers to the use of borrowed capital (debt) to finance property investments, with the aim of increasing returns on equity. By using debt, investors can control a larger asset base with less equity. If the property's income or appreciation exceeds the cost of debt, leverage amplifies equity returns. Leverage is widely used in both residential and commercial markets, with significant loan-to-value ratios. Leverage increases both expected returns and financial risk by creating fixed debt obligations regardless of property performance. As long as the return on assets (ROA) exceeds the cost of debt (r_d), equity returns (ROE) improve a condition known as positive leverage. Conversely, when ROA falls below the cost of debt, leverage erodes equity returns. This relationship can be formally expressed as follows:

$$\text{ROE} = \text{ROA} + \frac{D}{E}\left(\text{ROA} - r_d\right), \tag{1.1}$$

Example. Suppose a real estate investment has a return on assets (ROA) of 6%, a cost of debt $r_d = 3\%$, and a debt-to-equity ratio $D/E = 1$:

$$ROE = ROA + \frac{D}{E}(ROA - r_d) = 6\% + \frac{1}{1}(6\% - 3\%) = 9\%$$

This illustrates how leverage increases equity returns when the cost of debt is lower than the return on assets.

Building on this theoretical framework, it is useful to understand why real estate markets, in particular, are considered well-suited for the application of leverage. Leverage therefore boosts returns in good times and worsens losses in bad times, reinforcing its double-edged nature. Real estate is particularly suited for leverage due to its stable cash flows and collateral value. Before the 2008 financial crisis, commercial properties were often financed at 70–80% LTV, under the assumption that rental income could comfortably cover debt service. However, the crisis exposed the fragility of such strategies: declining asset values triggered defaults, leading to widespread financial instability. The episode illustrated how excessive leverage can amplify downturns and transmit systemic risk. These historical experiences underscore the need for theoretical frameworks that explain how firms determine their capital structure and manage financial risk.

Financial theory provides multiple frameworks to analyze capital structure decisions, including the Modigliani–Miller propositions, the trade-off theory, and the pecking order theory. **The Modigliani–Miller propositions (1958)** form the foundation of modern capital structure theory. In a perfect market with no taxes, bankruptcy costs, or information asymmetry, M&M Proposition I states that a firm's value is independent of its capital structure. Proposition II adds that as leverage increases, the expected return on equity rises to compensate for added financial risk, leaving the weighted average cost of capital (WACC) unchanged. When taxes are introduced, however, debt gains value through the interest tax shield, theoretically favoring 100% debt. Yet firms do not pursue such extremes, suggesting other factors—such as bankruptcy risk—play a key role. This leads to the **trade-off theory**, which proposes that firms balance the tax benefits of debt with the rising costs of financial distress. There exists an optimal capital structure where the marginal tax benefit equals the marginal expected cost of distress. In real estate, trade-off theory is particularly relevant. Properties offer strong collateral and stable income, supporting the use of debt, but market cyclicality exposes firms to potential distress. For instance, a property investor may benefit from leverage during stable periods, yet face insolvency risks during downturns as observed during the Global Financial Crisis (GFC). The theory implies that real estate firms should aim for a moderate leverage level that captures the benefits of debt (e.g., tax shields) without incurring excessive risk. Empirical evidence supports that many real estate companies and REITs target moderate leverage levels consistent with maintaining good credit ratings, implying conscious moderation to avoid distress costs. While the trade-off theory highlights the balance between tax advantages and financial distress, an alternative view—pecking order theory—emphasizes the role of information asymmetry in shaping financing decisions.

The pecking order theory (Myers and Majluf, 1984) provides an alternative framework for understanding financing behavior, emphasizing information asymmetry rather than targeting an optimal debt ratio. According to this theory, firms prefer internal financing (retained earnings), resorting to debt only when internal funds are insufficient, and turning to equity issuance as a last resort. This hierarchy reflects concerns about the potential dilution of shareholder value through undervalued equity issuance, the costs and negative market signals associated with it. This theoretical approach finds concrete application in the behavior of real estate investment trusts, whose financing patterns offer empirical support to the pecking order framework.

In this view, leverage is not actively optimized but rather emerges from the residual financing needs of the firm. Real estate firms, particularly REITs, offer an insightful application of this theory. These entities often pay out most of their earnings (e.g., 90% of taxable income for U.S. REITs), which limits internal funding capacity. To finance new investments, they often rely on debt rather than equity, in line with pecking order predictions. Empirical studies confirm this behavior: profitable REITs with greater internal funds tend to use less debt, while equity issuance typically occurs when leverage becomes excessive or debt financing is less attractive.

A study on Australian REITs (A-REITs) found that lower leverage was associated with profitability and reduced operational risk (supporting pecking order theory), while firm size correlated positively with leverage (supporting trade-off theory). This suggests that both theories influence real estate capital structure decisions, with varying weights depending on context.

Beyond theoretical models, numerous empirical studies have attempted to quantify the actual effects of leverage on performance, revealing a more complex and often non-linear relationship. Some studies report a positive relationship, with leverage amplifying returns in favorable markets. Others note a negative or neutral effect, attributing this to distress costs and agency problems. For REITs, international data from 2002–2011 showed that moderate leverage improved total returns, acting as a return multiplier. However, excessively high leverage reduced long-term performance, especially in downturns. Research suggests that the relationship between leverage and returns is non-linear: moderate levels may enhance returns, but excessive leverage can lead to underperformance.

Leverage also increases equity return volatility. By fixing debt payments, firms expose equity holders to greater variability in residual cash flows. This effect has been documented in higher betas and idiosyncratic risk among levered REITs. For instance, during the 2008 financial crisis, U.S. REITs experienced price drops of around 67%, compared to 15% declines in appraised property values. This disparity highlights how leverage intensifies downside risk, particularly during market stress.

At the systemic level, excessive leverage in real estate has broader financial implications. The 2008 crisis illustrated how highly levered real estate markets can trigger widespread instability, as defaults cascaded through financial systems. In response, regulators imposed stricter lending standards, such as lower LTV caps and increased capital requirements for real estate exposures. These policies, along with investor caution, have led to lower average leverage ratios in both U.S. and European REITs. For example, U.S. REIT debt-to-asset ratios have declined from above 50% pre-crisis to below 35% as of 2023.

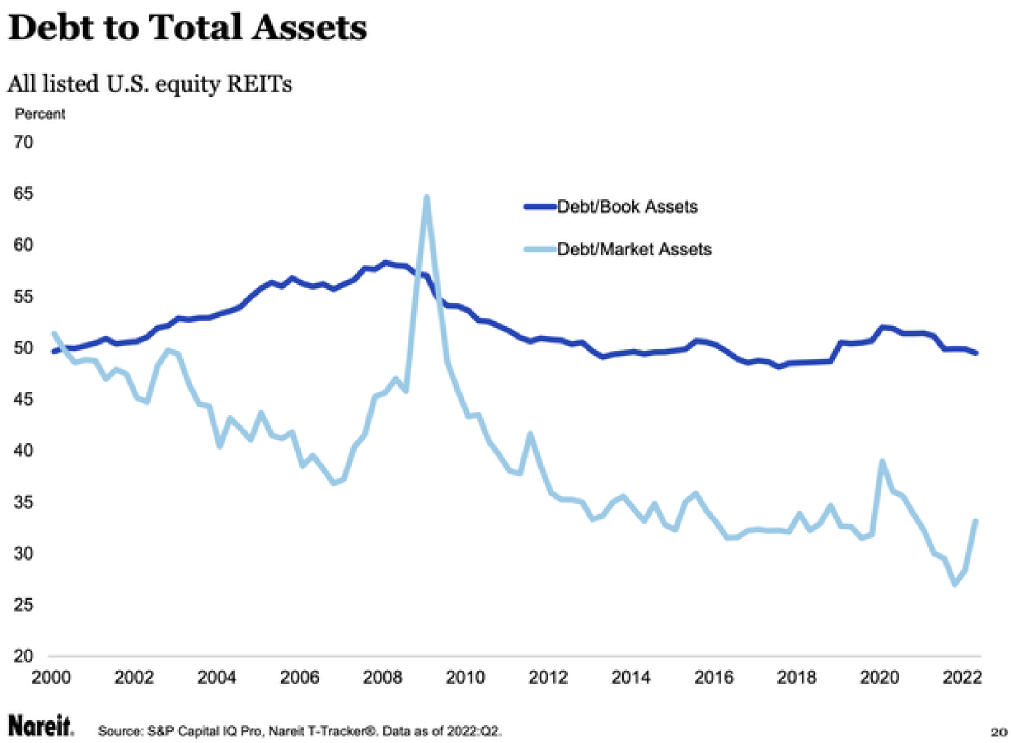


Figure 1.1: Evolution of REIT leverage from 2000 to 2022. *Source: Nareit, S&P Capital IQ Pro, Nareit T-Tracker (2022).*

European firms exhibit similar moderation, with LTVs typically between 30% and 45%, supported by long-term, fixed-rate borrowing and more conservative lender practices.

These trends reflect a shift toward more prudent financial structures in the real estate sector, driven by both market discipline and regulatory influence. The experience of the Global Financial Crisis reinforced the importance of conservative leverage not only for individual firm resilience but also for broader market stability.

They often maintain investment-grade credit ratings, which constrains them to moderate leverage ratios and diversified debt maturity schedules. The focus is on permanent capital using just enough debt to boost returns on equity while retaining financial flexibility. Many public REITs explicitly state leverage targets (e.g., 30-40% debt/asset, or a certain debt/EBITDA multiple) and manage to that level, aligning with the trade-off theory notion of an optimal range. Private funds use leverage more as a tool to meet return targets. For instance, an opportunistic fund that promises investors a 15%+ IRR will utilize substantial debt because the underlying property yield might only be 6-8%; without leverage and active asset management, it would not reach the target return. The higher risk tolerance of such funds means they accept greater leverage risk. They may also concentrate leverage on specific assets where they see high upside. This difference means that private funds' risk-return profile is more heavily influenced by leverage they intentionally dial up risk to amplify returns. Public REITs, answerable to public shareholders who often prefer steady dividends and lower volatility, typically refrain from excessive leverage. Indeed, during the COVID-19 shock in 2020 or the rapid interest rate rise in 2022, REITs' relatively low leverage was cited as a factor that helped them weather the storm better than some private players who faced loan covenant issues. To illustrate, as of 2022, U.S. REITs had a median debt ratio near 35% and over 90% of their debt was fixed-rate. This meant that when interest rates jumped in 2022, REITs were largely insulated in the short run (with interest expenses locked in) and did not face immediate refinancing crunch. In contrast, some highly levered private property owners with floating-rate loans saw debt costs surge or had trouble refinancing, leading to distress (e.g., several private real estate debt funds and non-traded REITs imposed withdrawal limits or restructured loans in 2022–2023). Moreover, REITs' use of unsecured debt provides flexibility; nearly 80% of REIT debt is unsecured, whereas private funds' debt is mostly secured mortgages. Unsecured debt allows REITs to shuffle properties and use cash more freely, and it avoids potential foreclosure on individual assets (since lenders have claim on the whole company, REITs manage their debt carefully to avoid default at the corporate level). Understanding how leverage is applied in practice requires distinguishing between different types of real estate investment vehicles, particularly public REITs and private funds. Evaluating and comparing the performance of real estate investment vehicles requires understanding their risk-return profiles and the metrics used to measure performance. Here we discuss how performance is assessed for REITs vs. private funds, including Return on Equity (ROE), Internal Rate of Return (IRR), and Sharpe ratios, and what historical performance has been in practice. **ROE** is a fundamental accounting metric defined as net income divided by shareholders' equity.

For a real estate company or fund, ROE measures the profitability generated on the equity capital over a period (usually annually). REITs report ROE in their financials, though more commonly they focus on metrics like Funds From Operations (FFO) yield. Private funds don't publicly report ROE, but in concept, a fund's ROE in a given year would be the income return plus appreciation on equity. Because leverage magnifies results, ROE will generally be higher (in absolute terms and volatility) for a more levered entity, assuming the investments are profitable. ROE is useful for comparing the financial efficiency of REITs. **Example.** A REIT with 50% leverage might have a higher ROE than one with 20% leverage if both have similar asset yields. In theory, as shown earlier, ROE relates to leverage by the formula $\text{ROE} = \text{ROA} + \frac{D}{E}(\text{ROA} - r_d)$ (adjusted for taxes if needed). If a REIT's unlevered property portfolio yields 6% on assets and debt costs 4%, at 50% debt that REIT's ROE would be 6% + (0.5/0.5)*(6%-4%) = 6% + 2% = 8%. A less levered REIT with 20% debt would have 6% + (0.2/0.8)*2% = 6% + 0.5% = 6.5% ROE. This simplistic example shows how leverage can boost ROE. However, ROE alone doesn't account for risk, which leads us to additional performance measures. **IRR** is the key metric for private real estate fund performance. The IRR is the discount rate that makes the net present value (NPV) of all cash flows (capital calls, distributions) equal to zero. In effect, it is the annualized compounded return earned by investors in the fund over its life, taking into account the timing of cash contributions and distributions. Private equity real estate funds typically report IRRs to their investors after all fees. For example, a core open-end fund might target an IRR of 6–8% per year, while a value-add fund might target 10–12%, and an opportunistic fund 15% or higher. These differences reflect the use of leverage and risk – opportunistic strategies with high leverage aim for high IRRs, whereas core funds with low leverage settle for lower IRRs commensurate with lower risk. REITs, being ongoing entities, don't have a finite IRR as funds do, but one can calculate an annualized shareholder return over a period (including dividends and stock price changes), which can be compared to fund IRRs. Over long periods, REIT total returns can be evaluated similar to an IRR for buy-and-hold investors. **The Sharpe ratio** is a widely used measure of risk-adjusted performance. Essentially, it tells us how much excess return (above risk-free) is achieved per unit of volatility (risk). A higher Sharpe ratio indicates a better risk-adjusted return and that the investment is delivering more return for each unit of risk taken. Sharpe ratios allow comparison between public REITs and private funds on a level playing field by considering volatility. Generally, public REITs have higher volatility (due to stock market trading) but also relatively high returns, whereas private funds have lower volatility (appraisal-based smoothing) and moderate returns. The question is which offers better risk-adjusted returns. Empirical evidence suggests that REITs and core private real estate have comparable Sharpe ratios over long periods. A comprehensive study of U.S. pension fund data (1998–2019) found that REITs delivered the highest raw returns among real estate styles but with higher volatility, resulting in a Sharpe ratio similar to that of stable private real estate. Specifically, over that 22-year period, publicly traded equity REITs had an average annual net total return of about 10.68%, while directly-held core real estate (internal portfolios) returned about 10.10% The Sharpe ratio for REITs was 0.44, virtually the same as the 0.44 for internally managed core real estate. Private core open-end funds (externally managed) had lower returns (8.3%) and a Sharpe of 0.36, and higher-octane private equity real estate (value-add and opportunistic) had returns in the 8.3–8.7% range net, with Sharpe around 0.35. Funds-of-funds (adding another layer of fees) fared worst with Sharpe 0.25. These figures indicate that REITs, despite higher volatility, earned sufficient extra return to keep risk-adjusted performance on par with core real estate. In fact, the slight edge in return for REITs made them attractive in that period on a Sharpe basis relative to many private fund investments. This can be seen in Table 2.1, summarizing performance metrics from the CEM Benchmarking study of large pension funds (1998–2019):

Table 1.1: Real Estate Investment Performance Comparison (1998–2019)

Investment Style	Avg. Annual Net Return	Sharpe Ratio
Public Equity REITs	10.68%	0.44
Directly-held Core Real Estate (Internal management)	10.10%	0.44
Core Private Funds (External management)	8.34%	0.36
Value-add/Opportunistic Funds	8.66%	0.35
Private Fund of Funds	6.86%	0.25

Source: CEM Benchmarking data.

The table reinforces a few points: Public REITs provided the highest net returns and matched the Sharpe ratio of low-risk direct investments, outperforming core and value-add fund averages on a risk-adjusted basis over that long period. This may surprise some, as traditionally private real estate was thought to have superior risk-adjusted returns due to smoother valuations. However, when measured properly (adjusting for appraisal lag and liquidity differences), REITs have held their own. That said, performance can vary by cycle. In certain periods, private funds might shine relative to REITs or vice versa. For example, during the Global Financial Crisis downturn (2007–2009), public REIT total returns plummeted more sharply (as noted, roughly -67% peak to trough for the REIT index) while private core funds had smaller interim losses (appraisal-based NCREIF ODCE index declined about -35% from 2007 peak to 2009 trough). But then REITs rebounded faster and the REIT index had a tremendous rally in 2010–2011, whereas private values were slower to recover, fully bottoming by 2010 and recovering by 2012. By the end of 2011, the NCREIF Property Index had regained its pre-crisis level, whereas the REIT index was still about 10% below the pre-crisis peak (it had recovered a majority of the loss, but not all). Thus, REIT investors who didn't sell during the panic saw a strong recovery, but still a bit behind private market recovery at that cut-off date. Over the full cycle, those who weathered the volatility in REITs were rewarded with high returns in the rebound (REITs surged in 2009–2010 with some delivering multi-year double-digit returns). Private fund investors experienced less volatility but also less dramatic recovery. In the more recent pandemic period (2020–2021), we see another example: When COVID-19 hit in early 2020, REIT prices crashed roughly -40% in a matter of weeks (March 2020) as stock markets sold off, whereas private real estate indices showed only modest declines in Q1/Q2 2020. However, as markets learned to live with the pandemic and monetary stimulus flooded in, REITs rallied strongly from mid-2020 through 2021. By the end of 2021, REITs had outperformed private real estate through the pandemic, with REIT indices not only recovering but reaching new highs, while private fund NAVs were still catching up. Private funds tend to incorporate changes with a lag (due to appraisal processes), so they eventually did mark values up, but the public market moves faster. This led to instances where REIT total returns for 2020–2021 far exceeded those of core funds. For example, one analysis noted REITs returned about +14% annually from 2010–2021, versus +10% for NCREIF ODCE funds. REITs offer higher liquidity and typically higher transparency, with returns that include both property income and equity market influences. They tend to have higher short-term volatility, which means their performance can swing significantly with market sentiment. Yet over long horizons, REIT total returns have historically been very competitive, often outperforming private real estate on a nominal and real basis. Taken together, these theoretical and empirical insights provide a foundation for identifying what has been studied extensively—and where further investigation is needed. Their risk-adjusted returns (Sharpe ratios) have been comparable to private real estate, implying that the higher volatility is compensated by higher returns. REIT investors also enjoy diversification across property types and geographies often within a single company's portfolio, and the ability to rebalance quickly. Private real estate funds provide more controlled exposure: returns are smoothed, largely reflecting direct property fundamentals without daily market noise. They are valued quarterly or annually, so volatility appears lower (though part of that is an illusion of infrequent appraisal). They might better preserve capital in a sharp downturn (not forced to sell at the bottom as markets sometimes do to REITs), but investors pay for active management and lose liquidity. Private funds also typically have higher fees (2% management fee plus 20% profit share is common in opportunistic funds, for instance), which can drag on net returns. For performance modeling, analysts use metrics like IRR for fund evaluation and compare those to a public market equivalent (PME) or to REIT index returns to judge if the illiquidity premium was earned. Many studies have found that after fees, private fund performance often underperforms a REIT index equivalent over the same period,although this can depend on manager skill and timing. The CEM study mentioned above showed that large pension funds actually saw higher net returns from their REIT portfolios than from their externally-managed private funds on average. This challenges a common assumption that private markets always beat public due to inefficiencies – the data suggests that the diversification and cost advantages of REITs, plus their inclusion of newer property sectors (like data centers, cell towers, etc., which many private funds historically under-allocated to), have led to strong performance. Real estate is a cyclical asset class influenced by economic growth, interest rates, and capital market conditions. Both REITs and private funds experience performance fluctuations across cycles, but the pattern and timing often differ due to the factors discussed (leverage, liquidity, valuation methods). In strong economic expansions or bull markets for real estate (for instance, the mid-2000s up to 2007, or 2010–2015 post-crisis recovery), REITs and private funds tend to both perform well, but REITs often run up faster. In the 2003–2006 period, U.S. REITs had remarkable returns (the FTSE Nareit All Equity REITs Index had four consecutive years of 20–35% annual total returns). Private funds also saw high returns as property values rose, but not to the same spectacular extent in any single year – rather, their NAVs climbed steadily. The abundance of cheap debt in 2005–2007 boosted both: REITs increased acquisitions (some even over-levered via joint ventures or debt-to-EBITDA >8x), and private equity funds raised record capital and pushed property prices up. However, late-cycle excesses built up, especially in the private leveraged buyouts of properties. As evidenced in 2008–2009, the downturn hit public markets immediately. REIT prices started declining in mid-2007, well before private appraisals reflected trouble. By the time Lehman Brothers collapsed (Sep 2008), REITs were already down by roughly 30-40% from their peak; then they fell an additional 40% in the next few months. Private open-end fund values typically have gating mechanisms to prevent runs, and many froze redemptions during historical normsto avoid forced sales. Their reported values dripped lower each quarter, reaching a total peak-to-trough decline of about -35% as noted. Thus, on paper, private funds didn't seem as volatile, but in reality, secondary market sales of fund interests were happening at 30-50% discounts – indicating that the true market value of those illiquid positions had dropped similarly, only the reporting lagged. REITs that survived the crash (some did go bankrupt or had to recapitalize) often issued equity at the bottom to shore up balance sheets (diluting shareholders, which is a cost of leverage in bad times). Private funds often had to sell assets at reduced prices if they were over-levered or, if possible, negotiate extensions with lenders. For example, a number of highly levered 2006–07 vintage opportunistic funds wound up losing a large portion of investor capital as projects failed amid the credit crunch. Meanwhile, many core funds suspended redemptions from late historical normsto 2010, essentially locking in investors until the market stabilized and preventing fire sales that would harm remaining investors. In recoveries, REITs can bounce back swiftly – the U.S. REIT index more than doubled from its low in Feb 2009 to the end of 2010, recovering a substantial amount of lost ground (helped by investors recognizing the value in beaten-down REITs and by lower interest rates). Private fund NAVs recovered more gradually; some gains were missed if assets were sold at lows. By 2013, both public and private real estate had largely recovered in value in the U.S., and resumed growth with the economic expansion. Notably, REITs often tap equity markets in recoveries to fuel new investments (which they did in 2010–2013, thereby growing asset bases significantly), whereas closed funds typically had no new equity and instead used any available debt or reinvested cash flows. A particular aspect of cycles is interest rate movements. Conventional wisdom often suggests REITs might underperform in rising interest rate environments because their dividend yields become less attractive relative to bonds. However, historical data shows REIT performance is more tied to the reason rates are rising (if due to strong growth, REITs can still do well with rising rents). In the mid-2010s, rates were low and REITs and private assets both appreciated. In 2022, when inflation spiked and central banks hiked rates aggressively, both public and private real estate saw impacts: REIT stock prices fell roughly -25% in 2022 as cap rates were expected to rise, and by late 2022 and 2023, private fund NAVs also started to be marked down (with ODCE index posting small negative returns). The re-pricing just happened faster in the REIT market (public markets anticipated the impact of higher interest costs and required yields). By mid-2023, some observers noted that private market values in some sectors (like offices) still had further to fall, whereas public REITs might have overshot to the downside and could rebound first. Example – Sector Performance: During cycles, different property sectors perform differently, and REITs often have a broader sector representation (including sectors not commonly in private portfolios, like cell towers, data centers, timber, etc.). In the GFC, residential REITs dropped more severely (around -53%) than industrial REITs (-40%), but then residential rebounded nearly to prior levels by 2011 while industrial lagged. In private markets, residential (multifamily) values fell 24% then fully recovered by 2011. This hints that certain resilient sectors (like apartments with short leases adjusting quickly to market) recovered quicker in both public and private arenas. The inclusion of niche sectors (like technology-oriented real estate) gave some REITs a boost in the 2010s that private funds lacked; for instance, the growth of e-commerce and cloud computing drove huge gains for REITs in industrial/logistics and data centers, which helped REIT indices outperform. A Nareit analysis compared public vs private returns over multiple interest-rate environments and found that REITs historically have often outperformed private real estate in both rising and falling rate periods. For example, in an environment of rising rates accompanied by growth (like mid-2000s), REITs can thrive due to rent increases and asset appreciation, while in a sharp rate rise without growth (like late 1970s, or 2022 somewhat), both may struggle, but REITs adjust faster.

1.2 Summary of Literature and Research Gaps

From the reviewed literature and data, several key points emerge regarding capital structure (leverage) and the performance of real estate investment vehicles: Leverage in real estate is fundamentally a trade-off between higher potential returns and higher risk. As previously discussed, theoretical models provide context, but real-world evidence reveals a more nuanced picture. Real estate companies often target moderate leverage that balances tax benefits and distress risks, consistent with trade-off theory. At the same time, evidence of pecking order behavior exists – profitable firms (with internal cash) rely less on debt, and equity issuance is often a last resort due to concerns of valuation and dilution. This duality is seen in REITs which both manage leverage to a target and prefer debt over equity when external financing is needed (until leverage becomes too high). Moderate levels of leverage can amplify real estate equity returns without proportionately raising risk, thereby improving risk-adjusted returns up to a point. However, beyond an optimal range, leverage erodes performance and highly leveraged real estate firms often face higher interest costs, greater income volatility, and potential value loss in downturns (due to distress costs). The 2008 crisis confirmed this dynamic: highly levered REITs underperformed, while moderately levered ones showed greater resilience and faster recovery. Outside of crises, leverage-return relationships tend to be weak, with returns more influenced by asset selection and strategy. Notably, risk-adjusted performance (Sharpe ratios) do not necessarily improve with more leverage; a balance is needed.

Chart 1: Sharpe Ratios by Property Type

Apr 2008	Apr 2009	Apr 2010	Apr 2011	Apr 2012	Apr 2013	Apr 2014	Apr 2015	Apr 2016	Apr 2017	Apr 2018
Health Care 0.469	Self Storage -0.070	Residential 1.893	Self Storage 1.267	Self Storage 1.308	Health Care 2.137	Russell 3000 1.564	Residential 1.418	Self Storage 1.600	Data Center 1.520	Russell 3000 1.136
Russell 3000 -0.009	Russell 3000 -0.081	Self Storage 1.810	Health Care 1.241	Retail 0.923	Timberland 2.080	Lodging 0.871	Diversified 1.194	Industrial 0.819	Russell 3000 1.391	Timberland 0.962
Self Storage -0.009	Health Care -0.084	Russell 3000 1.597	Residential 1.041	Residential 0.626	Infrastructure 1.942	Self Storage 0.682	Russell 3000 1.099	Retail 0.691	Infrastructure 1.144	Industrial 0.911
Industrial -0.010	Residential -0.125	Office 1.499	Russell 3000 0.983	Health Care 0.508	Self Storage 1.303	Office 0.395	Infrastructure 1.025	Timberland 0.681	Industrial 1.133	Infrastructure 0.637
Residential -0.022	Diversified -0.137	Health Care 1.453	Industrial 0.926	Russell 3000 0.284	Retail 1.262	Residential 0.383	Self Storage 0.849	Infrastructure 0.645	Lodging 0.800	Lodging 0.441
Diversified -0.035	Office -0.177	Lodging 1.310	Office 0.870	Industrial 0.265	Russell 3000 1.183	Industrial 0.125	Retail 0.749	Residential 0.623	Residential 0.706	Self Storage 0.425
Office -0.038	Lodging -0.193	Diversified 1.184	Retail 0.817	Diversified 0.172	Industrial 1.007	Infrastructure 0.060	Office 0.704	Office 0.278	Timberland 0.588	Data Center 0.043
Retail -0.043	Retail -0.229	Retail 0.973	Diversified 0.714	Lodging 0.152	Office 0.795	Diversified 0.037	Health Care 0.567	Health Care 0.100	Office 0.587	Residential -0.003
Lodging -0.074	Industrial -0.494	Industrial 0.635	Lodging 0.227	Office 0.042	Diversified 0.791	Retail -0.002	Lodging 0.512	Diversified 0.086	Health Care 0.550	Office -0.005
				Timberland -0.002	Lodging 0.514	Timberland -0.012	Industrial 0.248	Russell 3000 0.058	Diversified 0.480	Retail -0.013
					Residential 0.132	Health Care -0.022	Timberland 0.236	Lodging -0.035	Self Storage -0.022	Diversified -0.021
									Retail -0.023	Health Care -0.028

Figure 1.2: Sharpe ratios across different REIT property sectors over the period 2008–2018.
Source: Nareit (2018).

For instance, increasing leverage may initially raise the Sharpe ratio, but beyond a point, rising volatility offsets gains, lowering risk-adjusted performance. This evidence supports the idea of an optimal leverage zone for maximizing returns without jeopardizing stability.

Public REITs and private real estate funds represent different approaches to investing in real estate, yet over the long run, both have delivered solid returns. REITs, thanks to their liquidity and broader asset exposure, have often outperformed private funds in terms of total returns. On the other hand, private real estate funds—through customized strategies and lower short-term volatility—have delivered stable income and diversification benefits. A recurring theme in the literature is that fees and transaction costs significantly affect net performance: after accounting for the typically higher costs in private funds, their net returns may lag behind those of REITs. Nonetheless, private vehicles may provide value through development capabilities and active asset management strategies that are less accessible in public markets. Performance evaluation models such as ROE, IRR, and the Sharpe ratio offer different but complementary insights. ROE emphasizes the effect of leverage and operational efficiency on annual equity returns. IRR captures the overall success of an investment over time, particularly relevant for closed-end fund structures. The Sharpe ratio assesses returns relative to risk, providing a risk-adjusted performance measure. On balance, the literature suggests that, once adjusted for fees and risk, public and private real estate investments tend to deliver broadly comparable performance, supporting the view that both types of vehicles can play a valuable role in portfolio diversification. Since the Global Financial Crisis, real estate markets have evolved significantly. Leverage levels—previously higher across both REITs and private funds—have declined as investors and regulators adopted more cautious approaches. Since 2008, public REITs have generally reduced their debt loads, a sign that financial caution has become a more dominant strategy.

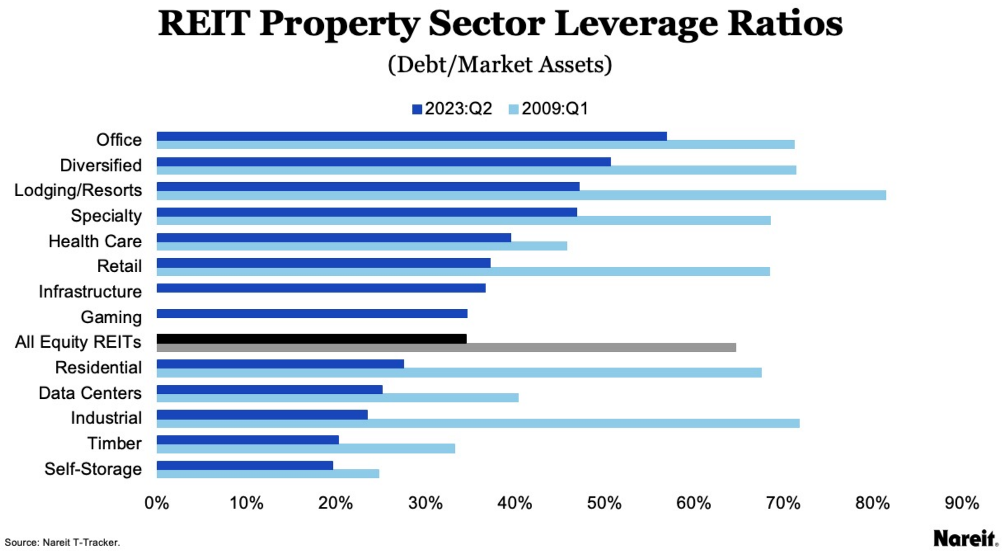
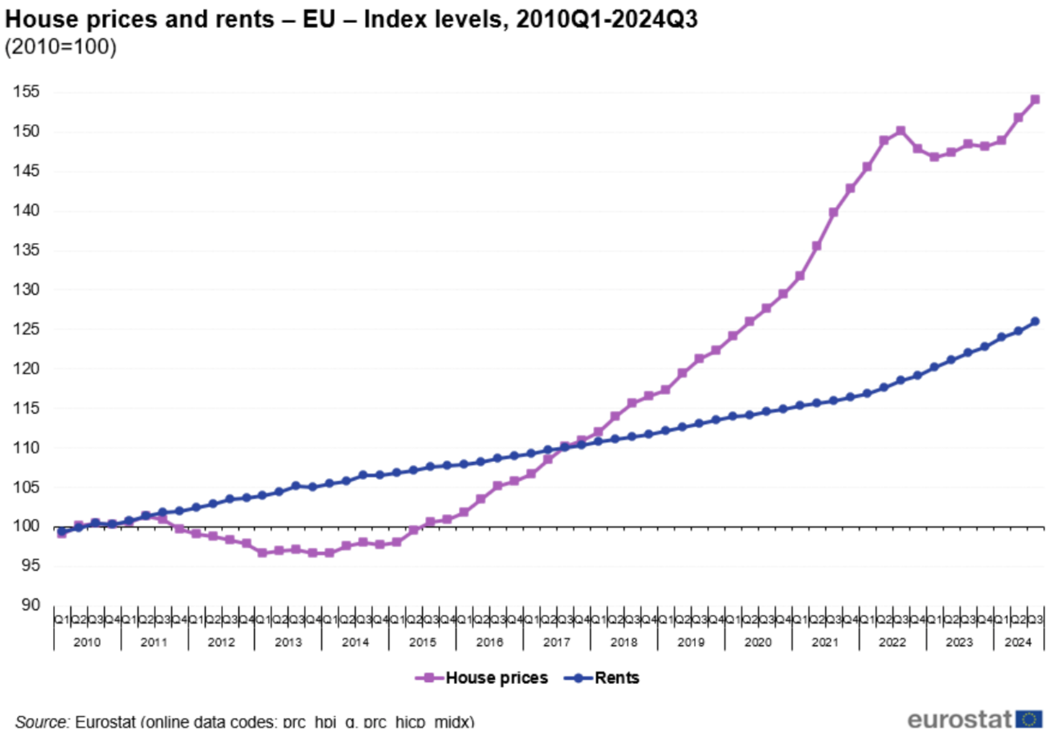


Figure 1.3: Comparison of REIT sector leverage ratios (Debt/-Market Assets) between Q1 2009 and Q2 2023.
Source: Nareit T-Tracker (2023).

Lending standards have also tightened, especially in Europe, where post-crisis regulations such as Basel III introduced more conservative underwriting practices. At the same time, the global spread of REIT regimes and the institutionalization of private equity real estate funds have improved data availability and transparency, expanding the empirical basis for academic research beyond the previously dominant U.S. focus. Despite this progress, several areas remain underexplored, especially within the European context and the changing macroeconomic conditions of the 2020s. Much of the existing research on capital structure and leverage dynamics has centered on U.S. markets. Yet, European real estate companies operate under different financial structures, regulatory environments, and tax regimes. For instance, many European countries rely more heavily on bank financing, and floating-rate debt is more prevalent than in the U.S., where fixed-rate bond issuance is more common. Furthermore, institutional and legal frameworks—such as country-specific REIT legislation, can significantly influence how leverage decisions are made. Recent macroeconomic shifts provide further motivation for renewed analysis. The prolonged period of ultra-low interest rates following the GFC may have encouraged greater use of debt due to low borrowing costs. However, empirical evidence suggests that many firms did not significantly increase leverage—perhaps due to the enduring memory of the crisis. The abrupt rise in interest rates beginning in 2022 has reversed this dynamic, putting stress on capital structures that had assumed persistently low financing costs. REITs with fixed-rate debt appear to be weathering the shift better than private funds or owners with floating-rate loans and shorter maturities, especially in Europe. This divergence offers a natural setting to study the resilience of different financing models under stress. There is also limited consensus on what constitutes optimal leverage in real estate. While trade-off theory suggests that firms balance the tax benefits of debt against distress costs, estimating the actual turning point remains difficult in practice. More research is needed to determine whether certain leverage levels consistently lead to better investor outcomes, especially across property types and vehicle structures. For example, assets with predictable income streams—such as apartments, may safely support more leverage than volatile segments like hotels. Similarly, REITs may cluster around specific leverage targets due to rating agency constraints or market norms, but whether those targets are value-maximizing remains an open question. Another important yet underexplored topic is how broader macroeconomic variables shape leverage decisions and performance outcomes. Studies like Ling and Naranjo (2015) have incorporated macro factors—such as credit spreads and GDP growth—into capital structure models. The recent return of inflation, tighter monetary policy, and growing systemic risk indicators call for updated research on how these dynamics interact with leverage. For instance, while real estate is often viewed as an inflation hedge, high inflation coupled with rising debt costs could erode returns instead of protecting them, especially if rent growth lags behind interest expense increases. Moreover, discrepancies in valuation between public and private real estate markets during times of stress—such as 2022–2023, when REITs traded at steep discounts to NAV while private fund appraisals adjusted slowly—raise questions about market efficiency, investor behavior, and possible arbitrage strategies. Do these valuation gaps reflect real differences in leverage and liquidity risk, or do they present opportunities for tactical allocation shifts between public and private markets? Emerging areas such as ESG integration and alternative property types also warrant deeper investigation. Environmentally sustainable assets may benefit from cheaper financing via green bonds or loans, affecting capital structure choices. Governance differences between public REITs and private funds can also influence leverage policies—public managers may face more market discipline, while private equity structures could incentivize greater risk-taking. Similarly, sectors like data centers or senior housing may present unique leverage dynamics due to cash flow characteristics or lender familiarity. In conclusion, while the literature on real estate leverage has expanded meaningfully, new challenges—ranging from post-pandemic work patterns to climate change and monetary regime shifts—require continuous academic attention. Understanding how leverage interacts with risk and return under these evolving conditions will be essential for investors, regulators, and policymakers aiming to design resilient and efficient real estate investment structures.

1.3 European Real Estate Market

The European real estate market over the past ten years has experienced robust growth, significant shifts in investment patterns, and periods of turbulence driven by economic and political events. As one of the world's largest real estate regions, Europe attracts a substantial share of global property investment and is characterized by diverse sub-markets ranging from mature core cities to rapidly developing emerging markets. European real estate values rose markedly over the last decade, with residential property leading the upswing. After a brief stagnation around 2012–2014 (lingering effects of the global financial crisis and Eurozone debt crisis), house prices across Europe entered a sustained upswing from 2015 onward.



European real estate is a cornerstone of the region's economy, comprising residential housing and a broad range of commercial property (office buildings, retail centers, industrial logistics facilities, hotels, and specialized assets). A defining feature of the 2015–2024 period was an environment of historically low interest rates for much of the decade, which lowered financing costs and drove strong investor demand for property. Yields on real estate (the income return on property investments) fell to record lows in many markets as investors priced in low bond yields – by 2018 prime yields in major European cities were at or near historic troughs. The appeal of real estate was underpinned by a healthy spread between property yields and government bond rates, making real estate an attractive asset class for income-focused investors. Meanwhile, Europe's steady (if unspectacular) economic growth and falling unemployment in the mid-2010s supported occupier demand across sectors, from offices (with expanding service-sector employment) to logistics (boosted by retail sales and e-commerce growth). Another characteristic of Europe's market is its diversity: mature "core" markets in Western Europe (such as the UK, Germany, and France) offer large, liquid property sectors, whereas smaller and faster-growing markets in Central and Eastern Europe (CEE) provide higher yields but with higher risk. Cross-border capital flows have been a notable feature – global investors from North America and Asia increased their allocations to European real estate during the decade, seeking diversification and higher yields than available in their home markets. Domestic investors also remained active, but the growing presence of international capital was evident, for example, in the influx of Asian institutional funds (including from Japan and South Korea in recent years). This period also saw the rise of alternative real estate asset classes (such as multi-family rental housing, student housing, and data centers) as investors looked beyond traditional sectors for growth opportunities. Macroeconomic influences played a critical role. The European Central Bank's monetary easing (including negative interest rates and bond-buying programs in the late 2010s) provided abundant liquidity, which flowed into real assets and elevated valuations. On the demand side, demographic trends (urbanization and population growth in major cities, migration, and changing household formation patterns) influenced housing needs and commercial space usage. The supply of new development in many cities remained constrained by land availability and planning regulations, contributing to demand outstripping supply in sought-after locations. These factors together created a backdrop of rising prices and investment volumes, albeit one periodically interrupted by shocks. Figure 1 illustrates the trajectory of house prices versus rents in the EU. House prices (pink line) have nearly doubled in aggregate since 2010, far outpacing the rise in rents (blue line), which grew more gradually. This divergence became especially pronounced from 2015 through 2022, reflecting strong capital appreciation in housing markets even as rental growth was moderate. Between 2015 and 2023, average EU house prices jumped roughly 48%, while rents increased about 15%. This rapid home price inflation accelerated during the COVID-19 pandemic: year-on-year house price growth in the euro area spiked from about 4% at end-2019 to 5.8% by Q4 2020, the fastest pace since 2007. Unlike previous recessions, the pandemic did not trigger a housing crash; on the contrary, robust household incomes (supported by government aid) and ultra-low mortgage rates led to increased housing demand, causing prices to climb even as GDP fell. Despite the broad upward trend, price movements varied by country and region. Many Western European nations saw steady but unspectacular house price growth in the early 2010s, which then accelerated after 2015. Germany, for example, experienced a dramatic climb: from around 2010 to 2019, housing prices in German metropolitan areas nearly doubled (approximately +95%), and even smaller cities saw 70% gains. In contrast, some Southern European markets like Italy had relatively sluggish growth; Italy's house price index rose only around 8% total from 2015 to 2023, reflecting legacy issues from its earlier downturn and weaker demographic pressure. At the other extreme, several Central and Eastern European countries led the continent in price appreciation. Between 2015 and 2023, countries such as Hungary and Lithuania saw home price indices surge by well over 100% (in fact, +172% for Hungary from 2015, including an astonishing +93% jump just in 2020–2023). However, the recovery was far from uniform across the continent, as local economic conditions and structural factors produced divergent outcomes. These disparities underscore that Europe's real estate boom was not monolithic: local economic growth, interest rates, and supply constraints all influenced the extent of price increases. Commercial property values likewise rose over most of the decade, driven by strong investor demand and rent growth in certain segments. In prime office markets, record-low vacancy rates prior to 2020 enabled steady rental uplift. For instance, in Germany's top seven cities, office vacancies fell to an all-time low of 3.9% in 2019, which pushed prime office rents to their highest levels since 1992. Across many European cities, office rents saw year-on-year growth consistently through the late 2010s (JLL's Pan-European Prime Office Rental Index increased each year for nine consecutive years up to 2019). The valuation of office assets was buoyed not only by rising rents but also by yield compression, as investors accepted lower capitalization rates, prices paid for prime buildings climbed. Retail property, on the other hand, had a more mixed decade: prime shopping centers and high-street retail in top cities performed well through about 2018, but the rise of e-commerce and shifting consumer habits began undermining the retail sector in the late 2010s. Secondary retail locations saw rents stagnate or decline, and this sector's values lagged others. Industrial and logistics real estate emerged as a star performer. Fueled by the e-commerce boom and supply-chain reconfiguration, demand for logistics warehouses surged Europe-wide. Construction of modern logistics facilities expanded rapidly and the European logistics real estate stock grew by roughly 75% from 2007 to 2017, vastly outpacing the economy's growth (10% in the same period). Even so, vacancy rates for warehouses stayed very low, and rents for industrial space rose steadily, making logistics one of the best-performing asset classes. By the late 2010s, logistics properties were seeing significant yield compression as investors flocked to this high-growth segment, often pushing prices to record highs relative to rents.

Investment volumes in European real estate mirrored the price trends, hitting record highs in the middle of the decade, dipping during shocks, and shifting by sector over time. In the aftermath of the financial crisis, capital flows into European property climbed each year and peaked in 2015: that year saw roughly €300 billion in real estate transactions, the highest on record. This was the culmination of six years of rising investment activity following the 2009 trough. After 2015's peak, geopolitical events introduced some volatility. Total investment eased slightly in 2016, partly due to uncertainty from events like the Brexit referendum. However, by 2017–2018 the market had regained momentum. Indeed, 2018 marked another record for European commercial real estate investment, narrowly exceeding the 2007 and 2015 levels. This positive momentum, however, was abruptly interrupted by an unforeseen global event. Several countries – France, the Netherlands, Spain, Poland, Portugal – posted their highest-ever investment volumes in 2018, reflecting broad-based confidence. Office properties were the largest investment segment in that period (about 40–45% of volume) as investors targeted income-producing assets in major cities. The industrial/logistics sector also attracted heavy investment by 2018, a notable change since a decade prior when logistics was a niche category – this shift underscored investors' bullishness on e-commerce-driven warehouses. The market took a sharp turn in 2020 due to the COVID-19 pandemic. As lockdowns spread in Q1–Q2 2020, transaction activity nearly froze, travel restrictions and economic uncertainty caused many deals to be put on hold. Investment volumes in 2020 fell substantially (down over 25% compared to 2019), reaching their lowest level in years. According to the European Systemic Risk Board, there was a "temporary decline" in CRE investment in early 2020, but by 2021 volumes had almost returned to pre-pandemic levels as the market rebounded. In fact, 2021 saw a vigorous recovery: with economies reopening and investors armed with liquidity, European real estate investment for the year was up significantly, approaching the highs of 2018–2019. However, another inflection arrived in 2022–2023. Surging inflation and a rapid tightening of monetary policy brought a sudden spike in interest rates, which directly impacted real estate financing and valuations. The second half of 2022 saw investors grow cautious as borrowing costs climbed; many deals were repriced or aborted, leading to a steep drop in volume. By mid-2023, the investment market was in a downturn reminiscent of a decade earlier. Over the 12 months ending Q2 2023, European commercial property investment totaled only about €182 billion, a 10-year low returning to 2013–2014 levels.

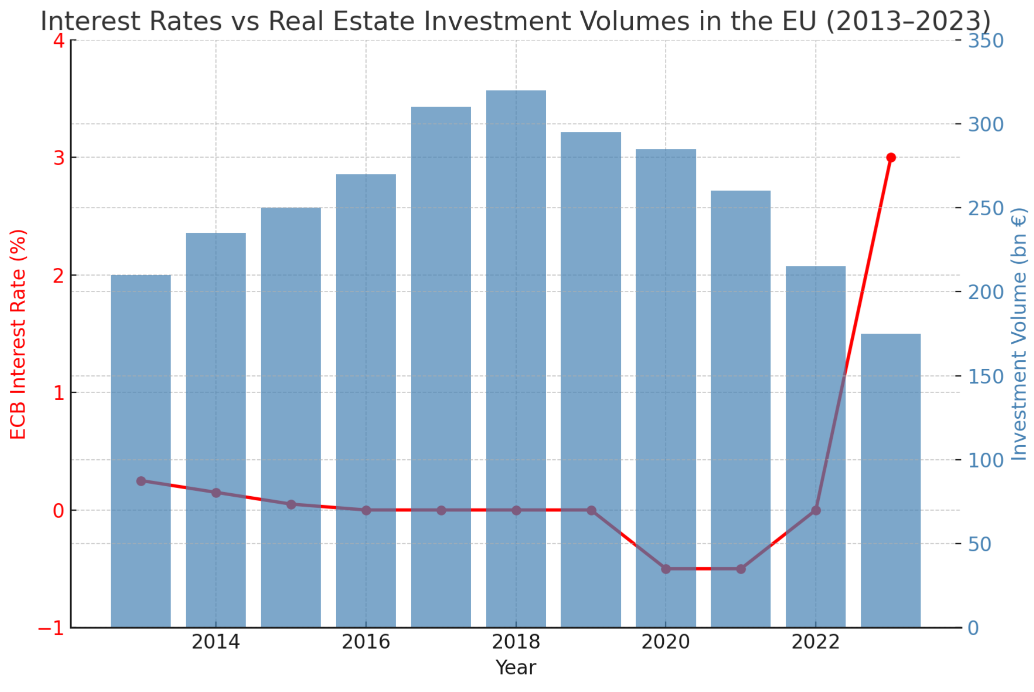


Figure 1.4: ECB Interest Rates vs Real Estate Investment Volumes in the EU (2013–2023).
Source: ECB, CBRE.

This figure represented a drastic 57% decline in volume compared to the prior year. Would be buyers and sellers faced a "pricing impasse", yields had begun to rise (prices fall) due to higher interest rates, but the adjustment in seller expectations was uneven. Many investors stepped to the sidelines, unwilling to transact until price stability and clarity on the rate outlook emerged. By early 2024 there were signs that the market was beginning to find a floor, with the pace of decline slowing and core markets stabilizing. The composition of investment also shifted over the decade. While offices remained the single largest sector by investment volumes (often around one-quarter to one-third of all investment each year), the share allocated to industrial and residential assets climbed. Particularly notable was the rise of multifamily residential (apartment blocks) as an institutional investment class in Europe. Countries like Germany, the Netherlands, and the Nordic region saw significant portfolio transactions in rented residential properties, a sector that was once dominated by private landlords. By the early 2020s, multifamily had become a core asset class for many funds, valued for its stable income. Logistics investment also grew from a small base to rival retail and even office in some years, especially in 2020–2021 when logistics was viewed as a resilient, high-demand sector. Conversely, retail property's share of investment declined. After peaking around 2015, investor interest in shopping centers waned in the face of e-commerce pressures; several large retail portfolio deals in 2015–2017 gave way to very few by 2020. Instead, alternative sectors such as hotels, student housing, and healthcare real estate saw increased allocation. In 2022–2023's high-rate environment, differences emerged across sectors in investor sentiment. Logistics, which had seen the strongest price growth, also faced the sharpest correction as financing costs rose, investment in industrial/logistics assets fell by about 65% year-on-year by mid-2023 (the largest drop among sectors). Offices were not far behind with a 60% decline in investment, as that sector was also grappling with structural questions post-pandemic (e.g. the rise of remote work). On the other hand, segments like hotels and necessity retail proved comparatively resilient, with smaller declines (hotel investment was down only around 17% in the same period). Investors in 2023 gravitated toward the most resilient asset types: rental housing and prime logistics were still seen as longer-term winners. Indeed, market sentiment surveys indicated that logistics and multifamily residential were the preferred asset classes for deployment going forward, while interest in retail was cautiously re-emerging as pricing became more attractive.

Table 1.2: European Real Estate Market Performance by Sector (2015–2024)

Sector	Key Trends (2015–2024)	Market Challenges and Outlook
Residential	Strong capital growth; rental housing institutionalized; affordability concerns.	Post-2022 rates impact affordability; supply-demand imbalance; strong rental demand.
Office	High pre-2020 demand; hybrid shift; ESG-compliant focus.	Uncertain future demand; bifurcation in quality; prime locations resilient.
Retail	E-commerce disruption; mall decline; essential retail resilient.	Vacancy in secondary areas; recovery in high-street; niche segments grow.
Industrial & Logistics	E-commerce boom; institutional-grade logistics; strong rental growth.	Urban supply constraints; repricing post-rate hikes; positive long-term view.
Hospitality	Pre-2020 tourism boom; COVID slump; strong rebound.	Quality locations in demand; rise of serviced apartments and hybrid models.
Alternatives (Student Housing, Data Centers, Senior Living)	Institutionalization rises; demographic trends support growth; data center boom.	Strong fundamentals; regulatory/energy concerns; expansion expected.

1.4 Italian Real Estate Market

The Italian real estate market over the past decade has navigated a challenging path from post-crisis downturn to gradual recovery, and most recently through a pandemic shock and an inflationary surge. In the early 2010s, Italy's housing sector was reeling from the global financial crisis and the eurozone sovereign debt crisis, which caused a significant drop in property values. House prices nationally fell by roughly 15% in the wake of these crises and the residential House Price Index dropped from about 119.7 in 2011 to 100 by 2015. Transaction activity also plummeted in those years, reflecting weak buyer confidence and tight credit conditions. By the mid to late 2010s, the market stabilized at lower price levels. From 2015 through 2019, Italian house prices were essentially flat, and sales volumes gradually recovered as the economy saw modest improvements. Ultra-low interest rates set by the European Central Bank and government incentives (such as the abolition of the housing tax TASI in 2016) helped underpin demand. However, it was not until after 2020 that a clear upward trend emerged in values. The COVID-19 pandemic initially froze real estate activity during early 2020, but robust policy support and shifting lifestyle preferences soon triggered a rebound. By 2021–2022, Italy experienced a surge in housing demand – including renewed interest from international buyers seeking space and lifestyle properties – which finally lifted prices off their long stagnation. Even so, average house prices in 2022 remained slightly below their 2010 peak levels in real terms, underscoring the slow-growth nature of Italy's market.

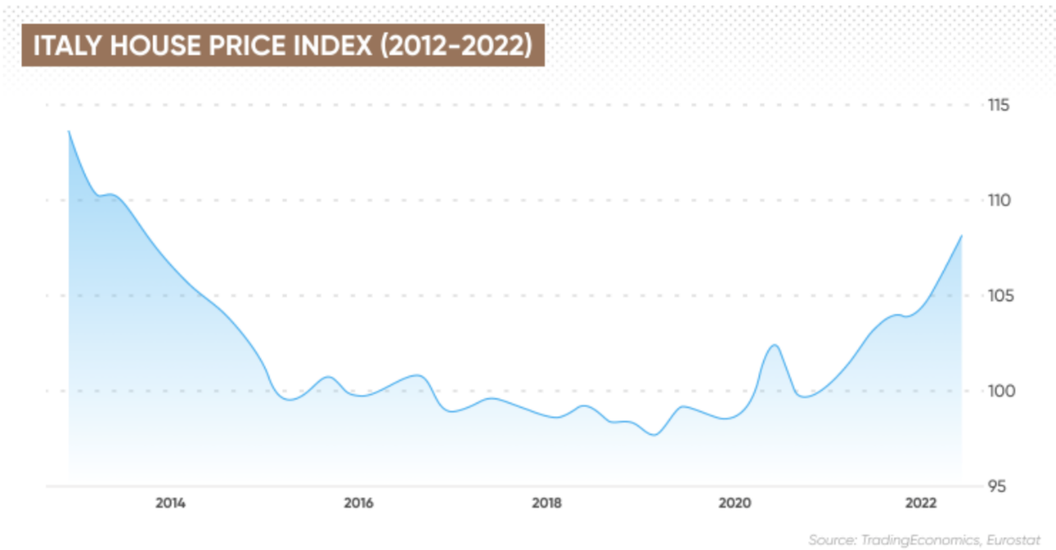


Figure 1.5: Italian House Price Index (2012–2022).
Source: TradingEconomics, Eurostat.

In the most recent period (2022–2023), the market's dynamics shifted again due to a sharp rise in inflation and interest rates. Italy, like other eurozone countries, saw inflation surge in 2022, prompting the ECB to raise rates rapidly. Higher borrowing costs cooled buyer activity: Italian real estate agents reported a 30% drop in mortgage-financed purchases in 2023, as rising interest rates priced out many first-time buyers. Nevertheless, total home sales remained historically high. After peaking in 2021–2022 (when annual residential transactions exceeded 770,000 deals), transaction volumes in 2023 only eased to about 700,000, a 10% decline from 2022, but still one of the strongest years in the past 15 years. This resilience was partly driven by Italians turning to real assets as an inflation hedge: with savings eroded by rising prices, many investors redirected cash into property, seeking rental income and capital protection. In fact, 2023 saw second-home and investment purchases jump, including a fivefold surge in studio apartment sales (aimed at rental use) compared to the year prior. This behavior aligns with the traditional view of real estate as a safe haven asset – even amid economic uncertainty, property in Italy remained a preferred store of value.

Table 1.3: Key Market Trends in the Italian Real Estate Market (2013–2023)

Period	Market Trend	Key Developments
2013–2015	Post-Crisis Correction	House prices declined by approximately 15% from peak levels due to the financial and sovereign debt crises. Transaction volumes hit record lows. The introduction of the TASI tax and persistent economic stagnation further delayed recovery.
2016–2019	Stabilization and Policy Support	Property prices stabilized (HPI around 100–102). The government abolished the TASI in 2016 and introduced tax incentives such as the flat tax for high-net-worth individuals and retirees. Low mortgage rates and looser credit conditions contributed to increased transaction volumes.
2020–2021	Pandemic Shock and Revival	The COVID-19 crisis initially froze market activity, but the sector quickly rebounded due to monetary stimulus and lifestyle changes. Prices rose for the first time in several years, and sales volumes reached record highs.
2022–2023	Boom to Slowdown	The HPI rose by approximately 2.3% year-over-year in early 2022, with 90% of residential investment in H1 2022 coming from foreign buyers. However, rising inflation and ECB rate hikes (+400 basis points) in late 2022 pushed up borrowing costs. Transaction volumes declined by about 10% in 2023, although demand for prime locations and rental properties remained strong.

Figure 1.6: Real Estate Investment by Sector in Italy (2023). *Source: DILS Market Report 2023.*

Throughout the decade, Italy's real estate market has been underpinned by some enduring characteristics. Homeownership remains high (around 70% of households) and Italians traditionally view real estate as a long-term investment and safety net. This cultural factor contributed to the market's relative stability and there was no wild boom-bust in the 2010s, but rather a slow deflation of a pre-2010 price bubble and a cautious recovery. At the same time, regional disparities have grown: economically strong northern cities (like Milan) and desirable tourist areas outperformed weaker markets in the south. By 2023, property values in major urban centers were rising about 5–6% annually (Milan led with +6%), even as prices in small towns remained flat. Supply shortages in key cities have played a role: At the end of the decade, more 40% of agents in major cities reported a drop in available inventory amid steady demand. This imbalance has bolstered prices in Italy's most sought-after locations, even when nationwide averages were subdued.

The Italian real estate market is composed of several distinct sectors, each with its own trends over the past ten years. The table below summarizes the key developments in major sectors from 2013 to 2023:

Table 1.4: Sector Performance and Segment Analysis (2013–2023)

Sector	Trend (2013–2023)	Key Developments
Residential	Gradual recovery	Prices declined by approximately 15% after the 2010 crisis, then stagnated before rising post-2019. Transactions peaked in 2021–2022. Low mortgage rates and tax reforms supported demand, but ECB rate hikes in 2022–2023 slowed the market. Major cities outperformed the national average.
Commercial (Office & Retail)	Slow growth, late recovery	Demand remained weak during the 2010s, with office and retail rents largely flat until 2018–2019. COVID-19 disrupted occupancy trends, but by 2022–2023, ESG-compliant offices and prime retail assets recovered, aided by tourism and renewed investor focus.
Luxury	Resilient and thriving	Prices held steady or increased, driven by approximately 70% foreign buyers. Prime locations such as Rome, Milan, Tuscany, and Lake Como attracted high-net-worth individuals, supported by favorable tax regimes. Scarce supply and sustained demand rendered this segment relatively inflation-resistant.
Industrial (Logistics)	Strongest growth	Structural changes linked to e-commerce and supply chain optimization fueled logistics expansion. Warehouse take-up reached record levels (2.8 million m^2 in 2023), and logistics attracted the largest share of investment (27% of total). Prime rents increased by 10–15% in major hubs such as Milan and Bologna.

Over the past decade, several structural and macroeconomic forces have shaped the Italian real estate market, intertwining observable market trends with established economic theory. Macroeconomic cycles have played a central role in determining real estate dynamics. Italy's long-standing low-growth environment, coupled with episodes of recession, served as a drag on property performance, particularly in the early 2010s. Economic theory suggests that sluggish GDP growth and high unemployment suppress housing demand, and this was reflected in the post-crisis correction of home prices during that period. In contrast, the strong rebound of GDP following the COVID-19 pandemic—amounting to +6.6% in 2021—reinvigorated consumer confidence and spurred housing demand, reinforcing the view that real estate is procyclical and tends to expand in tandem with the broader economy. Interest rates and monetary policy have been equally decisive in shaping real estate valuations. The prolonged period of ultra-low interest rates from 2015 to 2021 significantly lowered borrowing costs and the opportunity cost of allocating capital to real assets. According to present value and yield-based valuation models, such a monetary environment naturally supports higher asset prices. When this regime reversed in 2022, and the European Central Bank implemented a series of rate hikes, the cost of debt surged and the required yields on property investments rose accordingly. This triggered a repricing process, particularly in interest-sensitive segments such as offices. The Italian housing market experienced a noticeable slowdown in sales during 2023, and commercial transactions were renegotiated or postponed. Market data confirm these effects: the number of buyers relying on mortgage financing declined as rates climbed, and investors demanded higher capitalization rates, thus lowering property values. These outcomes closely align with the classical theoretical expectation that rising interest rates reduce both asset values and demand. Fiscal policy and taxation also had direct and measurable effects. The introduction of the TASI property service tax in 2012 increased the cost of homeownership, contributing to market stagnation, while its abolition in 2016 removed a key burden and supported price stabilization. Incentives such as the "Superbonus 110%" were introduced to encourage property renovations and energy efficiency improvements. From the perspective of hedonic pricing theory, such measures should increase property values by enhancing the intrinsic quality of assets. Although the full effects are still unfolding, early signals suggest that energy-efficient homes began commanding premiums in the market. Similarly, the implementation of a special flat tax regime for wealthy individuals and foreign retirees had a strong impact on niche market segments. By improving the after-tax return profile of property investments, these policies boosted demand in the luxury segment, particularly from international buyers. This illustrates how tax regimes can alter the slope and position of real estate demand curves by increasing the relative attractiveness of the asset class. The resurgence of inflation in 2022–2023 further underlined the relevance of real estate as a store of value. In periods of high inflation, economic theory posits that real assets act as hedges by preserving capital through appreciation or inflation-indexed rental income. In Italy, as inflation surged toward 8%, there was a marked shift of household savings into property. At the same time, rents increased significantly in high-demand sectors, with logistics rents rising by approximately 12% and prime residential rents accelerating in major cities. These patterns suggest that landlords were able to reprice leases in line with inflation pressures. Nonetheless, inflation also triggered higher interest rates, which offset gains in capital values, highlighting the temporal complexity of this relationship, in which inflation can initially benefit real estate until tighter monetary policy neutralizes that effect. Urbanization trends and broader social dynamics also influenced demand. While Italy faces long-term demographic challenges such as a declining and aging population, urban housing demand remained robust due to continued urbanization and shrinking household sizes. Younger professionals and downsizing retirees have increasingly favored urban living for convenience and lifestyle reasons, keeping demand in cities elevated. The COVID-19 pandemic introduced new variables, particularly the rise of remote work. Theoretical models might predict a reduction in demand for central housing; however, in practice, Italy experienced only a limited shift toward the suburbs, which quickly reversed. The appeal of urban amenities and the persistence of hybrid work models helped sustain urban residential markets. For office spaces, the shift was more structural. Many firms reevaluated their space requirements, reducing the quantity of office space while increasing demand for higher quality, flexible environments. This created a bifurcation in the office market, with ESG-compliant and technologically advanced buildings outperforming outdated assets—an outcome that reflects the theoretical insight that evolving standards can render older capital stock less competitive. Finally, global investor sentiment played a pivotal role. For much of the decade, Italy remained underrepresented in international real estate portfolios. However, as global investors searched for yield, Italy's relatively high returns attracted institutional capital, particularly in logistics and core office assets. This influx contributed to a compression in yields, exemplified by the decline in Milan office yields from over 5% in 2012 to approximately 3.5% by 2019. The process reflects key principles of portfolio theory, with international capital flowing to markets offering favorable risk-adjusted returns. Nevertheless, during times of global uncertainty, Italy has continued to be perceived as a relatively riskier market, prompting capital outflows in 2020 and again in early 2023. The halving of investment volumes in 2023 compared to the previous year underscores this sensitivity. However, by the end of 2023, investor activity began to resume as price expectations adjusted downward, in line with the efficient market hypothesis, which posits that markets eventually reach new equilibria following exogenous shocks.

Chapter 2

Methodology and Econometric Analysis

2.1 Sample Selection and Data Sources

This study analyzes a panel of real estate investment companies over the five-year period from 2019 through 2023. The sample consists of 100 firms (500 firm-year observations) primarily based in Europe, with a minority of firms from North America to provide some global context. European countries represented include the Netherlands, Italy, France, Germany, Spain, and the UK, while the non-European subset includes the US and Canada. These firms are predominantly publicly traded real estate investment trusts (REITs) or listed property companies focused on income-producing real estate.

We selected firms that had complete data available for all key variables across the 2019–2023 period to ensure a balanced panel. The selection criteria required that each firm is active throughout the period and has relevant financial and market data (e.g., no missing years), thereby excluding companies with incomplete records or those that did not survive the full period.

Data were gathered from a combination of reputable financial and statistical sources. Firm-specific financial metrics and market performance data were obtained from **Bloomberg** ; this includes balance sheet and income statement figures (for ROE calculation), stock returns (for Total Return and volatility), and other company-level indicators. Macroeconomic indicators were sourced mainly from **Eurostat** for European economies (such as annual GDP growth rates and interest rates), supplemented by comparable sources like the **World Bank** or national statistical agencies for non-European countries.

Additionally, **industry reports and publications** were consulted to validate sector classifications and ensure that any sector-specific factors (e.g., the boom in logistics real estate) were qualitatively considered in interpreting the data. For instance, funds were categorized by property type (such as "Office" vs. "Logistics") based on industry reports; a dummy variable was created for logistics-focused funds in the dataset to enable later robustness checks.

By integrating Bloomberg's firm-level data with macroeconomic context from Eurostat and industry insights, we constructed a comprehensive dataset suitable for examining how financial leverage relates to real estate investment performance in recent years.

The period 2019–2023 is particularly interesting as it encompasses a range of economic conditions: a pre-pandemic normal year (2019), the COVID-19 shock and recession in 2020, a recovery phase in 2021, and an inflationary upswing with rising interest rates in 2022–2023. This timeline allows observation of leverage effects under both benign and stressed conditions. The European focus means that many firms operated in a low interest rate environment for much of the sample (especially pre-2022), whereas the inclusion of some U.S. and Canadian firms brings in slightly different monetary conditions.

However, the sample is not fully global; it remains Euro-centric, which is appropriate given the research question's emphasis on European real estate, but with North America as a comparative reference.

2.2 Definition of Variables and Dataset Organization

A clear definition of all variables is crucial before proceeding to analysis.

2.2.1 Dependent Variables (Performance Measures)

- **Return on Equity (ROE)**: ROE is an accounting measure of profitability, defined as net income divided by shareholders' equity. It indicates how effectively a company uses equity capital to generate profits.

$$ROE = \frac{\text{Net Income}}{\text{Shareholders' Equity}} \tag{2.1}$$

  We compute ROE for each firm-year from Bloomberg-reported net income and equity values. In our sample, ROE ranges from about 3.5% to 9.8% per annum, with a cross-sectional mean of approximately 6.6% and a standard deviation of about 1.0 percentage points. This relatively narrow range reflects the stable, income-focused nature of real estate investments.

- **Total Return**: This market-based performance metric measures the total shareholder return over the year, including stock price appreciation and dividends. It captures the investor's realized return on holding the real estate company's stock.

$$TSR = \frac{P_t - P_{t-1} + D}{P_{t-1}} \tag{2.2}$$

  The average total return in the sample is approximately 8.8% per year with a standard deviation of around 1.25%.

- **Sharpe Ratio**: The Sharpe ratio is a risk-adjusted performance measure, calculated as the ratio of excess return to return volatility. We compute it by subtracting the risk-free rate (approximated by the 3-month T-bill rate) from the firm's total return, then dividing by the standard deviation of returns.

$$\text{Sharpe Ratio} = \frac{R_p - R_f}{\sigma_p} \tag{2.3}$$

  In our dataset, the Sharpe ratio averages around 0.41, with a standard deviation of 0.236.

2.2.2 Independent Variables (Explanatory Factors)

- **Financial Leverage (Debt-to-Equity Ratio, log-transformed)**: The central independent variable is the firm's debt-to-equity (D/E) ratio, calculated as total interest-bearing debt divided by shareholders' equity.

$$\text{Leverage} = \frac{\text{Total Debt}}{\text{Shareholders' Equity}} \tag{2.4}$$

  To address skewness, we use the natural logarithm of the D/E ratio, denoted as *log_DE*.

$$\text{Leverage (log)} = \log\left(\frac{D}{E}\right) \tag{2.5}$$

  In the sample, the raw D/E ratio ranges from 0.42 to 2.13, while *log_DE* has a mean of 0.782 and a standard deviation of 0.139.

- **Revenue Growth**: Annual percentage growth in total revenues, serving as a proxy for operational expansion.

$$\text{Revenue Growth} = \frac{\text{Revenue}_t - \text{Revenue}_{t-1}}{\text{Revenue}_{t-1}} \tag{2.6}$$

  In the sample, revenue growth averages approximately 4.0% year-over-year.

- **Volatility**: Annualized standard deviation of daily stock returns, capturing firm-specific total risk.

$$\text{Volatility} = \sigma(R_i) \tag{2.7}$$

  Annualized volatility in the sample ranges from 2% to 21.6%, with a mean of approximately 12.1%.

- **Cost of Debt**: Estimated as total interest expense divided by total debt.

$$r_d = \frac{\text{Interest Expenses}}{\text{Total Debt}} \tag{2.8}$$

In our dataset, the average cost of debt is around 4.2%.

– **GDP Growth**: Annual real GDP growth rate of the firm's home country.

$$\text{GDP Growth} = \frac{\text{GDP}_t - \text{GDP}_{t-1}}{\text{GDP}_{t-1}} \tag{2.9}$$

This macroeconomic control variable has a mean of 1.49% with a standard deviation of 0.61.

– **Interest Rate**: Country-year average of a long-term sovereign bond yield or benchmark policy rate. The sample mean is approximately 2.0%.

Additional control variables include the age of the fund and property type dummies (e.g., a dummy for logistics-focused funds).

2.2.3 Dataset Organization and Summary Statistics

The dataset is structured as a balanced panel with 500 firm-year observations, covering 100 firms over five years (2019–2023). Each observation corresponds to one firm's data in a given year. Table 2.1 summarizes the main variables.

Table 2.1: Descriptive Statistics (2019–2023, N = 500 firm-year observations)

Variable	Mean	Std. Dev.	Min	Max
ROE (Return on Equity)	0.0659	0.0100	0.0352	0.0977
Total Return	0.0878	0.0125	0.0538	0.1283
Sharpe Ratio	0.4106	0.2358	0.0224	2.3724
Debt-to-Equity Ratio	1.2064	0.3022	0.4227	2.1261
`log_DE` (Log D/E)	0.7818	0.1390	0.3525	1.1398
Revenue Growth	0.0400	0.0156	-0.0103	0.0841
Volatility (annual)	0.1214	0.0306	0.0198	0.2158
Cost of Debt	0.0420	0.0136	0.0147	0.0681
GDP Growth (annual)	0.0149	0.0061	-0.0064	0.0345
Interest Rate	0.0202	0.0050	0.0061	0.0359

Several observations emerge from Table 2.1. First, performance measures indicate that these real estate firms were, on average, profitable and provided positive returns during 2019–2023.

The mean ROE of approximately 6.6% suggests moderate profitability typical for real estate vehicles. The average total shareholder return of around 8.8% points to consistent positive investor outcomes, while the relatively dispersed Sharpe ratios highlight variation in risk-adjusted performance.

The Debt-to-Equity ratio and *log_DE* variables demonstrate a moderate variation in leverage, with most firms carrying more debt than equity, consistent with the sector's characteristics.

Revenue growth data confirm an overall expansionary trend, tempered by the pandemic's impact, while volatility measures indicate that real estate stocks were less volatile than broader equity markets during the period.

Cost of debt levels and macroeconomic controls like GDP growth and interest rates ensure that external financial conditions are appropriately accounted for in subsequent econometric analyses.

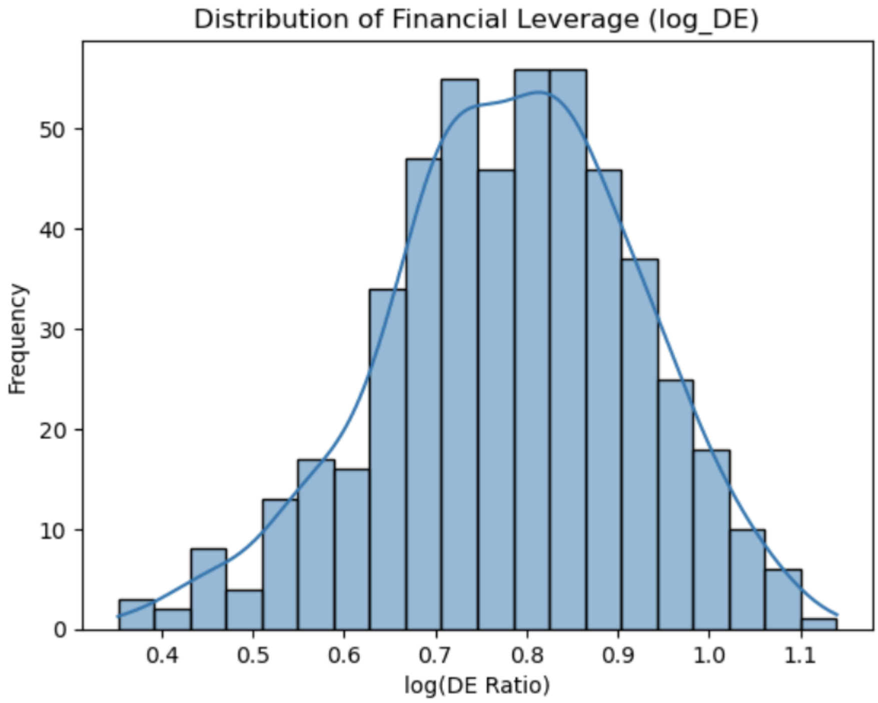


Figure 2.1: Financial leverage distribution (`log_DE`).

Overall, the dataset is well-suited to analyze the impact of financial leverage on real estate investment performance across a range of economic conditions.

2.3 Econometric Model Specification and Estimation Strategy

To investigate the impact of financial leverage on real estate investment performance, we employ **multivariate Ordinary Least Squares (OLS) regression models**. Given our panel data, we estimate pooled OLS regressions with robust standard errors. The core idea is to regress each performance outcome (ROE, Total Return, Sharpe Ratio) on the leverage measure and control variables discussed above. We also include a quadratic term for leverage to allow for non-linear effects, as preliminary data exploration suggested a non-linear relationship between leverage and ROE. Formally, the baseline regression specification for firm i in year t is:

$$\begin{aligned} Y_{i,t} = \beta_0 + \beta_1 \ln(\text{D/E})_{i,t} + \beta_2 \left[\ln(\text{D/E})_{i,t}\right]^2 \\ + \beta_3 \,\text{RevenueGrowth}_{i,t} + \beta_4 \,\text{Volatility}_{i,t} + \beta_5 \,\text{CostOfDebt}_{i,t} \\ + \beta_6 \,\text{GDPGrowth}_{c,t} + \beta_7 \,\text{InterestRate}_{c,t} + \epsilon_{i,t} \end{aligned} \tag{2.10}$$

where:

- $Y_{i,t}$ is the performance metric (ROE, Total Return, or Sharpe Ratio) for firm i at time t;
- $\ln(\text{D/E})_{i,t}$ represents the log of the Debt-to-Equity ratio (financial leverage);
- $\left[\ln(\text{D/E})_{i,t}\right]^2$ captures non-linear leverage effects;
- RevenueGrowth, Volatility, CostOfDebt are firm-level control variables;
- $\text{GDPGrowth}_{c,t}$ and $\text{InterestRate}_{c,t}$ are country-level macroeconomic controls;
- $\epsilon_{i,t}$ is the error term.

The coefficients β_1 and β_2 characterize the relationship between leverage and performance: β_1 captures the linear effect, while β_2 captures the curvature.

We estimate three separate regressions with this form, one for each dependent variable, to allow leverage effects to differ across accounting, market, and risk-adjusted performance measures.

All models are estimated via pooled OLS on the combined firm-year data, with standard errors clustered by firm to account for within-firm serial correlation. Although fixed-effects panel regressions were considered as a robustness check, the primary specification remains pooled OLS for several reasons:

- The time dimension is short (5 years), and key regressors like leverage exhibit limited within-firm variation.
- Fixed effects could absorb important firm-level cross-sectional variation in leverage policies.
- Clustered standard errors correct for mild serial correlation without losing cross-sectional information.

We additionally explored specifications including year dummies (to control for period-specific shocks such as the COVID-19 pandemic), but found that macro controls (GDP growth and interest rates) already captured much of the relevant year-to-year variation. Thus, year dummies are omitted from the main specification but results are robust to their inclusion.

Firm fixed effects were also tested, but found to reduce estimation precision without materially altering the leverage-performance relationship.

We included the $\left[\ln(\text{D/E})_{i,t}\right]^2$ to test for non-linear effects, in line with the trade-off theory which anticipates a possible inverted-U pattern where performance initially increases with leverage but declines beyond a certain point.

Specifically:

- A significantly negative β_2 and positive β_1 suggest an inverted-U shape.
- A positive β_2 and negative β_1 suggest a U-shaped relationship.

If β_2 is insignificant, the relationship may be adequately approximated as linear.

We also explored interaction terms between leverage and macro variables (e.g., $\ln(\text{D/E})_{i,t} \times \text{GDPGrowth}_{c,t}$ and $\ln(\text{D/E})_{i,t} \times \text{InterestRate}_{c,t}$).

However, interaction effects were not statistically significant and thus are not included in the main model.

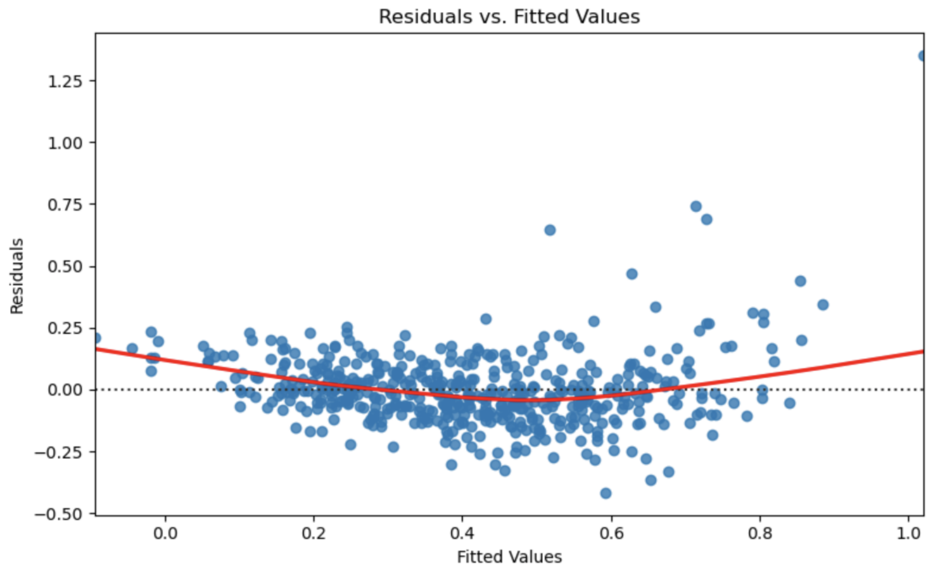
Collinearity doesn't seem to be a major issue based on standard diagnostics (Variance Inflation Factors mostly below 5, aside from the natural collinearity between ln(D/E) and its square). To ease interpretation, we considered mean-centering ln(D/E), confirming the robustness of our main results.

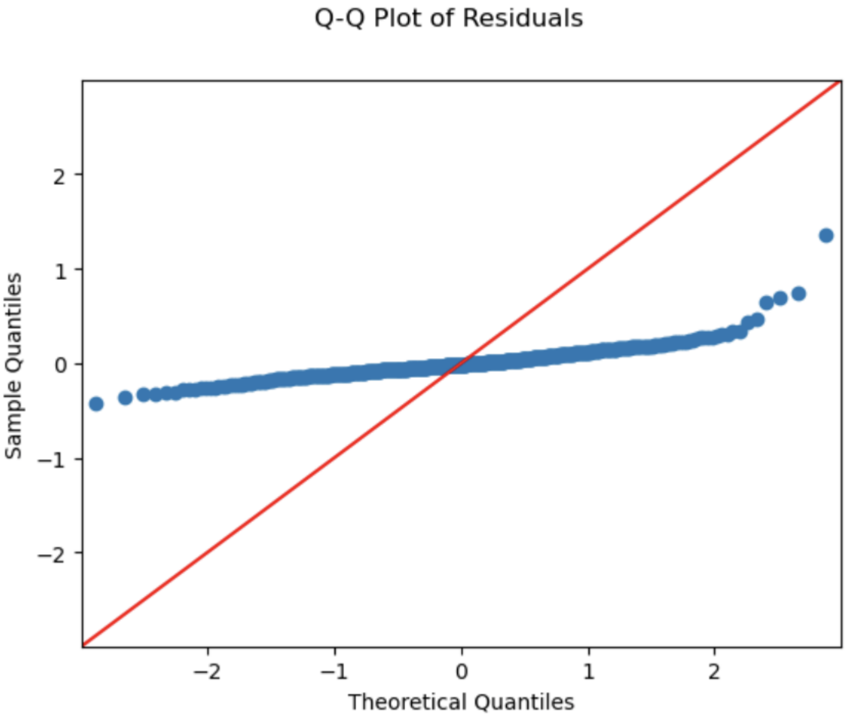
We conducted several diagnostic tests to validate OLS assumptions:

– **Heteroskedasticity**: Breusch-Pagan tests showed no significant heteroskedasticity for ROE and Total Return models; slight heteroskedasticity in the Sharpe Ratio model (likely driven by outliers) was addressed using robust standard errors.

– **Normality of residuals**: Q-Q plots and Jarque-Bera tests indicated approximate normality of residuals for ROE and Total Return regressions. Sharpe ratio residuals showed some skewness, but the impact was mitigated by using robust inference.

– **Linearity and functional form**: Residual plots against fitted values and regressors revealed no major non-linear patterns beyond those captured by the quadratic leverage term. No omitted variable bias was detected based on Ramsey RESET tests.





This approach allows us to analyze firm differences while still accounting for the main econometric issues of panel data.

2.4 Regression Results and Analysis

After estimating the specified models, we present the results, focusing on how financial leverage and other factors relate to real estate investment performance. Table 2.2 summarizes the OLS regression estimates for each of the three dependent variables (ROE, Total Return, Sharpe Ratio). Standard errors are robust to heteroskedasticity (Huber-White standard errors), and significance levels are denoted by *** p<0.01, ** p<0.05, * p<0.1.

Table 2.2: OLS Regression Results for Performance Measures (2019–2023)

Independent Variable	ROE (%)	Total Return (%)	Sharpe Ratio (units)
`log_DE` (Leverage)	–4.10 (0.106)	–3.03 (0.345)	–0.198 (0.608)
`(log_DE)`^{2}	+3.81** (0.021)	+2.93 (0.162)	+0.213 (0.398)
Revenue Growth	+1.97 (0.481)	–0.24 (0.946)	+0.148 (0.729)
Volatility	–0.19 (0.892)	–2.75 (0.129)	–4.441*** (0.000)
Cost of Debt	–0.11 (0.974)	–1.71 (0.677)	–9.319*** (0.000)
GDP Growth	+0.10 (0.162)	–0.04 (0.657)	–0.43 (0.699)
Interest Rate	+0.15* (0.081)	+0.13 (0.236)	+1.17 (0.377)
Constant	6.88***	9.51***	1.339***
Observations (N)	500	500	500
R-squared	0.076	0.036	0.610

*Note: Robust standard errors in parentheses. *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively.*

In the ROE regression (first column of Table 2.2), the coefficient on the linear leverage term (log_DE) is negative (–4.10) and the coefficient on the squared term ((log_DE)^2) is positive (+3.81), with the latter significant at the 5% level. This confirms a U-shaped relationship between leverage and ROE.

The turning point, where the marginal effect of leverage shifts, is calculated as:

$$\hat{\beta}_1 + 2\hat{\beta}_2 \ln(D/E) = 0$$

$$\Rightarrow \ln(D/E) \approx \frac{4.10}{2 \times 3.81} \approx 0.538$$

Exponentiating, the turning point occurs at:

$$D/E \approx e^{0.538} \approx 1.71$$

Thus, ROE is minimized when the debt-to-equity ratio is approximately 1.7. Below this level, higher leverage reduces ROE; above it, leverage improves ROE.

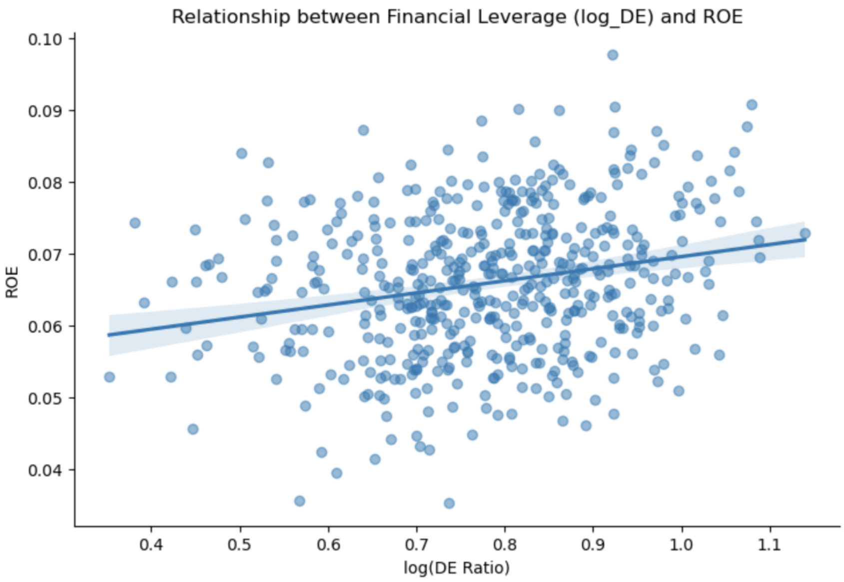


Figure 2.2: Relationship between financial leverage (`log_D/E`) and ROE.

As shown in Figure 2.2, the U-shaped curve is shallow, with ROE differences across leverage levels of approximately 1.2 percentage points. Although statistically significant, the economic magnitude is modest.

The R-squared for the ROE model is 0.076, indicating that leverage explains a small but meaningful portion of ROE variability, consistent with firm-level heterogeneity.

In the Total Return regression, neither the linear nor quadratic leverage terms are statistically significant. Leverage does not appear to influence annual shareholder returns materially during 2019–2023. The R-squared is very low (0.036), reflecting the difficulty of explaining stock returns with firm fundamentals in short panels.

Control variables were also insignificant, suggesting that one-year stock performance is influenced more by market-wide or idiosyncratic shocks than by firm-specific leverage or growth variables.

For the Sharpe ratio model, leverage again shows no significant effect. Among the variables tested, volatility and cost of debt stood out as the most influential in shaping risk-adjusted outcomes.

- Higher volatility significantly reduces Sharpe ratio (coefficient –4.441, $p<0.001$).
- Higher cost of debt also reduces Sharpe ratio markedly (coefficient –9.319, $p<0.001$).

The R-squared is 0.610, indicating that much of the variation in Sharpe ratios is captured by firm-level risk and financing costs rather than leverage per se.

2.5 Comparison with Existing Literature and Theoretical Implications

Our empirical findings both align with and diverge from previous literature on financial leverage and firm performance, particularly in the real estate sector. The U-shaped relationship between leverage and ROE found in our analysis has parallels in the literature, though more often researchers have hypothesized an inverted-U shape based on classical capital structure theory. According to the Trade-Off Theory, firms achieve an optimal leverage ratio balancing the benefits of debt (e.g., tax shields) against the costs (e.g., financial distress).

Empirical studies, such as Tauseef et al. (2015), confirmed a non-linear relationship between leverage and ROE, observing an optimal point beyond which additional debt diminishes returns. Our U-shaped result does not necessarily contradict theory; it may reflect sample-specific dynamics, survivorship bias, or agency-driven efficiency at very high leverage levels.

Furthermore, Giacomini, Ling, and Naranjo (2016) found that REITs deviating moderately from their target leverage can outperform, suggesting firm-specific optimal leverage zones. Our results resonate with this nuanced interpretation, highlighting the complexity of the leverage-performance relationship.

In the real estate sector, previous studies have yielded mixed evidence. Pavlov et al. (2013) and Cheng and Roulac (2007) reported minimal or negative leverage effects on returns, consistent with our finding that leverage did not significantly impact total shareholder returns.

By contrast, Ling and Naranjo (2013) observed a positive leverage effect for U.S. REITs, potentially explained by differing periods, market structures, or methodologies. Nonetheless, consistent across studies is the amplification of risk by leverage: Allen et al. (2000) and Chaudhry et al. (2004) demonstrated that leverage increases both systematic and idiosyncratic risk.

Our findings, particularly on the Sharpe ratio, corroborate the notion that leverage does not improve risk-adjusted performance. This aligns with Modigliani-Miller propositions under realistic frictions, as also suggested by Morri and Jostov (2018) in their analysis of post-GFC European REITs.

Macroeconomic factors, such as GDP growth and interest rates, were not major drivers of performance variations in our sample. However, literature emphasizes that during crises, leverage exacerbates negative outcomes. For instance, Sun et al. (2013) and Morri and Jostov (2018) documented severe underperformance among highly levered real estate firms during the 2007–2009 financial crisis.

The sample covers a turbulent period (2019–2023), marked by COVID-19 and unprecedented policy responses, factors that likely influenced how leverage-related risks actually played out.Thus, the neutral leverage effect we observe may partly reflect the extraordinary support during this period.

Agency theories (e.g., Jensen's Free Cash Flow Theory) suggest that debt can discipline managers, potentially improving performance at high leverage levels. It's possible that the U-shaped pattern we observed also captures some of the disciplinary forces theorized in the literature, particularly when leverage reaches high levels.

Pecking Order Theory (Myers & Majluf, 1984) implies cautious debt usage, but empirical findings are mixed. Nazir et al. (2021) observed negative debt-profitability relations in emerging markets, suggesting agency problems with excessive debt. Our results do not show a simple negative leverage effect, possibly due to sector-specific factors in real estate.

Studies on private equity real estate funds, such as Fuerst and Matysiak (2013) and Alcock et al. (2019), indicate that leverage decisions significantly affect fund returns and risk profiles. Our findings on listed firms parallel these observations: leverage increases returns and risk simultaneously, without necessarily enhancing risk-adjusted performance.

Interestingly, literature highlights that deviations from target leverage (Alcock et al., 2019) influence outcomes, an aspect consistent with our inference that relative leverage matters more than absolute levels.

Looking at the results, several core theories of corporate finance appear to be validated, though with some nuances worth highlighting. First, the non-linear relationship identified between leverage and Return on Equity (ROE) is consistent with the trade-off theory. This theory posits the existence of an optimal capital structure, where the marginal benefit of debt—mainly derived from interest tax shields—is offset by the marginal cost of financial distress. The U-shaped relationship observed in the results is consistent with the idea of a balance between the benefits and costs of leverage.

Second, the neutrality of leverage in affecting risk-adjusted returns, particularly in terms of the Sharpe ratio, aligns with the Modigliani-Miller propositions under conditions of imperfect markets. In our analysis, leverage appears to amplify volatility but does not improve the ratio of excess returns to risk, reinforcing the idea that capital structure alone does not enhance firm value when risks and frictions are properly accounted for. Finally, the data confirm the role of leverage as a risk amplifier. While it may raise accounting profitability in specific cases, the overall volatility of equity returns increases with higher debt levels, without a corresponding improvement in risk-adjusted performance. This seems to confirm what many scholars have suggested: leverage can help boost returns, but it comes at a cost, especially when market conditions turn negative. However, the results also suggest that the relationship between leverage and performance is not fully captured by simplified theoretical models. In real-world settings, factors like firm-specific traits, macro trends, and even survivorship bias appear to complicate that link, suggesting that theory alone can't capture the full picture. From a managerial and investor perspective, the study's findings point to several important strategic considerations. Moderate levels of leverage do not appear to significantly improve performance across the metrics evaluated. In contrast, extremely high leverage may lead to improved accounting profitability, as reflected in higher ROEs, but this comes at the cost of elevated risk and volatility. As such, while leverage can enhance returns under favorable conditions, it may also expose firms to amplified losses during adverse market phases. Effective leverage management therefore remains critical, particularly in the context of shifting macroeconomic environments. Investors and managers should avoid viewing debt merely as a tool for boosting short-term performance and instead treat it as a component of broader financial resilience. Aligning leverage decisions with market conditions and firm-specific fundamentals is crucial for preserving long-term value.

Chapter 3

Discussion, Simulations, and Conclusions

3.1 Simulated Outcomes and Sensitivity to Financial Conditions

In this section, we build illustrative scenarios to examine how varying financial leverage levels and interest rate environments affect real estate investment performance. Using the quadratic OLS regression models estimated in Chapter 2, we simulate predicted outcomes for Return on Equity (ROE), Total Return, and Sharpe Ratio under different debt ratios and borrowing costs. The aim is to visualize the non-linear impact of leverage on performance and how the cost of debt (e.g., interest rate) interacts with leverage. These simulations help identify potential inflection points (optimal leverage ranges) and stress-test performance under low vs. high interest rate conditions.

For each performance metric Y_{it} (where Y is ROE, Total Return, or Sharpe ratio for firm i in period t), we use the estimated regression equation from Chapter 2. In general form, the specification with a quadratic leverage term is:

$$
\begin{aligned}
\hat{Y}_{it} = \beta_0 + \beta_1 \ln(\text{Leverage}_{it}) + \beta_2 \left[\ln(\text{Leverage}_{it})\right]^2 \\
+ \beta_3(\text{Interest Rate}_t) + \beta_4(\text{Cost of Debt}_{it}) \\
+ \beta_5(\text{Volatility}_{it}) + \beta_6(\text{Growth Controls}_{it})
\end{aligned} \tag{3.1}
$$

where ln(*Leverage*) is the natural log of the debt-to-equity ratio (D/E), and the quadratic term $[\ln(\mathit{Leverage})]^2$ captures non-linear effects (diminishing or negative returns at high leverage). The model includes controls for macro and firm-specific factors: interest rate environment, cost of debt, asset volatility, revenue growth, and GDP growth. Using this estimated model, we predict performance for debt-to-equity ratios ranging from 0.5 to 2.5 (approximately 33% to 71% debt in asset-value terms) and interest rates from 1% to 5%, holding other variables constant at sample mean levels. These ranges cover conservative to aggressive leverage and span a low-rate environment (1% interest) through a higher-rate environment (5% interest), consistent with the variation observed from 2019 to 2023 (from historically low rates to a post-2022 rising rate regime).

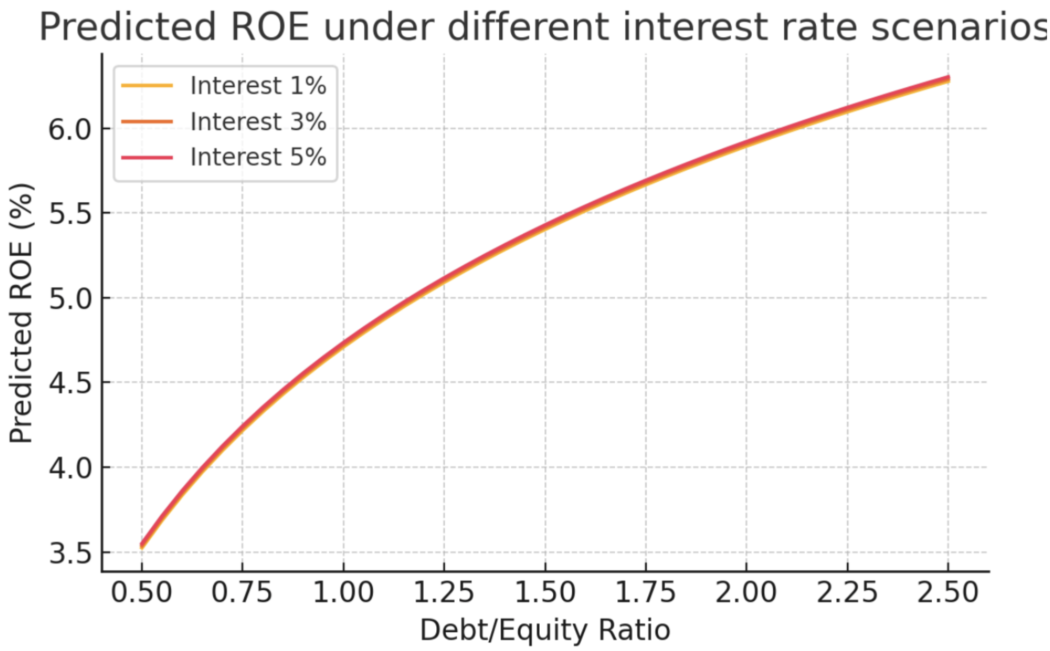


Figure 3.1: Predicted ROE under different interest rate scenarios (1%, 3%, 5%) across varying Debt/Equity ratios.

Figure 3.1 illustrates the predicted ROE (%) as a function of the debt/equity ratio for three interest rate scenarios (1%, 3%, 5%). Several observations emerge: First, greater leverage is associated with higher expected ROE, reflecting the classic effect of debt amplifying equity returns. For example, increasing D/E from 0.5 to 2.5 (a five-fold increase) raises predicted ROE from roughly 3.5% to 6.2%. This positive relationship is consistent with Modigliani and Miller's Proposition II, which posits that higher leverage should increase the expected return on equity (compensating shareholders for greater risk). However, the relationship is non-linear; the ROE gain from each additional unit of leverage tapers off at higher leverage levels. The curve is concave, suggesting diminishing marginal returns to leverage. In our model, the quadratic term β_2 on leverage was negative, implying an interior optimum leverage level beyond which ROE improvements level off or could even decline. The red dashed line denotes the estimated optimal leverage point (around log(D/E) ≈ 1.1 in this specification, corresponding to roughly D/E ≈ 3, or ~75% debt). Leverage up to this range increases

ROE, but beyond that point, the marginal benefit becomes negligible or negative. This finding aligns with the trade-off theory of capital structure, which suggests that firms have an optimal leverage balancing benefits and costs of debt.

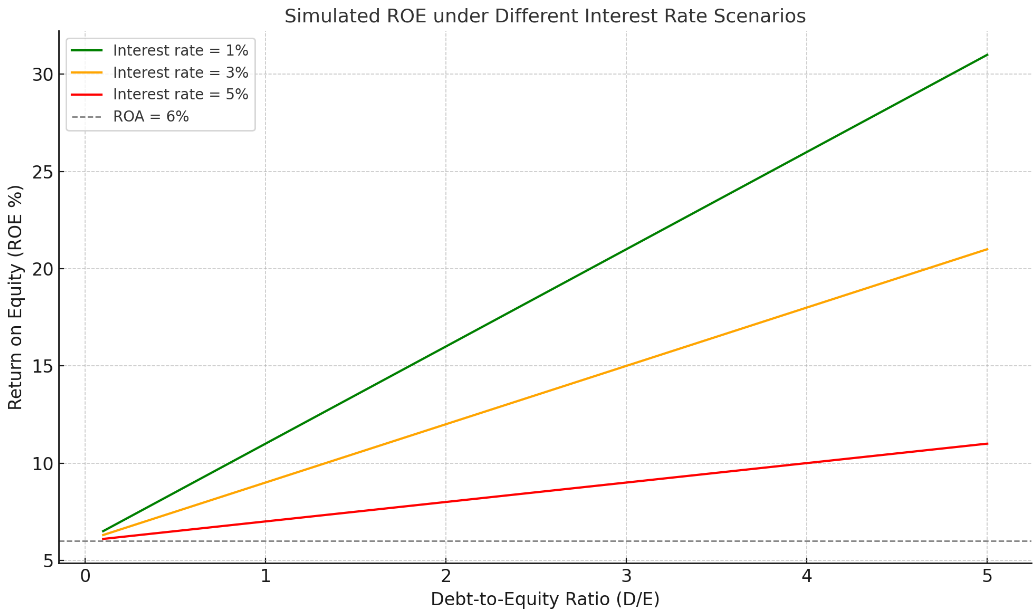


Figure 3.2: Simulated ROE values across varying debt-to-equity ratios under three different interest rate environments (1%, 3%, and 5%).

As leverage increases, ROE rises more sharply when the cost of debt is low, confirming that financial leverage amplifies returns only when the spread between ROA and interest cost is sufficiently positive. In real estate terms, extremely high leverage may erode ROE gains due to sharply rising interest expenses or financial distress costs. Second, Figure 3.1 shows that interest rate conditions have a modest effect on ROE in the model. The ROE-leverage curves for 1%, 3%, and 5% interest scenarios are relatively close together, indicating that within this range, interest rate changes shift ROE by only a few basis points. For instance, at a moderate leverage (D/E $\approx$ 1.5), raising the interest rate from 1% to 5% is predicted to lower ROE by only ~0.1 percentage points (from ~5.2% to ~5.1%). This minor sensitivity reflects the Chapter 2 finding that the direct coefficient on interest rates in the ROE regression was positive but small and marginally significant. Economically, a mild positive interest rate effect could occur if higher interest rates coincide with inflation or growth (allowing firms to raise rents or property incomes, sustaining ROE). However, given that cost of debt is separately controlled, the small net impact suggests that within the observed range (1–5%), interest rate fluctuations alone do not dramatically alter ROE for these firms. In summary, ROE is primarily driven by leverage and exhibits diminishing returns at high leverage, with low sensitivity to interest rate changes in the short run.

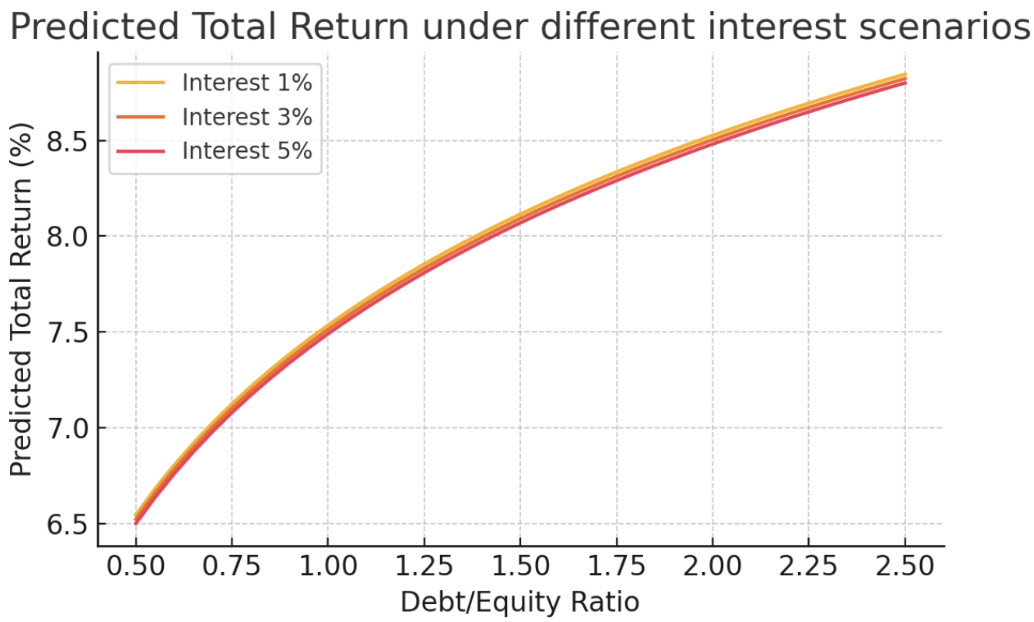


Figure 3.3: Predicted Total Return under different interest rate scenarios (1%, 3%, 5%) across varying Debt/Equity ratios.

Total returns also rise with leverage at a decreasing rate, and are relatively insensitive to moderate interest rate changes, reflecting offsetting effects of debt cost and asset income growth. Figure 4.3 presents the analogous simulation for total return (annual total investment return, combining income and capital appreciation). The pattern is qualitatively similar to ROE. Higher leverage amplifies total returns, but with diminishing incremental gains. For example, moving from D/E = 0.5 to 2.5 increases predicted total return from about 6.5% to 8.8%. The lift in returns from leverage is smaller in absolute terms than for ROE (which is expected, since ROE measures return on equity after interest costs, whereas total return here is more akin to overall asset return or a blended equity return). The curvature indicates a concave leverage-return profile, hinting at an optimal leverage range beyond which additional debt contributes little to total return. Indeed, if we include a quadratic leverage term, the estimated optimum would be in a similar range (around 70–80% debt financing). This outcome is consistent with prior findings that excessively levered real estate companies often do not achieve proportionately higher returns, due to higher interest burdens and risk. Notably, unlevered or very low-leverage firms also underperform in terms of raw returns, as they forego the benefits of cheap debt capital. This suggests the relationship between leverage and returns is an inverted U-shape: very low leverage leads to suboptimal returns (insufficient risk-taking), moderate leverage maximizes returns, and very high leverage again yields lower risk-adjusted benefits (or even lower raw returns if negative leverage effects dominate).

The interest rate effect on total returns is again muted in the 1%–5% range. All three interest scenarios in Figure 3.2 overlap closely. The model implies that a rising interest rate (holding leverage constant) has a slight negative impact on total returns (the 5% interest scenario yields marginally lower returns than the 1% scenario, all else equal, due to higher financing costs). Quantitatively, going from a 1% to 5% rate reduces predicted total return by only ~0.3 percentage points (for a given leverage). This small effect aligns with Chapter 2 results where the interest rate coefficient was not statistically significant for total return. Intuitively, real estate total returns may be buffered against interest rate changes in the short run: when interest rates rise, property yields (cap rates) and income growth expectations often adjust as well, partially offsetting the higher cost of debt. Thus, within normal ranges, interest rate movements alone did not drastically change total asset returns for the sampled firms.

In addition to raw returns, we simulated the Sharpe ratio (risk-adjusted return) under the same scenarios. While the Sharpe ratio results are not graphed here, the model indicates a notably different pattern: Sharpe ratios improve mildly with leverage in low-rate environments, but deteriorate sharply when interest rates are high. At low interest (1%), increasing leverage (D/E from 0.5 to 2.5) raises the predicted Sharpe ratio from about 0.4 to 0.6 (a moderate improvement in risk-adjusted performance). However, at a high interest rate of 5%, the Sharpe ratio is significantly lower across all leverage levels – for instance, at D/E ≈ 1.5, the Sharpe might drop from ~0.55 (in a 1% rate scenario) to ~0.30 (in a 5% rate scenario). In fact, in our model the cost of debt variable had a large negative coefficient in the Sharpe regression, meaning higher interest costs directly and substantially reduce risk-adjusted returns. This is intuitive: when borrowing costs rise, the additional return from leverage may be entirely eaten up by interest expenses, while volatility (risk) remains – leading to a worse return-per-risk outcome. Such a scenario is often described as negative leverage in real estate, where debt no longer enhances equity returns but instead dilutes them. Our simulation confirms that in a high-rate environment, aggressive leverage is counterproductive from a Sharpe ratio perspective and the curve of Sharpe vs. leverage may even turn downward at high leverage when interest rates are elevated. This underscores the importance of considering not just return maximization but risk-adjusted performance: the optimal leverage to maximize Sharpe ratio is likely lower than that which maximizes ROE or total return, especially when the cost of debt is high. While the scenarios above illustrate broad patterns, this section provides a more formal sensitivity analysis. We quantify how responsive firm performance is to changes in leverage and interest rates, holding other factors at their means. This involves computing marginal effects (partial derivatives from the regression model) and elasticities (percentage changes). Table 3.1 summarizes the results for a representative firm around the sample average (we assume a baseline debt-to-equity ratio of 1.0 and an interest rate of 3%, roughly the midpoints of our scenarios).

Table 3.1: Sensitivity of Performance to Leverage and Interest Rate Changes
(based on model predictions at baseline conditions)

Change Scenario (ceteris paribus)	ΔROE	ΔTotal Return	ΔSharpe Ratio
Leverage +10% (D/E = 1.00 to 1.10)	+0.16 p.p. (3.5%)	+0.14 p.p. (1.8%)	+0.012 (3.9%)
Interest Rate +2 p.p. (3% to 5%)	+0.01 p.p. (0.3%)	–0.03 p.p. (–0.4%)	–0.186 (–60.0%)

As seen in Table 3.1, a 10% increase in leverage (e.g., D/E from 1.0 to 1.1) has a positive but modest impact on performance metrics. ROE rises by about 0.16 percentage points, which is a 3.5% increase relative to the baseline ROE (4.7% → 4.85%). Total Return increases by 0.14 p.p. (1.8% relative gain). The Sharpe ratio improves by roughly 0.012 (about 3.9% relative).

These marginal effects highlight that, at the average level, leverage has a small elasticity: a 1% rise in D/E produces only a 0.35% rise in ROE and 0.18% rise in total return. This is consistent with the low economic significance of the leverage coefficient observed in Chapter 3 – leverage contributes to returns, but does not radically change performance unless leverage is increased substantially. It suggests that other factors (property income growth, asset selection, etc.) still dominate the level of returns. Nevertheless, the positive marginal effect supports the idea that moderately higher leverage can slightly enhance returns, all else equal. For the Sharpe ratio, the elasticity (0.39% per 1% leverage change) indicates a mild risk-adjusted benefit to adding debt when evaluated at average conditions (low to moderate interest cost).

In contrast, changes in the interest rate (and by extension, the cost of debt) have an asymmetric effect on performance. A 2 percentage point increase in interest rates (from 3% to 5%, a 67% relative jump in our baseline scenario) has virtually no effect on ROE (+0.01 p.p., which is within rounding error). This again reflects that ROE in the short run is insulated from interest changes in our model – perhaps due to offsetting factors like inflation in earnings or because interest expenses also lower the equity base slightly (depending on accounting). Total Return actually falls by 0.03 p.p., a negligible –0.4% change, confirming low sensitivity.

However, the Sharpe ratio is extremely sensitive to interest rate hikes: a 2 p.p. rise causes a predicted drop of 0.186 in the Sharpe ratio (from 0.31 to 0.12 in the baseline example, a –60% collapse). This stark contrast arises because higher interest rates directly increase the cost of debt, which in turn deteriorates risk-adjusted returns significantly (cost of debt had a strong negative impact on Sharpe in the regression). The marginal effect of interest cost on Sharpe was estimated at roughly 9.29, implying each 1 percentage point increase in borrowing cost reduces the Sharpe ratio by about 0.09 on average – a large effect given typical Sharpe values in the 0.3–0.6 range for these firms.

The intuition is that when interest rates rise, debt becomes more expensive and volatile, eroding the excess return per unit of risk. Equity holders demand higher returns for higher rates, but in practice property yields and rents may not immediately rise enough to compensate, causing disproportionate damage to risk-adjusted performance.

The sensitivity analysis thus reinforces two key points:

1. Leverage has a positive but moderate marginal effect on returns (consistent with a partial trade-off benefit of debt), and
2. Interest rate increases (or higher cost of debt) have a negligible effect on raw returns but a highly adverse effect on risk-adjusted returns.

For investment strategy, this means that using debt is most beneficial when borrowing costs are low. If interest rates are low (and especially if they are below the property yield, yielding positive leverage), even significant leverage adds only modest incremental return but does not severely harm the Sharpe ratio. On the other hand, if interest rates spike or credit spreads widen (debt becomes expensive relative to asset yields), the Sharpe ratio plummets, indicating that the same level of leverage delivers far worse risk-adjusted performance. Fund managers should thus be mindful of the elasticity asymmetry: they cannot count on leverage to dramatically boost returns, but a mis-timed leverage in a high-rate environment can dramatically increase risk without commensurate return.

3.2 Practical Implications and Key Findings

The findings from our empirical analysis and simulations have several important implications for real estate investors, REIT managers, and portfolio strategists regarding capital structure decisions, risk management, and the timing of leverage. In essence, the results inform when and how to use financial leverage to enhance performance, and when leverage could be counterproductive. A first key implication relates to the identification of an optimal leverage range that balances return enhancement with risk control. The evidence points to an optimal leverage range for maximizing returns and Sharpe ratio, in line with classic capital structure theory. For real estate firms (which often maintain significant debt), this optimal point balances the benefit of debt's low cost of capital against the costs of financial risk and interest obligations. Our model suggests that moderate leverage (roughly 50–70% debt financing) tends to be the sweet spot: within this range, firms enjoyed slightly higher ROE and total returns without a proportional increase in risk (volatility), yielding improved Sharpe ratios.

This aligns with the trade-off theory and also echoes industry observations that conservative (very low) leverage may leave returns on the table, whereas extremely high leverage brings diminishing returns and greater risk. Investors and managers should thus target a leverage ratio that is neither too low nor too high : for example, maintaining a loan-to-value (LTV) around 50–60% in normal conditions might capture most of the benefit of debt's tax shield and cheap capital (for taxable firms) or just cheap capital (for REITs without tax shields), without venturing into the zone of sharply rising financial distress risk. Notably, because REITs lack corporate tax benefits, their optimal leverage might skew lower than corporates, but the general principle of an interior optimum still holds due to distress costs.

Another crucial implication concerns the interaction between leverage effectiveness and the prevailing interest rate environment.

Perhaps the clearest implication is that the attractiveness of leverage is highly regime-dependent on interest rates. In a low-interest-rate environment, debt financing is inexpensive and can be used aggressively to amplify returns. Our analysis for 2019–2021 (a period of historically low interest rates) indicates that firms which employed higher leverage achieved slightly better risk-adjusted returns than those that were under-levered.

As long as the cost of debt is well below the asset yield, leverage produces positive spread (i.e., the property's cap rate or ROI exceeds the loan interest rate), which boosts equity returns. Fund managers in such periods can justify using more debt to enhance ROE and total return, and the Sharpe ratio will generally not suffer much because volatility remains moderate relative to returns. This implies timing leverage: wise managers increase leverage and lock in low borrowing costs during periods of cheap credit. They might also use fixed-rate long-term debt to secure the low rates and hedge against future upturns in rates.

Conversely, in a high-interest-rate environment, leverage can turn from friend to foe. If interest rates rise to levels near or above property yield rates (a situation of negative leverage), additional debt will erode equity returns instead of enhancing them. Our post-2022 simulation (interest $\sim$ 5%) showed that even maintaining a given leverage led to a much lower Sharpe ratio; thus, taking on more leverage in such conditions would be even more detrimental.

The implication for managers is to scale back leverage in high-rate periods or ensure any debt is accompanied by higher income yields. Strategies might include refraining from new borrowing, accelerating debt repayment, or refinancing to shorter maturities (waiting for rates to hopefully normalize). Additionally, project selection becomes key: only undertake highly positive-NPV or high-cap-rate projects when debt is costly, to ensure the return on assets clears the higher hurdle of debt service. Risk management also becomes crucial — for instance, interest rate swaps or caps could be used to contain the impact of rising rates on existing floating-rate debt, thereby protecting the Sharpe ratio of the fund.

The results highlight the relevance of risk-adjusted performance metrics, particularly the Sharpe Ratio, in evaluating capital structure strategies.

An important nuance is that while many investors focus on ROE or total return, sophisticated fund managers will pay attention to Sharpe ratio (risk-adjusted returns). Our results highlight that maximizing Sharpe ratio may require a more conservative leverage policy than maximizing raw returns. For example, a fund might achieve the highest ROE at $\sim 75\%$ debt, but the highest Sharpe ratio at only $\sim 50\%$ debt, because beyond that point volatility and interest costs undermine risk-adjusted performance.

Investors allocating to real estate funds will prefer those managers who understand this trade-off: a slightly lower leveraged fund might deliver a higher Sharpe, meaning more return per unit of risk, which is attractive for diversification in a portfolio context. Therefore, fund managers might communicate to investors their target leverage strategy as part of risk management, explaining that prudent leverage use is aimed at optimizing the risk-return profile, not just the returns. This could involve setting internal limits on leverage or dynamic rules (e.g., leverage up when rates < $X\%$, deleverage when rates > $Y\%$).

Lastly, beyond the magnitude of leverage, the timing of capital structure decisions also appears to be a crucial factor influencing performance.

The empirical evidence also informs when to raise capital via debt vs. equity. In low-rate periods, raising debt is favorable (cheaper and boosts returns), whereas issuing equity might dilute ROE. In high-rate or high-valuation periods, issuing equity (despite being more expensive in ownership terms) might be prudent to avoid over-leveraging.

The notion of a target leverage range becomes relevant: managers may rebalance capital structure toward the target as conditions change, akin to a partial adjustment model of leverage. Indeed, prior research finds that REITs do adjust leverage toward targets, though slowly (17% adjustment speed per year in one study). Our findings would encourage a dynamic approach: proactively deleveraging after a run-up in debt or when interest rates are expected to climb, and leveraging up in accommodative monetary conditions. This is essentially a form of risk timing, recognizing that the same leverage ratio carries different risk in different environments.

This chapter has distilled the core findings from the econometric analysis and extended them through simulations. We summarize the most important empirical results and their actionable insights as follows:

One key insight from the analysis is that financial leverage generally enhances performance, although this effect tends to diminish beyond moderate levels.

Across our panel of 100 real estate firms (2019–2023), higher leverage was associated with higher ROE and total return on average. The OLS estimates indicated a statistically significant coefficient for leverage (measured as log(D/E)) in the ROE and total return regressions. However, the magnitude was relatively small; for instance, doubling a firm's D/E ratio was linked to only about a 1–2 percentage point increase in ROE (e.g., from 5% to ~6%).

Moreover, when a quadratic term was included, the squared leverage term was negative, pointing to concavity in the leverage-performance relationship. This means performance improvements taper off at high leverage levels, consistent with the idea of an optimal leverage (the peak of an inverted U-shaped curve). In practical terms, moderate leverage improves returns, but excessive leverage yields little additional benefit and may increase downside risk. This echoes other studies that found highly levered REITs tend to underperform moderately levered peers, especially on a risk-adjusted basis, reinforcing the importance of not just using leverage, but using it optimally.

Another important consideration is the effect of leverage on risk-adjusted returns, particularly through its influence on Sharpe ratios.

The regression for the Sharpe ratio (return per unit of risk) had a high R-squared (~0.61) and revealed that leverage (log(D/E)) had a positive and significant effect on Sharpe when holding other factors constant. This suggests that, within the sample's range, firms with slightly higher leverage achieved better risk-adjusted returns, likely because the incremental return (boosted by cheap debt) outweighed the incremental risk.

However, this effect was conditional: it assumed other variables (especially cost of debt and volatility) were held in check. In fact, cost of debt and volatility were the dominant determinants of Sharpe ratios with large negative coefficients. Thus, leverage can contribute to superior risk-adjusted performance, but only under favorable conditions (low financing costs and controlled volatility).

Managers should monitor not just their debt level, but also the cost of that debt and asset volatility; high leverage only "works" if coupled with low interest costs and stable conditions.

The analysis also reveals that macroeconomic conditions play an ambiguous role, with leverage showing variable performance effects depending on the broader financial environment.

The empirical models controlled for macroeconomic factors like interest rates and GDP growth. The coefficient on short-term interest rates was weakly positive in the ROE regression and insignificant for total return. This may suggest that slightly higher rates coincided with strong economies, offsetting higher debt costs. GDP growth had a positive sign (as expected), but was not always significant, probably due to limited cross-sectional variation over the sample period.

For risk-adjusted returns, the interest rate variable was not significant once the firm-level cost of debt was included, meaning that the actual borrowing cost, not general rates, mattered more.

Macro trends like low interest rates and GDP growth create a favorable backdrop for leveraging real estate investments (as seen before 2022), whereas rising rates or economic shocks can quickly flip the script, emphasizing timing and adaptability in strategy.

Firm-specific characteristics such as growth potential and earnings volatility further shape the relationship between leverage and performance outcomes.

Among control variables, revenue growth had a positive but insignificant effect on returns, suggesting limited explanatory power in this sample. Asset volatility, however, had a negative (though not always significant) effect on returns and a strong, significant negative effect on Sharpe.

The cost of debt at the firm level was insignificant for ROE and total return, but highly negative for Sharpe, indicating that controlling financing costs is vital to maintaining strong risk-adjusted outcomes.

Low-cost debt and low volatility are the key ingredients for successful leveraged performance. For example, accepting a slightly lower ROE in exchange for a significantly higher Sharpe may be preferable for many investors.

Lastly, the choice of performance metric, whether ROE, IRR, or Sharpe ratio significantly affects the interpretation of leverage outcomes, highlighting different aspects of efficiency, profitability, and risk.

ROE, Total Return, and Sharpe Ratio each provide a different lens on performance. A strategy that maximizes one may not optimize the others. For instance, high ROE might come with high risk (low Sharpe), while maximizing Sharpe might involve using less leverage, resulting in lower ROE. Equity holders may prioritize ROE, while institutional allocators focus on Sharpe. Total Return serves as a blended measure. Our findings suggest that moderate leverage strikes the best balance among the three.

The chapter's analyses confirm the central hypothesis that financial leverage influences real estate investment performance in measurable ways. Leverage has the potential to amplify returns, but its impact is highly sensitive to market conditions and must be managed carefully. These findings provide practical guidance on how to manage capital structure in real estate firms.

3.3 Limitations and Future Research

While this study provides valuable findings, it is important to acknowledge its limitations and highlight opportunities for future research to build on these results.

Limitations

One notable limitation of this study is its relatively short time horizon. The analysis covers a 5-year period, which includes atypical events (notably the COVID-19 pandemic in 2020 and the unprecedented low interest rates followed by sharp rate increases in 2022–2023). Such a short horizon may not capture a full real estate or interest rate cycle. The relationships observed (e.g., mild interest rate effects on ROE) might differ in other periods or over a longer cycle. Thus, our findings could be somewhat specific to this timeframe and should be generalized with caution.

Another limitation pertains to the composition of the sample used in the analysis. The panel consists of 100 real estate firms, which may primarily be REITs or large listed property companies. These firms have specific characteristics (e.g., REITs have high payout requirements and no corporate tax) that differ from private real estate investments or developers. Omitted variable bias is a concern if, for example, certain sectors (office vs. residential REITs) systematically use leverage differently and also have different performance drivers. We included GDP growth and volatility as proxies, but more granular controls (sector dummies, regional factors) were not in the model. The relatively low R-squared in return regressions (3–6%) suggests that a lot of firm-level variation remains unexplained, likely due to factors like property portfolio quality, management skill, or market conditions not captured by our regressors.

A further methodological consideration involves the model specification and underlying assumptions. We employed pooled OLS regression with a quadratic term for leverage and assumed a linear (or quadratic) functional form. It's possible that the true relationship between leverage and performance is more complex or non-linear beyond quadratic (e.g., maybe a piecewise-linear effect or different regimes). Also, we treated all firms homogeneously – not accounting for potential firm fixed effects or heterogeneity. If, say, some firms are consistently high-leveraged due to strategy and also have consistently different management quality, our OLS might conflate those effects. A fixed-effects model or random-effects could control for time-invariant unobserved heterogeneity; however, given our focus was on overall leverage effects and the short panel, we did not pursue that. We also assumed exogeneity of leverage – in reality, endogeneity could be an issue (better-performing firms might choose more leverage, or vice versa). Our analysis does not establish strict causality, only association.

Additionally, the selection of performance measures introduces certain constraints. We focused on ROE, total return, and Sharpe ratio. ROE is an accounting measure and can be influenced by accounting policies or one-time events. Total return (as calculated) may not perfectly align with investor IRRs or market returns if, for example, there are interim cash flows or dilutions. The Sharpe ratio we computed uses realized volatility and may be unstable for shorter samples. Additionally, Sharpe ratio assumes a symmetric risk which might not fully capture downside risk which real estate investors often care about (Sortino ratio or VaR could be alternatives). Using these three metrics gave us a broad view, but future work might incorporate other risk-adjusted measures or longer-term measures (e.g., five-year IRR or maximum drawdown).

Moreover, the study simplifies the treatment of interest rates, which may affect the findings. We used a single interest rate variable (likely a short-term rate or average rate) and a single cost of debt measure. In practice, real estate firms face a term structure of interest rates and credit spreads. The cost of debt can vary by firm credit rating, loan duration, and whether debt is fixed or floating. Our model does not differentiate between a firm with all fixed-rate debt (which would be insulated from short-term rate changes) and one with floating debt. Thus, the interest rate sensitivity results are an average effect. A more detailed analysis could incorporate each firm's debt structure (duration, hedges, etc.) to better project how interest changes feed into performance.

Finally, the analysis does not fully account for macroeconomic and systemic factors that could influence the results. The period studied saw large macro swings (e.g., pandemic lockdowns, stimulus, etc.). We included GDP growth as a control, but more nuanced macro factors (unemployment, fiscal policy, real estate capital flows) were not modeled. Also, omitted variables such as property price indices or cap rate trends could improve the model – for instance, a booming real estate market could boost both leverage capacity and returns, creating a spurious correlation if not controlled. In short, our model is somewhat reduced-form and may not capture all relevant dynamics.

Future Research Directions

Several avenues emerge for future research based on the current findings. First, extending the analysis to a longer period (e.g., 2000–2025) would allow observation of multiple interest rate cycles and crises (dot-com bust, 2008 financial crisis, etc.). This could help confirm whether the leverage-performance relationship holds consistently or changes in downturns (some literature suggests highly levered REITs suffered more in 2008, for example). Additionally, analyzing sub-samples (e.g., U.S. vs Europe, or REITs vs private developers) could uncover if regulatory differences (like REIT rules) alter the optimal leverage outcome. A cross-country panel could be insightful given differences in tax regimes and market maturity.

Another promising direction involves employing dynamic and structural models. Future research could employ a dynamic panel model or structural estimation to explicitly model how firms choose leverage over time and how that impacts performance. A partial-adjustment model (as in ©Giacomini, Ling, Naranjo 2015) could estimate target leverage ratios and adjustment speeds. One could then examine if deviations from target leverage lead to predictable performance changes (their research suggests over-levered firms relative to target can sometimes outperform under-levered ones). A structural approach might incorporate the trade-off theory (estimating the point where marginal tax shield = marginal distress cost) even though REITs have no tax shield, distress costs and agency benefits (e.g., debt discipline) could be quantified. Such models would give a more causal interpretation of how adjusting leverage would change firm value, rather than our reduced-form correlations.

Moreover, future work could explore non-linear interactions between leverage and volatility, building on the stark Sharpe ratio sensitivity observed in this study. For instance, a regime-switching model could be applied, where leverage mildly helps in "stable periods" but dramatically hurts in "high-volatility periods." This can be modeled through interaction terms (leverage × volatility) in the regression, or by using quantile regressions to focus on tail performance. Additionally, employing downside risk measures—such as the Sortino ratio or Conditional VaR of returns—as dependent variables might prove valuable to investors who are particularly concerned with worst-case scenarios.

In addition, rather than focusing solely on firm-level aggregate returns, future research could examine property-level performance, provided such data are available. This would allow for the analysis of how project-level leverage—measured as loan-to-value (LTV) on individual property investments—correlates with project-specific internal rates of return (IRRs) or default rates. Such an approach could reduce aggregation noise and help disentangle the distinct effects of leverage on upside versus downside outcomes.

Furthermore, given the importance of debt cost highlighted in this study, future research could investigate credit market conditions in greater depth. This may include variables such as credit spreads, loan-to-value covenants, and the general availability of financing. One relevant question would be whether periods characterized by easy credit—marked by low spreads and generous LTV terms—encourage excessive leverage that eventually leads to underperformance, as was observed in the 2007–2009 financial crisis. Conversely, it would also be valuable to examine how firms that secure long-term fixed-rate financing perform relative to those that rely on shorter-term or floating-rate debt. Addressing these issues could offer practical guidance for shaping financing strategies, such as the timing of bond issuance or the use of interest rate hedging tools.

Researchers could also expand upon the simple simulations presented in this study by conducting more comprehensive stress tests. For example, one might examine the combined effects of interest rates rising to 8% alongside a sharp decline in property values. Such scenarios would allow a comparison of outcomes between highly levered and low-levered firms. Implementing this approach would involve integrating the regression results with explicit assumptions about how volatility and economic growth evolve under stress. The resulting analysis could offer a more holistic perspective on risk management and would likely be of interest to both regulators and investors seeking to assess the systemic risks associated with real estate leverage.

As data availability continues to expand, future studies could incorporate alternative datasets—such as real-time market sentiment indicators or high-frequency REIT market data—to examine how market-implied expected returns, including implied cap rates or option-implied volatilities, relate to leverage decisions. Additionally, an interesting direction would be to explore the interaction between leverage and ESG factors or management quality metrics. For instance, it would be valuable to assess whether firms with higher governance scores tend to manage leverage more effectively.

Conclusions

The findings of this research underscore the dual nature of financial leverage in real estate investment as both a powerful return enhancer and a potent risk amplifier. Using a panel of real estate investment firms from 2019 to 2023, the analysis revealed a non-linear relationship between leverage and performance. In particular, returns generally improved with moderate debt usage, but beyond an inflection point the benefits of additional leverage began to taper off and risks escalated sharply. There is clear evidence of an optimal leverage zone: firms tended to achieve the highest risk-adjusted performance when leverage ratios were neither minimal nor excessive. Empirically, this "sweet spot" appeared to center around approximately 50–60% loan-to-value (LTV). Within this range, companies enjoyed enhanced equity returns (and higher ROE) without a commensurate rise in volatility, thus improving their Sharpe ratios. Leverage levels below this range often left potential returns unrealized, whereas leverage beyond this range led to diminishing returns and heightened financial strain. This overarching result confirms that while financial leverage can magnify gains, it will just as readily magnify losses if pushed too far – a sober reminder of the trade-off between risk and return in leveraged real estate strategies. Crucially, the effectiveness and consequences of leverage were shown to depend on market conditions and the type of investment vehicle. The 2019–2023 period included both an unprecedented global shock and a dramatic shift in monetary policy, allowing a nuanced observation of leverage under stress and recovery. During the low-interest-rate environment of 2019 through 2021 – punctuated by the COVID-19 pandemic and subsequent stimulus – debt was inexpensive and helped amplify returns. Firms that maintained higher leverage during these years saw superior risk-adjusted outcomes on average, as the cost of borrowing remained well below property yields. Leverage's return-enhancing effect was evident in the post-pandemic rebound: access to cheap credit and recovering asset values meant that moderately to highly levered firms bounced back strongly, highlighting leverage's upside in benign financial conditions. However, this situation reversed as macroeconomic tides turned. In 2022–2023, interest rates rose rapidly to tame inflation, dramatically increasing borrowing costs. The study's evidence shows that when interest rates approached or exceeded cap rates, leverage shifted from friend to foe. Highly levered firms experienced a marked decline in performance and Sharpe ratios once debt became expensive, illustrating how quickly leverage can erode equity returns when the interest burden grows. Notably, even maintaining prior leverage levels in this high-rate period proved detrimental. These findings reinforce that the attractiveness of leverage is regime-dependent: it flourishes in periods of cheap credit but can become a liability in tight monetary conditions. The COVID-19 shock further demonstrated leverage's risks and resilience in real time – public real estate markets initially saw steep declines, reflecting leveraged exposure to sudden cash flow disruptions, but then recovered strongly with policy support, whereas private markets exhibited delayed and smoother adjustments. Overall, the varied market phases within the sample period provided a rich test of leverage dynamics, confirming that context matters greatly in determining whether leverage adds value or peril. Another important dimension of this research is the comparison between public real estate investment trusts (REITs) and private real estate funds regarding their use of debt and their resilience to shocks. The analysis found systematic differences in how these two structures manage leverage. Public REITs generally employed more conservative leverage ratios and demonstrated greater flexibility in navigating the volatile period. Several factors likely contribute to this: REITs face capital market scrutiny, must adhere to certain regulatory guidelines, and do not benefit from corporate tax shields – all of which encourage moderate debt usage. Moreover, their access to public equity markets allows them to recapitalize more readily if needed, enhancing their resilience. In contrast, private real estate funds often utilized higher leverage, especially those pursuing aggressive value-add or opportunistic strategies aiming for high returns. This extra debt can boost returns during strong markets, but it also leaves private vehicles more vulnerable when conditions deteriorate. The findings indicate that during the stress of 2020's pandemic onset and the 2022–2023 rate hikes, highly levered private funds faced greater liquidity pressures and valuation declines relative to their public counterparts. Lacking the same degree of transparency and access to fresh equity, some private funds had less flexibility to reduce leverage or buffer losses, leading to tougher challenges in downturns. Meanwhile, REITs, despite experiencing stock price volatility, were generally able to weather the storm by deleveraging or raising capital, and they bounced back as markets normalized. This differential resilience suggests that prudent leverage levels may differ between public and private real estate contexts. Ultimately, the comparative insight reinforces that there is no one-size-fits-all leverage policy – the optimal debt load is influenced by the organizational form and its capacity to manage risk. From a practical perspective, these results carry several implications for real estate investors, portfolio managers, and financial decision-makers. First, the confirmation of an optimal leverage range (50–60% LTV) provides a tangible guideline for balancing risk and return. Investors and managers should consider maintaining leverage within this zone under normal market conditions to maximize performance while containing risk. Pushing leverage much beyond that threshold could jeopardize stability, especially as economic conditions change. Second, the clear regime-dependent benefits of leverage imply that timing and flexibility are key. In periods of low interest rates or strong economic growth, taking advantage of cheap debt financing can enhance property investment returns – however, it is prudent to lock in fixed rates or long maturities during such times to safeguard against future rate increases. Conversely, when interest rates are rising or economic uncertainty looms, a cautious stance on new borrowing is warranted. Active risk management of leverage – such as using interest rate hedges, staggering debt maturities, and maintaining sufficient liquidity – becomes critical to protect equity during downturns. Third, the divergent experiences of REITs vs. private funds suggest that capital structure decisions should be tailored to the specific context: public real estate firms might focus on sustaining moderate leverage to retain creditworthiness and investor confidence, while private fund managers must weigh the allure of high leverage against the potential for severe drawdowns and impaired investor trust in adverse markets. In all cases, a strategic approach to debt – treating leverage not as a static choice but as a dynamic tool – will enable better navigation through real estate cycles. The study's insights thus encourage practitioners to calibrate their use of debt financing, aiming for that "goldilocks" level of leverage and remaining vigilant as macroeconomic winds shift. In addition to practical takeaways, this thesis offers theoretical contributions to the finance literature, particularly in the context of capital structure theories applied to real estate. The empirical confirmation of a concave, non-linear leverage-performance relationship lends support to the classic trade-off theory. It provides real-world evidence that there is indeed an interior optimum where the marginal benefit of debt (through lower capital cost and interest tax shields for taxable entities) is balanced by the marginal cost (through higher financial distress risk). By quantifying this optimal zone for real estate firms, the research reinforces the trade-off framework within a sector often characterized by high debt usage and illiquid assets. Simultaneously, the findings offer nuance to the pecking order theory in a real estate setting. The observed behavior – for instance, the fact that firms did not simply maximize debt indiscriminately, but adjusted leverage in line with market conditions – is consistent with the idea that companies prefer internal financing and moderate debt over issuing new equity, especially when external equity markets are less favorable or when their stock prices are undervalued. Public REITs' conservative leverage can be seen as aligning with a pecking order preference to avoid equity dilution unless necessary, whereas private funds' heavier reliance on debt underscores their limited avenues for new equity and the appeal of debt until risks become too high. Moreover, the differential responses to the 2020 shock and subsequent tightening highlight how information asymmetry and market signaling (core aspects of pecking order theory) play out: for example, REITs raising equity or cutting dividends in 2020 may have signaled distress to the market, so many instead leaned on debt refinancing and asset sales to manage leverage. In essence, this research bridges theory and practice by showing that the real estate industry's leverage choices reflect a complex balancing act predicted by these theories – confirming some aspects (like a target leverage range) while also illustrating context-driven deviations (such as temporarily deviating from target leverage in a low-rate boom). Thus, the thesis enriches the academic discourse by contextualizing Modigliani–Miller, trade-off, and pecking order paradigms within the contemporary real estate investment landscape. Finally, the study opens several avenues for future research to build on these insights. One important direction would be to examine the role of Environmental, Social, and Governance (ESG) factors in the leverage-performance nexus. For instance, future studies could investigate whether firms with stronger ESG profiles enjoy lower borrowing costs or greater resilience (possibly shifting the optimal leverage threshold) compared to their less sustainable peers. Another extension would be to explore regional heterogeneity: the present analysis covered European and North American markets in aggregate, so further research might analyze specific countries or emerging markets to see if different legal frameworks, market maturities, or economic conditions lead to different optimal leverage levels or risk outcomes. Additionally, more granular investigation into the structure of debt financing could be illuminating – particularly the impact of floating vs. fixed interest rates on real estate performance. A deeper understanding of how interest rate exposure (floating-rate loans that can spike in cost versus fixed-rate debt that locks in financing costs) influences the risk/return profile would help investors manage interest rate risk alongside leverage. Other potential research angles include studying the interaction of leverage with property-type diversification (does an optimal leverage differ for residential vs. commercial portfolios?) and the long-term effects of leverage on portfolio stability through multiple cycles. By addressing these questions, future scholarship can further refine what we know about leveraging strategies. In conclusion, this thesis has demonstrated that financial leverage, when judiciously applied, remains a powerful tool in real estate investment – one that can substantially elevate returns without undue risk if kept within optimal bounds and adjusted for the financial climate. The challenge and opportunity for real estate professionals going forward is to incorporate these findings into smarter capital structure decisions, and for researchers to continue probing how leverage can be optimally harnessed in an ever-evolving economic environment.

Appendix – Python Code for Regression Analysis

Python Code – OLS regressions and multicollinearity check

```
import pandas as pd
import statsmodels.api as sm
from statsmodels.stats.outliers_influence import
    variance_inflation_factor

# 1. Load the dataset
df = pd.read_excel("Dataset_Leva_Performance_Definitivo.xlsx"
    )

# 2. Select the variables (excluding log_DE squared,
    interactions, and industry dummies)
X = df[[
    "log_DE",                # linear leverage effect
    "Revenue Growth",
    "Volatility",
    "Cost of Debt",
    "GDP Growth",
    "Interest Rate"
]]
X = sm.add_constant(X)

# 3. Compute VIF to check for multicollinearity
vif = pd.DataFrame()
vif["Variable"] = X.columns
vif["VIF"] = [variance_inflation_factor(X.values, i) for i in
    range(X.shape[1])]
```

```
print("=== VIF ===")
print(vif)

# 4. Function to run clean OLS regression
def run_clean_ols(dep_var):
    y = df[dep_var]
    model = sm.OLS(y, X).fit()
    return model.summary()

# 5. Run the regressions
print("\n=== ROE ===")
print(run_clean_ols("ROE"))

print("\n=== Total Return ===")
print(run_clean_ols("Total Return"))

print("\n=== Sharpe Ratio ===")
print(run_clean_ols("Sharpe Ratio"))
```

Scatter Plot – Leverage and ROE

```
# Scatter plot with regression line
sns.lmplot(x="log_DE", y="ROE", data=df, aspect=1.5,
           scatter_kws={"alpha":0.5})
plt.title("Relationship between Financial Leverage (log_DE)
   and ROE")
plt.xlabel("log(DE Ratio)")
plt.ylabel("ROE")
plt.show()
```

Histogram – Distribution of Financial Leverage

```
# Histogram of financial leverage distribution
sns.histplot(df["log_DE"], bins=20, kde=True)
plt.title("Distribution of Financial Leverage (log_DE)")
plt.xlabel("log(DE Ratio)")
plt.ylabel("Frequency")
```

```python
plt.show()
```

Residual Diagnostics – Sharpe Ratio OLS Model

```python
# Select independent variables
X = df[[
    "log_DE", "Revenue Growth", "Volatility", "Cost of Debt",
    "GDP Growth", "Interest Rate"
]]
X = sm.add_constant(X)  # add constant to the model
y = df["Sharpe Ratio"]

# Fit the OLS model
model = sm.OLS(y, X).fit()
residuals = model.resid
fitted_values = model.fittedvalues

# Q-Q plot of residuals
fig_qq = sm.qqplot(residuals, line='45')
fig_qq.suptitle("Q-Q Plot of Residuals")
plt.show()

# Residuals vs. Fitted values plot
plt.figure(figsize=(8, 5))
sns.residplot(x=fitted_values, y=residuals, lowess=True,
              line_kws={'color': 'red'})
plt.title("Residuals vs. Fitted Values")
plt.xlabel("Fitted Values")
plt.ylabel("Residuals")
plt.tight_layout()
plt.show()
```

Bibliography

[1] Fondation Abbé Pierre – FEANTSA (2024). *Ninth Overview of Housing Exclusion in Europe 2024*.

[2] Alcock, J., Steiner, E., & Tan, K. J. K. (2017). *Australian REITs, Property Characteristics and the Sources of their Returns*. Journal of Real Estate Finance and Economics, 54(1), 1–34.

[3] Alcock, J., Steiner, E., & Tan, K. J. K. (2019). *Target Leverage and Adjustment Speed in Public Real Estate Firms*. Journal of Real Estate Finance and Economics, 59(4), 635–661.

[4] Allen, M. T., Madura, J., & Springer, T. M. (2000). *REIT Characteristics and the Sensitivity of REIT Returns*. Journal of Real Estate Research, 20(3), 389–406.

[5] Alcock, J., Steiner, E., & Tan, K. J. K. (2019). *Leverage Targeting in Real Estate Investment Trusts*. Journal of Real Estate Finance and Economics, 59(3), 479–512.

[6] Anson, M. J. P., & Hudson-Wilson, S. (2012). *Why Real Estate?* Journal of Real Estate Finance and Economics, 44(3), 295–311.

[7] Anson, M. J., & Hudson-Wilson, S. (2012). *Managing Leverage in Real Estate Investment*. Journal of Real Estate Finance and Economics, 45(2), 384–402.

[8] Bank for International Settlements (BIS), *Measuring Commercial Property Prices in Italy*, BIS Working Papers, available at: `https://www.bis.org/research`.

[9] BNP Paribas Real Estate (2023). *Europe CRE 360 – Global Research*. September 2023.

[10] CBRE (2019). *European Investment Market Snapshot Q2 2019*. CBRE Research.

[11] Chaudhry, M. K., Myer, F. C. N., & Webb, J. R. (2004). *Stationarity and Cointegration in REIT Markets*. Journal of Real Estate Research, 26(2), 127–152.

[12] Cheng, P., & Roulac, S. (2007). *Measuring the Performance of REITs: Is it Style or Structure?* Journal of Real Estate Portfolio Management, 13(2), 157–168.

[13] CliffsNotes, *Trade-Off Theory and Pecking Order Theory*.

[14] Cushman & Wakefield, *Italian Real Estate Market Report 2023*, available at: `https://www.cushmanwakefield.com/en/italy`.

[15] Dils, *Real Estate Market 2023 in Italy: Investment Trends*, available at: `https://www.dils.com/en/research/real-estate-italy`.

[16] DWS, *Macroeconomic Factors and Leverage in Global Real Estate Markets*.

[17] DWS (Deutsche Asset Management) (2016). *Europe Real Estate Strategic Outlook: Mid-Year Review 2016*.

[18] Frayne, C., Szczypińska, A., Vašíček, B., & Zeugner, S. (2022). *Housing Market Developments in the Euro Area: Focus on Housing Affordability*. European Economy Discussion Paper 171, European Commission.

[19] European Central Bank (ECB), *The Role of Leverage in the 2008 Global Financial Crisis*.

[20] European Central Bank (2021). *Euro area house price developments during the coronavirus pandemic*. ECB Economic Bulletin, Issue 4/2021.

[21] EPRA, *Performance Analysis of Public Real Estate Investment Vehicles*.

[22] European Systemic Risk Board (2023). *Vulnerabilities in the EEA commercial real estate sector*. January 2023.

[23] Eurostat (2025). *Housing price statistics – house price index*. Statistics Explained article, January 2025.

[24] Finance Ideas, *Optimal Leverage for Real Estate Investments*.

[25] Fuerst, F., & Matysiak, G. (2013). *Analysing the Performance of Private Real Estate Funds: A Panel Data Approach*. Applied Economics, 45(10), 1251–1267.

[26] Giacomini, E., Ling, D. C., & Naranjo, A. (2016). *Leverage and Performance of REITs: Evidence from Target Adjustment Behavior*. Working Paper, University of Florida.

[27] Giacomini, E., Ling, D. C., & Naranjo, A. (2016). *Optimal Leverage and Performance in REITs*. Real Estate Economics, 44(2), 367–408.

[28] Idealista, *Luxury Real Estate Market in Italy 2025*, available at: https://www.idealista.it/en/news/real-estate-market.

[29] Valderrama, L., Gorse, P., Marinkov, M., & Topalova, P. (2023). *European Housing Markets at a Turning Point – Risks, Household and Bank Vulnerabilities, and Policy Options*. IMF Working Paper WP/23/76.

[30] Investcorp (2019). *European Real Estate Trends and Updates*. Market Report, November 2019.

[31] Investopedia, *Leverage in Real Estate*.

[32] Jensen, M. C., and Meckling, W. H. (1976), *Theory of the Firm: Managerial Behavior, Agency Costs, and Ownership Structure*, Journal of Financial Economics, Vol. 3, No. 4, pp. 305–360.

[33] Knight Frank, *Prime Italian Real Estate Report 2022*, available at: https://www.knightfrank.com/research.

[34] Knight Frank (2019). *The Germany Report*.

[35] Ling, D. C., & Naranjo, A. (2013). *Leverage and Real Estate Investment Returns*. Journal of Real Estate Finance and Economics, 47(3), 405–434.

[36] Ling, D. C., Naranjo, A., & Giacomini, E. (2014). *Leverage and Return Dynamics in Public Real Estate Markets: Cross-Country Evidence*. ResearchGate.

[37] Modigliani, F. and Miller, M. (1958), *The Cost of Capital, Corporation Finance, and the Theory of Investment*, American Economic Review, Vol. 48, No. 3, pp. 261–297.

[38] Morri, G., & Jostov, V. (2018). *Capital Structure and Performance of European Real Estate Companies during Financial Crises*. Journal of European Real Estate Research, 11(1), 41–60.

[39] Morri, G., & Jostov, M. (2018). *Leverage and Performance in European Property Companies: Evidence from the Post-Crisis Era*. ResearchGate Working Paper.

[40] Myers, S. C., and Majluf, N. S. (1984), *Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have*, Journal of Financial Economics, Vol. 13, No. 2, pp. 187–221.

[41] Nazir, M. S., Arshad, I., & Sharif, M. (2021). *Impact of Capital Structure on Firm Performance: Evidence from Emerging Markets*. International Journal of Economics and Financial Issues, 11(3), 12–20.

[42] OECD, *International Housing Database: Italian Residential Market Analysis*, available at: `https://www.oecd.org/housing-data`.

[43] Pavlov, A., Steiner, E., & Wachter, S. (2013). *REIT Capital Structure: The Value of Getting It Right*. Journal of Real Estate Research, 35(3), 343–365.

[44] Pavlov, A., Wachter, S., & Zevelev, A. (2013). *The Leverage Cycle in International Real Estate Markets*. EPRA Research Paper.

[45] Pacific Rim Real Estate Society (PRRES), *Leverage Effects in Real Estate Finance: An Australian REIT Analysis*.

[46] Recapital News, *European Real Estate Market Trends and Leverage*.

[47] Nareit, *U.S. REIT Market Data and Analysis*.

[48] Nareit, *T-Tracker REIT Market Data 2024*.

[49] Savills Research (2024). *Has the European investment market turned a corner?*. Savills News, March 2024.

[50] Statista, *House Price Index in Italy (2010–2022)*, available at: `https://www.statista.com/statistics/house-price-index-italy`.

[51] Sun, L., Titman, S., & Twite, G. (2013). *REIT and Commercial Real Estate Returns: A Post-Crisis Reexamination*. Real Estate Economics, 43(1), 8–36.

[52] Tauseef, S., Tan, C. B., & Lohano, H. D. (2015). *Trade-Off Theory and Pecking Order Theory: Comparative Analysis on Firm's Capital Structure*. IJEFI, 5(2), 350–360.

[53] Tauseef, S., Lohano, H. D., & Khan, M. A. (2015). *Effect of Capital Structure on Firm Performance: Evidence from the Textile Sector of Pakistan*. IJEFI, 5(4), 929–935.

[54] Trading Economics, Eurostat, *Italy House Price Index (2012–2022)*, available at: `https://tradingeconomics.com/italy/house-price-index`.

[55] Urban Land Institute (ULI), *European Real Estate Investment Funds: Leverage and Performance*.

[56] WE Family Offices, *Real Estate Investment Structures and Debt Strategies*.