Capital Structure Choices and Crisis Performance in U.S. REITs: The Role of Leverage, Debt Maturity, and Property Type Differences

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I Abstract (English)

This dissertation examines how capital structure choices of U.S. Equity Real Estate Investment Trusts (REITs) before a crisis affect performance during two fundamentally different economic shocks – the Global Financial Crisis (GFC) and the COVID-19 pandemic. Since REITs have limited internal financing options due to statutory distribution requirements, they heavily depend on external financing sources, which makes the structure of leverage and debt maturities particularly important. Building on the framework of Pavlov, Steiner and Wachter (2018), this study analyzes performance effects through cross-sectional OLS and logistic regressions ("Does preparation matter?"), determinants of adjustment ("Who prepares?"), and if these relationships differ across property-type heterogeneity.

The findings show that the effect of capital structure preparations is crisis-specific. While deleveraging before the GFC leads to significantly better crisis performance, neither leverage reductions nor adjustments of debt maturities had any impact on performance during the COVID-19 pandemic. Further, this study confirms that sectoral differences play a key role: Defensive REITs benefited significantly during the GFC with prior deleveraging, while during COVID, especially short-term debt maturities led to negative crisis performance for defensive REITs.

Overall, this study shows that the effect of capital structure adjustments varies both across crisis types (credit market versus cash flow shock) and across different property type risks. Further, this study shows that crisis effects and property type heterogeneity jointly determine financial flexibility, which indicates that decisions over capital structure must be tailored to crisis and sector-specific conditions rather than applied universally.

Título: Decisões de Estrutura de Capital e Desempenho em Crises nos REITs dos EUA: O Papel da Alavancagem, da Maturidade da Dívida e das Diferenças por Tipo de Propriedade

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Palavras-chave: Estrutura de Capital, Desempenho em Crises, REITs, Alavancagem, Variação da Alavancagem, Maturidade da Dívida, Variação da Maturidade da Dívida, Tipo de Propriedade, Crise Financeira Global, Crise da COVID-19, Preparação para Crises, Retorno Total Acumulado, Desalavancagem, Extensão de Maturidades, Reservas de Liquidez, Flexibilidade Financeira

II Abstract (Portuguese)

Esta dissertação analisa como decisões de estrutura de capital tomadas pelos U.S. Equity REITs antes de uma crise influenciam o seu desempenho durante dois choques económicos distintos: a Global Financial Crisis (GFC) e a pandemia da COVID-19. Devido às exigências legais de distribuição de rendimento, os REITs dependem fortemente de financiamento externo, tornando a alavancagem e a maturidade da dívida fatores críticos em períodos de stress. Com base no enquadramento de Pavlov, Steiner e Wachter (2018), o estudo utiliza regressões OLS e modelos logísticos para avaliar se a preparação melhora o desempenho ("Does preparation matter?"), identificar quais empresas se preparam ("Who prepares?") e verificar se estes efeitos variam entre tipos de propriedades.

Os resultados mostram que a eficácia da preparação é específica ao tipo de crise. A redução da alavancagem antes da GFC melhorou significativamente o desempenho, enquanto não teve efeito durante a COVID-19. Extensões de maturidade não geraram benefícios diretos em nenhuma crise, embora a pressão de refinanciamento tenha impulsionado ajustes em ambos os períodos. Diferenças sectoriais são determinantes: sectores defensivos beneficiaram-se da desalavancagem durante a GFC, mas foram mais afetados por maturidades curtas durante a COVID-19.

Conclui-se que o impacto das decisões de estrutura de capital depende do tipo de choque (mercado de crédito versus choque operacional) e das características sectoriais dos REITs. Estes resultados contribuem para a literatura e oferecem implicações práticas para gestores e investidores.

Contents

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III List of abbreviations

U.S.	-	United States
Nareit	-	National Association of Real Estate Investment Trusts
REIT	-	Real Estate Investment Trust
GFC	-	Global Financial Crisis
COVID-19	-	COVID-19 pandemic
CFO	-	Chief Financial Officer
H1-H3	-	Hypotheses 1-3
ROA	-	Return on Assets
ROE	-	Return on Equity
OLS	-	Ordinary Least Squares
CTR	-	Cumulative Monthly Total Return
LNSize	-	Natural Logarithm of Firm Size
Logit	-	Logistic Regression
MVIC	-	Market Value of Invested Capital
Q	-	Tobin's Q
Δ	-	Change / Difference

1. Introduction

REITs (Real Estate Investment Trusts) represent an important investment vehicle in U.S. financial markets, providing institutional and private investors with liquid access to the real estate asset class. According to Nareit (n.d.), REITs are the third largest asset class in the United States (40% Equities, 39% Bonds, 15% Commercial Real Estate, 6% Cash). They provide a combination of stable dividends and potential for long-term value enhancement. Their yields exhibit a comparatively low correlation with broader equity and fixed-income markets, which means that REITs make a significant contribution to institutional portfolio diversification. One defining institutional characteristic of REITs, relative to other financial assets, is the statutory requirement to distribute at least 90% of taxable income, leading to relatively stable cash flow distributions. At the same time, this regulatory structure of REITs makes them especially dependent on external capital sources and thus potentially vulnerable to periods of crisis.

Especially in times of crisis, it becomes apparent how strongly the differences in capital structure and property types affect REIT performance. The Global Financial Crisis (GFC) 2007-2009 was characterized by a credit-market-driven shock marked by liquidity shortages, collapsing interbank lending, and widespread refinancing constraints. The COVID-19 pandemic was, in contrast, an exogenous real-economic shock that burdened operating cash flows in many sectors, while capital markets were stabilized by expansionary monetary policy measures. These structural differences raise the question of whether REITs can be prepared for both types of crises with balance sheet adjustments, or whether the nature and effect of capital structure measures vary depending on the crisis.

1.1 Research Problem & Questions

In the influential study of Pavlov, Steiner and Wachter (2018), it is confirmed that "preparation matters": REITs which deleveraged prior to the GFC and extended short-term debt maturities achieved significantly higher crisis performance. Simultaneously, several financial studies confirm that property type sectors react differently to crises, and sectoral cash flow stability plays a significant role.

Despite these findings, there are still key gaps in research:

- There exists no comparative analysis that investigates whether capital structure adjustments have an effect both during the GFC and during the COVID crisis.

- It is unclear which REITs prepare their balance sheets prior to a crisis ("Who prepares?") and which risk factors play a role here.
- To date, no research has been conducted to examine whether the effects of leverage and maturity adjustments vary across property types, even though their heterogeneity is well-documented empirically.

This leads to the central research question of this thesis:

Do pre-crisis capital structure choices – specifically leverage reductions and debt maturity extensions – improve the crisis performance of U.S. Equity REITs, and do these effects differ across property types and between the Global Financial Crisis and the COVID-19 crisis?

1.2 Research Objectives & Contributions

This study provides four contributions:

1. Crisis comparison: This study provides the first systematic comparison of capital structure preparations for a credit market-driven crisis (GFC) and a real economic shock (COVID).
2. Extension of existing literature: The "preparation matters" framework is applied to different crisis dynamics, revealing its robustness and limitations.
3. Integration of sectoral heterogeneity: This study combines capital structure with property type risks and shows that REITs are not a homogeneous asset class.
4. Practical implications: The findings provide actionable insights for CFOs and investors by showing at which point leverage or maturity adjustment are most effective for enhancing crisis resilience.

1.3 Thesis Outline

The structure of this paper is as follows: First, Chapter 2 presents the theoretical foundation, including capital structure theories, REIT-specific financing characteristics, financial flexibility, and sectoral differences. Second, Chapter 3 develops the research design, empirical models, and hypotheses H1-H3. Chapter 4 describes the data foundation, the variable construction, and the sample selection. Empirical findings for the three hypotheses will be presented in Chapter 5, while Chapter 6 discusses economic mechanisms, compares these results with existing literature, and derives implications. Finally, Chapter 7 summarizes the main results of this study, names limitations, and provides perspectives for future research.

2. Theoretical Background and Literature Review

This chapter provides the theoretical foundation for empirical analysis. First, capital structure theories are summarized, as they are important for companies' choices of leverage and debt maturities. Second, it will be discussed how these theories apply – or fail to apply – to REITs, given their regulatory payout requirements and industry-specific leverage constraints. Building on that literature, this chapter examines whether a relationship exists between financial flexibility and performance during crises, followed by a theoretical analysis of property-type heterogeneity. This chapter concludes with an overview of the research gap and the specific contribution of this work.

2.1 Capital Structure Theories

Capital structure theory investigates how companies choose their capital structure between equity and debt and why leverage levels across companies and over time differ. The starting point is the irrelevance proposition of Modigliani and Miller (1958). In their frictionless reference model with a perfect capital market setting, firm value depends solely on the cash flow generated by its real investments and is independent of the mix of debt and equity (Modigliani and Miller, 1958). Capital structure is, in this context, only a cosmetic decision; the weighted average cost of capital remains constant across all leverage levels.

Results change once corporate income taxes are considered. Since interest costs are tax-deductible, whereas equity payouts are not, debt creates a tax shield, which reduces the average cost of capital with rising leverage levels (Modigliani and Miller, 1958). The tax-adjusted version of their proposition shows that the cost of capital is a decreasing function of the debt-to-value ratio. Without counteracting effects, companies would finance themselves fully with debt – a result that is obviously not the reality in practice.

A very important step towards a more realistic theory is the introduction of bankruptcy and restructuring costs. Scott (1976) develops a multi-period valuation model in which debt is valuable because interest costs are tax-deductible, but higher leverage increases the probability of costly bankruptcy or restructuring. In his model, both factors determine the firm value as a function of leverage levels. Scott (1976) formally shows that under plausible assumptions about the distribution of operating cash flows and the structure of insolvency costs, an internal optimum and the relationship between firm value and leverage have a clear maximum point. With that, he provides a concrete version of the trade-off theory: Companies balance the marginal tax advantages of additional debt against additional distress costs.

However, statistical trade-off models cannot fully explain empirical findings that profitable companies are more likely to have lower leverage levels, as well as pay higher dividends, and do not increase leverage after large stock price increases. DeAngelo and DeAngelo (2007) argue that these patterns can be explained when financial flexibility is a key goal of the capital structure policy. Elements from the trade-off and pecking-order theory are combined in a dynamic model in which companies consciously use low leverage levels to preserve unused leverage capacity as an option for future financing requirements (DeAngelo and DeAngelo, 2007). Debt issues serve in this framework as a temporary deviation from the intended low leverage target when unexpected investment opportunities or earnings shortfalls arise, and companies gradually rebalance back to their leverage targets as free cash flows and market conditions permit.

The central finding of this theory is that the opportunity cost of exploiting debt capacity today is a reduced ability to take on additional debt in the future if necessary and to avoid underinvestment. This intertemporal trade-off generates a new form of debt-related costs, which differ from ex post distress costs of the traditional trade-off models (DeAngelo and DeAngelo, 2007). Low leverage can be optimal even when the expected tax benefits from additional debt appear high, and distress risk is small, because preserving financial flexibility has substantial option value. Overall, modern capital structure theory explains leverage decisions through the dynamic trade-off between tax advantages, expected distress costs, and the value of external financing.

2.2 Capital Structure in REITs

The capital structure of REITs differs from traditional companies, especially due to regulatory policies, limited internal financing opportunities, and stable, real estate-based cash flows. A key feature is the statutory distribution requirement. As documented by Harrison, Panasian and Seiler (2011, p. 143), REITs are required to pay out at least 90% of their taxable income as dividends to retain their pass-through status according to Internal Revenue Service regulations. According to Ott, Riddiough, and Yi (2005, p. 212), REITs financed their investments by equity and long-term debt, equaling 84% of aggregate firm-specific investment over the entire sample period. Furthermore, retained earnings were financed with only 7% of the investment average, and short-term debt and preferred stock made up the remaining 9% (Ott, Riddiough, and Yi, 2005, p. 212). Due to these restrictions, REITs are forced to finance their investments more heavily from external capital markets in comparison to traditional companies, which are not forced to pay out income distributions.

These conditions lead to higher leverage levels of REITs. Harrison, Panasian, and Seiler (2011) show that leverage levels of REITs are closely related to asset tangibility, arguing that real estate assets serve as strong collateral and therefore increase debt capacity. Furthermore, they reference Brown and Riddiough (2003), who document that a specific property type with more stable cash flow can support higher debt levels due to its enhanced collateral value. Higher collateral values usually lead to better financing conditions as well. Finally, the restriction on internal financing due to the distribution requirements means that REITs are more dependent on debt capital as a source of financing, which structurally favors higher debt ratios (Harrison, Panasian, and Seiler, 2011).

The choice over leverage levels and debt maturities has a significant impact on REIT performance, especially during crisis periods. Sun, Titman and Twite (2015) document that REITs with higher leverage ratios suffered significantly more from larger performance declines during the GFC as debt increases vulnerability to declines in real estate prices and balance sheet adjustment pressures. Furthermore, they identify that short-term debt maturity is a risk source: More short-term debt leads to refinancing problems as capital markets tighten (Sun, Titman and Twite, 2015). These findings illustrate that capital structure choices have particularly far-reaching consequences for REITs due to their regulatory and financial constraints.

2.3 Crisis and Financial Flexibility

Financial crises are changing the requirements of external financing and reveal vulnerabilities in the capital structure of companies. How well companies survive those shocks depends on their financial flexibility – the ability to react to unexpected burdens without being dependent on expensive or scarce external funds. This correlation is particularly relevant for REITs, which are less able to build up internal liquidity due to regulatory distribution requirements and are heavily dependent on access to capital markets.

The GFC 2007-2009 is a typical example of a financing-driven crisis. Ivashina and Scharfenstein (2010) show that banks sharply reduced loan origination during the GFC, causing a massive credit supply shock. Companies that were reliant on bank financing experienced an abrupt decline in their financing options, while at the same time, conditions were tightened. The situation was especially problematic for companies with a high degree of short-term debt: The authors document that companies with high refinancing demand were disproportionately affected, as credit lines were not extended or were only granted at significantly higher costs (Ivashina, Scharfenstein, 2010). Leverage levels and debt maturities turned into key risk factors

at that point. These mechanisms were also crucial for REITs, as they regularly use short-term financing and secured loans.

In contrast, the COVID crisis was not characterized by a collapse of credit markets but by an abrupt real economic shock. Ramelli and Wagner (2020) show that companies recorded a strongly negative stock performance when they were dependent on international supply chains, while financial markets remained largely functional due to rapid policy interventions. Financial characteristics gained importance in a later phase called the "fever period": Companies with small liquidity buffers or high leverage levels suffered significantly more as they could not cushion the pandemic-related cash flow shortfalls (Ramelli and Wagner, 2020). The authors underline that COVID initially had an impact through real channels and only subsequently spread through financial amplification mechanisms. This underscores: Even outside of a typical financial crisis, leverage levels, liquidity, and debt maturity remain key determinants for crisis resilience.

Denis (2011) provides the theoretical foundation that defines financial flexibility as the ability to react to unexpected shocks without having to bear high external financing costs. Financial flexibility arises through liquidity, conservative leverage policies, and structuring debt with longer maturities. Because external financing becomes more expensive and less accessible during crisis periods, preserving debt capacities carries significant option value. This is especially relevant for REITs because, due to their mandatory distributions, they have fewer opportunities to build up liquidity buffers.

Further, DeAngelo, DeAngelo and Whited (2011) argue that companies manage leverage dynamically rather than targeting static optimal levels. They show that increases in debt ("transitory debt") could help to bridge financial needs, but it is important to secure long-term financial flexibility through low long-run leverage (DeAngelo, DeAngelo and Whited, 2011). Permanent high leverage levels reduce the ability to receive new financial sources during crisis periods and increase the risk of financial distress. Firms with low initial debt can maintain strategic flexibility in refinancing and investment decisions during periods of market stress.

2.4 Property-Type Heterogeneity in REITs

REITs differ significantly from each other since they invest in different property types with their own characteristics. The structure of the asset portfolio determines the stability of cash flows, the cyclicality of their demand, the length of lease structures, and operational intensity.

These characteristics are important to understand why REITs respond differently to macroeconomic shocks, especially during crisis periods.

A major driver of heterogeneity across REITs results from specialization in different types of real estate. Sun, Titman and Twite (2015) explain that during the GFC, prices fell significantly across all REIT property types, but losses varied considerably between property types. In particular, Hotel, Office/Industrial, Retail, and Diversified REITs had not recovered their pre-crisis price levels by 2011, indicating a higher vulnerability to crisis in these property sectors. In comparison, Healthcare and Residential REITs experienced smaller declines and are considered less risky. Furthermore, the authors show that the volatility varied across property types. Residential REITs lost around 53% of their value between 2007 and 2009 and subsequently recovered approximately 90% of their value, which illustrates high cyclicality and strong recovery momentum (Sun, Titman and Twite, 2015). These patterns confirm that differences in the operating environment across property types – such as demand cyclicality or lease structure – directly result in varying levels of crisis exposure.

Allen, Madura and Springer (2000) provide a further perspective on risk differences between REITs. The authors show that REITs cannot be fully protected from macroeconomic influences such as stock market movements or interest rate changes; however, they can influence their market risk due to company-specific characteristics. Their findings show that REITs with lower leverage levels are less sensitive to stock market changes, and self-managed REITs tend to have lower market risk than externally managed REITs (Allen, Madura, and Springer, 2000). At the same time, they find no evidence that asset structure, leverage, management strategies, or the degree of specialization significantly affect sensitivity to interest-rate changes. Overall, the study shows that risk differences between REITs partially arise through operating and governance characteristics, even if no direct statements are made about property type.

Anderson, Benefield and Hurst (2012) provide comprehensive analysis of the meaning of property type diversification in the REIT sector. Based on data from 1995–2006, they show that higher diversification correlates with better key performance indicators such as Return on Assets (ROA), Return on Equity (ROE), and Tobin's Q. Further, they describe that Diversified REITs achieve better operating and valuation performance than Specialized REITs on both a raw and risk-adjusted basis. The authors attribute these advantages to two key mechanisms:

(1) risk insulation, which protects REITs against cash flow volatilities within a single segment and,

(2) “cherry-picking”, meaning that they invest capital in property types which promise the most attractive returns at the respective point in time (Anderson, Benefield and Hurst, 2012).

Moreover, their findings show that diversified REITs achieve, on average, 7-11% higher valuation than specialized REITs. Even though diversification leads to clearly higher ROA or ROE values, this advantage is priced in by the market, meaning that there is no above-average investment outperformance effect in favor of diversified REITs. Overall, the study shows that property-type heterogeneity provides a significant contribution to performance and valuation of REITs – but the advantages are already priced in by the market.

2.5 Research Gap and Contribution

This study makes a major contribution to the existing literature by investigating how financial flexibility affects REIT performance in two different crisis circumstances. Existing literature isolates mostly one crisis, ignoring whether balance sheet preparations provide value in both credit-induced downturns and in shocks caused by the real economy. This study provides a systematic analysis that directly compares the GFC and the COVID-19 pandemic to examine whether leverage levels and debt maturity structures have different effects in both types of crises.

A further contribution is in the extension of Pavlov, Steiner, and Wachter’s (2018) “preparation” framework. While their results highlight the importance of balance sheet adjustments prior to financial market disruptions, it is unclear if those mechanisms also apply to crises, which are not primarily driven by credit-market frictions. The analysis of two modern crises with different transmission channels enables an assessment of the robustness and universal validity of this concept. Moreover, this study includes property type heterogeneity in the investigation of financial flexibility. Prior studies analyzed either capital structure or differences between property types, but not their relationships. With the specific separation of balance sheet quality and property type risk profiles, this study shows why REITs with similar financial ratios show different levels of vulnerability to a crisis.

After all, this study provides practical insights for REIT managers and investors. The findings illustrate how the relationship between leverage, debt maturity structure, and property type heterogeneity shapes crisis resilience and which measures – such as deleveraging, extending maturities, or liquidity planning – contribute to strengthening financing flexibility.

The study thus provides concrete implications for the preparation of REIT balance sheets for different macroeconomic downturns.

3. Methodology and Research Design

This chapter summarizes the methodology and research design of the dissertation, aiming to set up the logical connection between the research question, the formulated hypotheses, and the empirical investigation. The focus is on the quantitative analysis of capital structure choices of listed U.S. REITs during two different macroeconomic crises – the Global Financial Crisis (GFC) from 2007-2009 and the COVID-19 pandemic from 2020-2022.

The methodological framework is based on Pavlov, Steiner and Wachter (2018, p. 160-161), which shows that "preparation matters" – meaning that REITs that proactively managed their capital structure before a financial downturn tend to perform better during a financial crisis. The present study builds on that foundation through replication and extends their empirical design: while Pavlov, Steiner and Wachter (2018) focused only on the GFC crisis, this dissertation additionally investigates the COVID-19 crisis by analyzing and comparing the performance effects of pre-crisis capital structure choices between those two crisis events (following Pavlov, Steiner and Wachter, 2018).

To answer the research question, the study applies a cross-sectional regression design (OLS) by linking pre-crisis capital structure adjustments to crisis performance, measured by cumulative monthly total returns (see also Pavlov, Steiner and Wachter, 2018; Sun, Titman and Twite, 2015). Additionally, logistic models are applied to investigate which firms were more likely to adjust their capital structures before the crisis period ("Who prepares?").

3.1 Research Framework

The research framework builds on the assumption that the capital structure of a company before a financial crisis, especially proactive adjustment of leverage and debt maturities, does have a major impact on the resilience of a company during a financial downturn (Pavlov, Steiner and Wachter, 2018; Sun, Titman and Twite, 2015). The analysis follows the logic of Pavlov, Steiner and Wachter (2018, p. 161), who show that Equity REITs with a conservative leverage structure and longer debt maturities in short-term debt experienced outstanding performance. Building on that approach, this dissertation analyzes whether similar patterns are observable during the COVID-19 crisis and whether a relationship between pre-crisis capital structure and crisis performance holds across different crisis contexts.

To ensure comparability, the study uses a two-period design covering the two major financial downturns in the 21st century:

Global Financial Crisis (GFC): Pre-crisis 2005 – 2006 → Crisis 2007-2009

COVID-19 crisis: Pre-crisis 2018-2019 → Crisis 2020 – 2022

For each crisis, the cumulative monthly total return (CTR) is measured as the performance during the crisis windows. The explanatory variables capture pre-crisis leverage and debt maturity adjustments, as well as control variables for market leverage, firm size, Tobin's Q, and liquidity controls (cash-to-assets ratio) (Pavlov, Steiner and Wachter, 2018). This set-up allows a consistent analysis of how pre-crisis capital structure choices impact the market performance of Equity REITs. Beyond the overall data sample, the framework also includes property type heterogeneity to explore and measure differences in the capital and risk structure impact between cyclical property types (Office, Retail, Industrial, Hotel & Resorts) and defensive/stable property types (Residential, Healthcare).

Variable definitions and regression structure are based on Pavlov, Steiner and Wachter (2018) to secure methodical comparability. The data sample includes the listed U.S. Equity REITs obtained from Compustat and CRSP. With that, this research framework provides a unified empirical structure to test whether pre-crisis capital structure adjustments helped REITs to perform better during financial crises.

3.2 Hypotheses

The foundation of the modern capital structure theory goes back to the work of Modigliani and Miller (1958), who show that under perfect conditions of capital markets, the firm value of a company is independent of its financing structure. However, they also show that higher financial leverage increases the volatility of equity returns, thereby raising the required rate of return on equity as debt levels rise (Modigliani and Miller, 1958). This relationship implies that while firm value is not affected by leverage in frictionless markets, higher debt leads to equity risk once market imperfections, such as refinancing constraints or information asymmetries, are included.

Dynamic models of the capital structure expand this logic by connecting volatility with debt risk to leverage decisions. Brennan and Schwartz (1984) show that, under limited liability, companies endogenously choose lower debt levels to maximize firm value when they are facing greater uncertainty. Similarly, Chen and Kou (2009) display that growing asset volatility

increases the endogenous default boundary, which reduces the optimal debt-to-equity ratio. Both models display a theoretical rationale for preventative balance sheet management: when managers expect higher future volatility or liquidity risk, they can choose a conservative capital structure to minimize expected distress costs. The following theoretical and empirical work emphasizes the role of financial flexibility as a main goal of capital structure choices. DeAngelo and DeAngelo (2007) argue that firms lower their leverage to keep a liquidity buffer in the future when capital markets perform poorly.

Pavlov, Steiner and Wachter (2018) apply this theoretical framework to U.S.-listed Equity REITs to show that "preparation matters" in terms of pre-crisis reduction of leverage and debt maturities resulting in significantly better performance during financial downturns. Based on those theoretical fundamentals, this dissertation develops three sets of hypotheses to examine whether similar mechanisms can be observed in the COVID-19 crisis, and whether the effects differ between those two crisis events.

H1(a): Leverage Adjustment Hypothesis

REITs that reduced leverage before a crisis achieved higher cumulative monthly total returns during the subsequent crisis period. This hypothesis reflects the expectation that deleveraging prior to a financial downturn reduces refinancing pressure and strengthens crisis resilience (Pavlov, Steiner and Wachter, 2018; DeAngelo and DeAngelo, 2007).

H1(b): Debt Maturity Adjustment Hypothesis

REITs that reduced or extended debt maturities before a crisis reached higher cumulative monthly returns during the subsequent crisis period. Longer debt maturities reduce the risk of refinancing bottlenecks and protect companies from liquidity shocks when debt capital markets tighten (Pavlov, Steiner and Wachter, 2018).

While Hypothesis 1 focuses on performance, Hypothesis 2 investigates determinants of such pre-crisis adjustments. Pavlov, Steiner and Wachter (2018, p. 165) argue that companies with ex-ante capital structure risk – specifically with higher leverage and shorter debt maturities – have stronger incentives to adjust their balance sheet prior to a crisis.

H2: Preparation Hypothesis

Companies with higher capital structure-related risks adjust their balance sheet proactively with a higher probability to avoid adverse market conditions.

Finally, because REITs operate within different property type sectors with different risk and cash flow profiles, this study introduces a third hypothesis with a cross-sectional analysis. Since property sectors such as residential or healthcare are more crisis- and economically resilient, it is reasonable to assume that sectors such as office or retail are more sensitive to macroeconomic downturns. Accordingly, it can be expected that the benefits of pre-crisis capital adjustments vary across property types.

H3: Property Type Heterogeneity Hypothesis

The impact of capital structure adjustments prior to a crisis differs across property type sectors; cyclical sectors benefit more strongly from preparation than defensive ones.

Together, those hypotheses build the empirical framework for the following analysis and allow this study to investigate the influence of pre-crisis capital structure choices on REIT performance during two different macroeconomic crisis events.

3.3 Econometric Models

To empirically test the developed hypotheses in Chapter 3.2, this study applies cross-sectional econometric models, which are based on the framework of Pavlov, Steiner and Wachter (2018). This analysis combines capital structure adjustments prior to a crisis with the performance during a crisis measured by cumulative monthly total return (CTR). To analyze the performance (H1a, H1b, H3), OLS regressions are applied, while a logistic model is used to determine which companies adjusted their capital structure prior to a crisis (H2). Each model is estimated separately for the GFC and the COVID-19 crisis. To account for heteroskedasticity, robust standard errors are used. The exact variable definitions are explained in Chapter 4.2.

Model 1 – Leverage Adjustment Hypothesis (H1a)

To test if leverage reductions prior to a crisis lead to better crisis performance, the following cross-sectional OLS regression is based on Pavlov, Steiner and Wachter (2018, pp. 173-174):

$$(1)\ CTR_{i,c} = \beta_0 + \beta_1 \mathrm{D.M}\ Lev_i + \beta_2 MLev_i + \beta_3 LNSize_i + \beta_4 Q_i + \beta_5 Cash_i + u_i$$

$CTR_{i,c}$ measures cumulative monthly total return 2007-2009 and 2020 of REIT *i* during the crisis window *c*, β_0 is a constant, β_i is the regression coefficient belonging to the explanatory variable *j,* and *u* is the residual. *D. M Lev* captures the change in market leverage prior to the crisis, measured in the pre-crisis years 2006 and 2019*, while M Lev* is the market leverage at the end

of 2006 and 2019, capturing the effect documented by Sun, Titman and Twite (2015). *LNSize* is the log of firm size, Q refers to Tobin's Q, and *Cash* is the cash-to-asset ratio, all variables measured as of the end of the pre-crisis year 2006 and 2019. Sector fixed effects are also included, and heteroskedasticity-robust standard errors are reported (Pavlov, Steiner and Wachter, 2018).

Model 2 – Debt Maturity Adjustment Hypothesis (H1b)

To analyze if extensions of debt maturities affect the crisis performance of a REIT, the following cross-sectional OLS regression, based on Pavlov, Steiner and Wachter (2018, p. 176), is used:

(2) $CTR_{i,c} = \beta_0 + \beta_1 \mathrm{D}.Mat23_i + \beta_2 LNSize_i + \beta_3 Q_i + \beta_4 Cash_i + u_i$

In this case, *D. M Lev* is replaced by *D. Mat23*, where *D. Mat23* captures the change in debt maturities due 2-3 years prior to the crisis, measured in the pre-crisis years 2006 and 2019.

Model 3 – Preparation Hypothesis (H2)

To test hypothesis 2 and differentiate between managerial skill or pure luck which may have led to adjustments in capital structure in pre-crisis years, the question is examined whether those firms that were at higher risk were more aware of their financial situation and more likely to adjust their capital structure toward a more conservative position to avoid financial distress risks during a crisis (Pavlov, Steiner and Wachter, 2018, pp. 176-177). This question leads to the following cross-sectional logit models based on Pavlov, Steiner and Wachter (2018):

(3) $Red_i = \beta_0 + \beta_1 L.MLev_i + \beta_2 L.LNSize_i + \beta_3 L.Q_i + \beta_4 L.Cash_i + u_i$

Red_i is the likelihood that a firm reduced leverage by 0.05 or more in 2006 or 2019.

Followed by Pavlov, Steiner, and Wachter (2018, p. 177), this study explores the likelihood that REITs extend short-term debt maturity by replacing the dependent variable in the regression with the likelihood that a REIT reduced the share of debt due in 2-3 years ($Ext23_i$) by 0.05 or more in the pre-crisis years (2006 and 2019). The following model is estimated:

(4) $Ext23_i = \beta_0 + \beta_1 L.Mat23 + \beta_2 L.LNSize_i + \beta_3 L.Q_i + \beta_4 L.Cash_i + u_i$

Model 4 – Property-Type Heterogeneity (H3)

To test hypothesis 3, this model is based on the H1a and H1b regressions of Pavlov, Steiner, and Wachter (2018), but additionally adds property type effects to measure whether there are significant differences between cyclical and defensive property types. The dummy $Sector_{i,s}$ takes the value 1 if the property type is cyclical (Diversified, Hotel & Resorts, Industrial, Office, Retail, and Specialized REITs) and 0 if the property type is defensive/crisis-resistant (Residential and Healthcare REITs). The model estimated for measuring heterogeneity in the leverage effect is:

(5) $$CTR_i = \beta_0 + \beta_1 \Delta \mathrm{M}Lev_i + \sum_s \beta_{2s}\left(Sector_{i,s} \times \Delta \mathrm{M}Lev_i\right) + \beta_3 MLev_i + \beta_4 LNSize_i + \beta_5 Q_i + \beta_6 Cash_i + u_i$$

The same model is applied for heterogeneity in the maturity effect by replacing leverage with debt maturity in the regression as follows:

(6) $$CTR_i = \beta_0 + \beta_1 \Delta Mat23_i + \sum_s \beta_{2s}(Sector_{i,s} \times \Delta Mat23_i) + \beta_3 LNSize_i + \beta_4 Q_i + \beta_5 Cash_i + u_i$$

All regressions are measured separately for the GFC period (2007-2009) and for the COVID-19 window (2020). Alternative windows and variables are measured and explained in the next Chapter, 3.4 Robustness & Validations.

3.4 Robustness & Validation

To ensure the validity and reliability of the empirical results, two robustness tests were implemented. These tests verify whether the results of the main regressions are sensitive to the alternative COVID-19 crisis window and variable measurements.

Alternative Crisis Window – COVID-19 Period

The main COVID-19 analysis is based on a 12-month period from January 2020 to December 2020. This window captures the market breakdown during the start of the COVID-19 pandemic as well as the recovery period of the financial markets. In comparison to Pavlov, Steiner and Wachter (2018), the choice of this period is more compact, justified by lower volatility than during the GFC. To examine robustness, a 26-month period from January 2020 to February 2022 is used to have a methodological comparison of Pavlov, Steiner and Wachter's (2018) crisis window. The GFC window captures the whole credit disruption and recovery phase. This robustness specification allows a methodological comparison to the original study and ensures that results are not driven by a specific time window.

Alternative Variable Definition – Debt Maturity Due in 1-5 Years

A second robustness test examines the effect of an alternative debt maturity variable. While the main specification analyzes debt maturities due in 2-3 years, an alternative measure of debt maturity due in 1-5 years is tested. This broader debt maturity definition captures a higher proportion of REITs' refinancing obligations and additionally checks the stability of the maturity effect identified in the main regressions.

Both robustness tests serve as a validation of the estimated relationships and verify that the empirical conclusions do not depend on the precise model setup. Empirical results will be presented and discussed in Chapter 5.5 Robustness Tests.

4. Data and Variables

The dataset is based on the methodology of Pavlov, Steiner and Wachter (2018). Accordingly, this dissertation focuses on the listed U.S. Equity REITs, extended by the COVID-19 crisis, to systematically analyze and compare two major systemic shocks.

4.1 Sample Construction

The empirical analysis is based on a panel dataset of listed U.S. Equity REITs, and the sample design follows the methodological framework of Pavlov, Steiner, and Wachter (2018), which analyzes capital structure adjustments prior to the GFC year and REIT performance during the crisis window.

Data Sources:

Accounting and balance sheet data from REITs were drawn from Compustat, while returns were obtained from CRSP. Datasets were merged with company tickers and names. REIT property type classification was cross-checked with Refinitiv Eikon to ensure that only U.S. Equity REITs were included. Mortgage REITs, hybrid REITs, and non-U.S. firms (such as Canadian firms) were excluded to ensure homogeneity in operating business models.

Sample period and crisis windows:

The data sample covers the GFC pre-crisis period from 2005-2006, and for the COVID-19 pre-crisis period, 2018-2019. The cumulative monthly total return sample period for the GFC was from January 2007 to February 2009, and for COVID January 2020 – December 2020. For

robustness during the COVID-19 crisis the same 26-month window length was tested, analogous to Pavlov, Steiner and Wachter (2018), covering January 2020–February 2022.

Sample Filtering:

Observations were only retained for REITs where financial and accounting data were complete, as well as return data. REITs with missing data for leverage, maturity, or returns were excluded. Each REIT has a single observation per crisis, representing its capital structure prior to a crisis and corresponding crisis period performance to ensure comparability. CTRs are winsorized at the 2nd and 98th percentiles to mitigate any undue influence of outliers in this analysis (Pavlov, Steiner and Wachter, 2018). The final dataset contains 100 Equity REITs for the GFC sample and 160 Equity REITs for the COVID sample.

4.2 Variable Definitions

This chapter describes the construction of all variables that were used in this study. The definition is based on Pavlov, Steiner and Wachter (2018) and Sun, Titman, and Twite (2015). However, since the data source used was Compustat and not SNL Financial, there are slight deviations in the computation of variables. Nevertheless, all variables still fulfill the same purpose despite deviations. All variables are measured in the pre-crisis year (2006 for the GFC and 2019 for the COVID-19 crisis).

Dependent Variable:

Cumulative Monthly Total Return (CTR).

The crisis performance is measured as the cumulative monthly total return during the crisis window. This study uses the original GFC crisis window defined by Pavlov, Steiner, and Wachter (2018) from January 2007 to February 2009. For the COVID-19 crisis this study focuses on the main analysis, January – December 2020, and for the robustness test, January 2020 – February 2022, to compare a crisis window of the same length as Pavlov, Steiner and Wachter (2018). CTR is calculated as the compounded return over the period:

$$CTR_{i,c} = (\prod_{t} (1 + RET_{i,t})) - 1$$

Capital Structure Variables:

Total Debt.

Total interest-bearing debt is computed based on Pavlov, Steiner and Wachter (2018) as the sum of short-term and long-term interest-bearing debt. Short-term debt is approximated using Compustat data. Short-term interest-bearing debt = Debt in Current Liabilities – Accounts Payable (which provides an accurate way to isolate short-term interest-bearing debt). Long-term debt, as defined by Compustat, corresponds to Long-term interest-bearing debt, which is economically suitable because long-term debt in Equity REITs is mostly interest-bearing. Therefore, Total Debt = Short-term debt + long-term debt.

Market Value of Invested Capital (MVIC).

MVIC is computed as the sum of total debt, preferred stock, and market capitalization. MVIC = Total Debt + Preferred Stock + Market Capitalization (Pavlov, Steiner and Wachter, 2018).

Market Capitalization.

Market Capitalization is computed as the number of shares outstanding multiplied by the end-of-year share price: Market Capitalization = Number of shares outstanding x end-of-year share price (Pavlov, Steiner and Wachter, 2018).

Market Leverage.

Market leverage is computed as Market Leverage = Total Debt / MVIC (Pavlov, Steiner and Wachter, 2018).

Change in Leverage.

The change in leverage is measured as the year-on-year change in market leverage between the two years preceding the crisis, for GFC (2005-2006), for COVID-19 (2018-2019) (Pavlov, Steiner and Wachter, 2018).

Debt Maturity Variables:

Share of Debt Due in Two to Three Years.

To measure the refinancing exposure, the ratio is computed as the ratio of total debt maturing in 2–3 years to Total Debt. Debt due in 2-3 years = Debt due in 2 years + Debt due in 3 years. Share of Debt due in 2-3 years = Debt due in 2-3 years / Total Debt. This variable definition is consistent with Pavlov, Steiner and Wachter (2018).

Change in Maturity.

This variable is defined as the year-on-year change in the share of debt due in 2-3 years (Pavlov, Steiner and Wachter, 2018).

Alternative Robustness Definition: Share of Debt Due in 1-5 Years.

To measure the sensitivity of results to broader debt maturities, an alternative variable of debt maturing within 1-5 years is defined as: Debt due in 1-5 years = Debt due in 1 year + Debt due in 2 years + Debt due in 3 years + Debt due in 4 years + Debt due in 5 years. The variable is computed as: Debt due in 1-5 years / Total Debt (Pavlov, Steiner and Wachter, 2018).

Control Variables:

Firm Size.

Firm size is computed as the natural logarithm of market capitalization: Firm Size = ln(Market Capitalization) (Pavlov, Steiner and Wachter, 2018).

Tobin's Q.

The computation of Tobin's Q is followed by Pavlov, Steiner and Wachter (2018) and is defined as: Tobin's Q = (Market Capitalization + Total Assets – Book Value of Equity) / Total Assets.

Cash-to-Assets Ratio.

This variable is computed as the ratio of cash and short-term investments to total assets: Cash-to-Assets = Cash and short-term investments / Total Assets (Pavlov, Steiner and Wachter, 2018).

4.3 Descriptive Statistics

Table 1 Descriptive statistics for listed equity REITs, 2006 & 2019

United States - GFC								
Variable	*N*	*Mean*	*SD*	*P5*	*P25*	*Median*	*P75*	*P95*
Change in Leverage	100	-0,02	0,06	-0,11	-0,07	-0,03	0,00	0,08
Change in Debt Due (2-3y)	100	-0,01	0,18	-0,26	-0,09	0,00	0,06	0,28
Market Leverage	100	0,36	0,16	0,05	0,26	0,36	0,48	0,62
Share of Debt Due (2-3y)	100	0,16	0,15	0,00	0,03	0,14	0,23	0,45
Log of firm size	100	7,31	1,40	5,10	6,58	7,34	8,09	9,63
Tobin's Q	100	1,62	0,45	1,11	1,27	1,55	1,88	2,46
Cash to assets	100	0,04	0,06	0,00	0,01	0,02	0,05	0,14
Cumulative total return 01/2007-02/2009	100	-0,61	0,23	-0,93	-0,80	-0,64	-0,46	-0,14
United States - Covid								
Variable	*N*	*Mean*	*SD*	*P5*	*P25*	*Median*	*P75*	*P95*
Change in Leverage	163	-0,02	0,06	-0,13	-0,06	-0,02	0,01	0,07
Change in Debt Due (2-3y)	163	0,00	0,21	-0,36	-0,07	0,00	0,09	0,28
Market Leverage	163	0,40	0,20	0,15	0,26	0,36	0,50	0,81
Share od Debt Due (2-3y)	163	0,18	0,18	0,00	0,04	0,16	0,23	0,51
Log of firm size	163	7,85	1,69	4,54	7,03	8,05	9,09	10,31
Tobin's Q	163	1,51	0,58	0,93	1,10	1,39	1,72	2,52
Cash to assets	163	0,05	0,09	0,00	0,01	0,02	0,04	0,19
Cumulative total return 01/2020 - 12/2020	163	-0,12	0,26	-0,52	-0,29	-0,12	0,04	0,24

Table 1 is based on the methodology of Pavlov, Steiner and Wachter (2018) and presents descriptive statistics for U.S.-listed equity REITs in the pre-crisis years 2006 and 2019. In general, the patterns look similar to Pavlov, Steiner and Wachter (2018) but with significant differences between the GFC and the COVID-19 crisis. The differences form the foundation of the empirical analysis in Chapter 5, Empirical Results.

Capital Structure Adjustments:

Prior to the year of crisis, REITs reduced leverage on average by -0.02 in both 2006 and 2019. These results are consistent with Pavlov, Steiner and Wachter (2018), who illustrate that prior to the GFC, REITs made changes in their financial structure, suggesting that the extent of pre-crisis leverage adjustments did not materially change over time. However, REITs were more highly leveraged in market leverage as well as in debt maturities due in 2-3 years compared to the GFC period. This observation leads to the empirical question of whether the negative relation between leverage and crisis performance observed by Pavlov, Steiner and Wachter (2018) also persists in an environment where REITs had systematically higher leverage while the macroeconomic shock is lower.

Debt Maturity Structure:

Within the two crisis samples, the average share of debt due in 2-3 years is very similar (0.16 in 2006 and 0.18 in 2019). However, during the COVID period, the dispersion is higher, with the 95th percentile reaching 0.51, while the result in the GFC sample is only 0.43. These results indicate that a smaller number of REITs entered the COVID-19 crisis with substantial near-

term refinancing exposure and provide the economic foundation for hypothesis H1b, which suggests an analysis of debt maturities in both crises.

Market Leverage Levels.

The average market leverage level increased from 0.36 in 2006 to 0.40 in 2019, indicating a moderate re-leveraging of the property REIT sector over time. Higher leverage combined with lower debt maturity adjustments prior to the COVID crisis indicates that REITs were more highly leveraged prior to COVID but worked less on reducing their capital structure. This leads to the question of whether leverage, which was strongly negatively correlated with performance during the GFC, is a risk predictor for the COVID-19 crisis. This question will be analyzed in Chapter 5.

Firm Size and Valuation Differences.

Before COVID, REITs were substantially larger than prior to the GFC. The mean log of firm size increased from 7.31 to 7.85. Tobin's Q, by comparison, falls slightly from 1.62 to 1.51 (mean), indicating that market valuations were relatively lower than fundamentals. Larger company structures with moderate valuation may explain why the COVID downturn resulted in substantially milder return losses than the GFC.

Liquidity.

The cash-to-assets ratio remained nearly unchanged, which suggests that liquidity buffers did not materially change across periods. While cash holdings are, in general, important for short-term financial flexibility, the lack of variation indicates that liquidity is unlikely to explain cross-crisis differences in performance. In comparison, leverage and debt maturity seem to be the primary sources of variation in crisis resilience.

Crisis Performance.

Cumulative total returns averaged −0.61 during the GFC, compared with only -0.12 during the COVID-19 crisis. This large difference in the CTRs in the two crises shows that the magnitude, duration, and market dynamics differed across the two economic downturns. These differences suggest that firm-specific effects, which were documented by Pavlov, Steiner and Wachter (2018), do not fully carry over to the COVID sample in the same way. This motivates the central research question of this study: Does the "preparation matters" mechanism also work in a structurally different crisis?

To summarize, the descriptive statistics yield three main findings:

1. REITs reduced leverage before both crises but with significantly different heterogeneity.
2. In the pre-COVID period, leverage levels were higher, while refinancing risks were unevenly distributed.
3. COVID performance was milder overall, which suggests a reassessment of the generalizability of Pavlov, Steiner and Wachter's (2018) results.

Table 2 Correlation table for main variables, 2006 & 2019

United States - GFC	1	2	3	4	5	6	7	8
(1) Cumulative total return 01/2007-02/2009	1							
(2) Change in Leverage	0.0263	1						
(3) Change in Debt Due (2-3y)	0.0792	0.1485	1					
(4) Market Leverage	-0.5619*	0.0490	0.0586	1				
(5) Share of Debt Due (2-3y)	0.0594	-0.0994	0.5369*	0.0656	1			
(6) Log of firm size	-0.2869*	-0.3143*	-0.1264	-0.0635	-0.0186	1		
(7) Tobin's Q	0.1251	-0.2789*	-0.2098*	-0.5281*	-0.1393	0.4932*	1	
(8) Cash to assets	0.0451	-0.0805	-0.1656	-0.0725	-0.0994	-0.0261	0.1362	1
United States - Covid	1	2	3	4	5	6	7	8
(1) Cumulative total return 01/2020 - 12/2020	1							
(2) Change in Leverage	-0.0012	1						
(3) Change in Debt Due (2-3y)	0.0576	-0.0259	1					
(4) Market Leverage	-0.2954*	0.2056*	-0.1545*	1				
(5) Share of Debt Due (2-3y)	-0.2372*	0.0591	0.4515*	0.0122	1			
(6) Log of firm size	-0.0300	-0.1398	-0.0265	-0.3738*	-0.0721	1		
(7) Tobin's Q	0.2020*	-0.0979	0.1978*	-0.5274*	0.0165	0.5548*	1	
(8) Cash to assets	0.1171	0.0924	-0.0149	-0.1551*	0.2354*	-0.2664*	-0.1373	1

Table 2 is based on the methodology of Pavlov, Steiner and Wachter (2018) and shows the correlation matrix of the main variables for the pre-crisis year of the GFC and the COVID-pandemic. This matrix serves two purposes; it provides a descriptive overview of correlations between capital structure and crisis performance and allows a preliminary assessment of potential multicollinearity before using the regression analysis. Overall, the patterns confirm several theoretically expected correlations but also reveal important differences between the two crises.

Correlations with crisis performance

In the GFC sample, cumulative total returns show only weak linear relationships with pre-crisis adjustments. The correlations of the change in leverage (0.03) and the change in debt due in 2–3 years (0.08) are close to zero. In comparison, there is a strong negative correlation between CTR and market leverage (-0.56*), indicating that REITs with high leverage performed worse during the GFC. Furthermore, there is a moderate negative relationship with firm size (-0.29*), while the correlations of Tobin's Q (0.13) and cash-to-assets (0.05) are low and statistically insignificant.

The COVID sample shows a different picture. The correlation of CTR with market leverage remains negative but is smaller in magnitude (-0.30*). While the significance is lower, leverage still plays a role in REITs in crisis performance. It is noteworthy that the share of debt due in 2-3 years is now significantly negatively correlated with CTR (-0.24*), indicating that a shorter financing horizon in 2020 was correlated with lower performance. In contrast to the GFC period, firm size is almost uncorrelated with performance (-0.03), while Tobin's Q shows a positive and significant relationship (0.20*). This suggests that valuation and growth prospects played a higher role during the COVID-19 crisis. The correlation between CTR and change in leverage and debt due in 2-3 years remains low, which implies that their impact needs to be analyzed in a multivariate setting.

Structure of Capital Structure Variables and Controls

This matrix also provides insights into the internal structure of the balance sheet. In both samples, a negative correlation exists between market leverage and firm size (-0.06 in 2006 and -0.37* in 2019), as well as market leverage and Tobin's Q (-0.53* in both samples). This indicates that larger and higher-valued REITs tend to have lower leverage levels on their balance sheet. Debt due in 2–3 years is strongly positively correlated with its change in both samples (0.54* in 2006 and 0.45 in 2019), reflecting the persistence of debt maturity: REITs that start with more medium-term debt are also those that adjust debt maturities more strongly.

Firm size is in both samples positively associated with Tobin's Q (0.49* and 0.55*), while it is negatively associated during the COVID sample with cash-to-assets (-0.27*). It suggests that larger REITs combine higher valuation with lower liquidity buffers. Cash-to-assets itself shows only weak correlation to the remaining variables and almost no relationship with crisis performance; liquidity is therefore not a primary driver of cross-sectional performance differences.

Implications

To summarize, these correlations highlight three major points: First, higher leverage is associated with worse performance, especially during the GFC. Second, refinancing risks measured by the share of debt due in 2-3 years gain greater relevance during the COVID period, where it is clearly negatively related to returns. Third, changes in capital structures show weak correlation with performance in both samples, which suggests that the use of multivariate

models in Chapter 5 is necessary to isolate their effects while controlling for firm characteristics.

Table 3 Firm characteristics sorted by leverage ratio quintiles 2006 & 2019

United States - GFC	1	2	3	4	5	Difference	*(t-stat)*
Market Leverage	0.121357	0.292214	0.360804	0.453054	0.584611	0.463***	(19.82)
Share of Debt Due (2-3y)	0.139183	0.161547	0.178848	0.141621	0.189447	0.050	(0.81)
Change in Leverage	-0.028561	-0.047531	-0.021342	-0.003243	-0.011763	0.017	(1.01)
Change in Debt Due (2-3y)	-0.050888	-0.033727	0.012630	0.008091	0.015928	0.067	(0.95)
Log of firm size	7.397413	7.964521	7.913238	6.861010	6.405947	-0.991**	(-2.07)
Tobin's Q	2.081924	1.823998	1.627092	1.346142	1.217137	-0.865***	(-7.10)
Cash to assets	0.050432	0.022095	0.055271	0.043371	0.028757	-0.022	(-1.25)
Cumulative total return 01/2007-02/2009	-0.436852	-0.595448	-0.538209	-0.724572	-0.751169	-0.314***	(-4.63)
United States - Covid	1	2	3	4	5	Difference	*(t-stat)*
Market Leverage	0.178300	0.280337	0.360643	0.455618	0.723769	0.545***	(22.77)
Share of Debt Due (2-3y)	0.198652	0.114158	0.193909	0.176483	0.202527	0.004	(0.08)
Change in Leverage	-0.030917	-0.027404	-0.038452	-0.033797	0.012943	0.044***	(3.20)
Change in Debt Due (2-3y)	0.055998	-0.024322	0.031370	-0.060616	-0.023147	-0.079	(-1.48)
Log of firm size	8.719411	8.659294	8.195152	7.193141	6.506588	-2.213***	(-5.70)
Tobin's Q	2.088020	1.604451	1.549408	1.253897	1.035540	-1.052***	(-7.96)
Cash to assets	0.079495	0.017236	0.046072	0.051321	0.031198	-0.048	(-1.62)
Cumulative total return 01/2020 - 12/2020	-0.016103	-0.053126	-0.134141	-0.158477	-0.224247	-0.208***	(-2.74)

Table 3 is based on the methodology of Pavlov, Steiner and Wachter (2018) and compares company characteristics across leverage ratio quintiles for the pre-crisis period 2006 (GFC) and 2019 (COVID). Sorting firms by their market leverage shows clear economic patterns.

Leverage Dispersion Across Quintiles

In both crisis periods, market leverage exhibits a large difference between the largest and the lowest quintiles. The difference between Q1 and Q5 is 0.463*** prior to the GFC and 0.545*** prior to the COVID-19 crisis, which indicates that the dispersion in capital structure was slightly more pronounced before the pandemic.

Debt Maturity Structure

While market leverage has a large difference between the lowest and highest quintiles, debt maturities do not show significant differences across both crises (GFC 0.050; COVID 0.004). In addition, changes in debt maturities are insignificant (GFC 0.067; COVID -0.079). This suggests that refinancing horizons were not mechanically connected to leverage conditions; highly leveraged REITs did not necessarily operate with shorter maturities.

Capital Structure Adjustments

The results show that capital structure adjustments exhibit an important difference across crisis periods. Prior to the GFC period, there were almost no differences in capital structure adjustments between Q1 and Q5 (0.017). In contrast, the COVID sample exhibits a significant

difference, as highly leveraged REITs reduced their leverage more strongly (0.044***). This suggests a clearer precautionary adjustment among REITs with a higher capital risk profile.

Firm Size, Valuation, and Liquidity

REIT fundamentals show a clear pattern. Firm size declines significantly across market leverage quintiles in both crises, both in 2006 (-0.991**) and even larger in 2019 (-2.213***). This confirms that highly leveraged REITs are significantly smaller in firm size.

Tobin's Q declines also across market leverage quintiles with highly significant differences (-0.865***) in 2006 and (-1.052***) in 2019. This suggests that REITs with higher leverage tend to exhibit substantially lower market valuations and lower growth potential.

Crisis Performance Across Quintiles

Crisis performance shows a consistent pattern across crisis periods. High-leveraged REITs performed significantly worse. During the GFC, Q5 REITs earned on average -0.314*** lower cumulative total returns than Q1 REITs. The same pattern can be observed during the COVID-19 crisis where the difference remained economically and statistically relevant at -0.208***. Table 3 confirms that leverage plays a central role in crisis resilience, setting a clear motivation for the regression analysis in Chapter 5.

Table 4 Capital structure choices in 2006 & 2019 sorted by cumulative total return quintiles 2007-2009 & 2020

United States - GFC	1	2	3	4	5	Difference	*(t-stat)*
Cumulative total return 2007-2009	-0.891047	-0.751758	-0.630490	-0.471202	-0.230651	0.660***	(26.152)
Market Leverage	0.466640	0.410367	0.351875	0.338312	0.216564	-0.250***	(-5.807)
Share of Debt Due (2-3y)	0.143184	0.136509	0.200680	0.147991	0.189291	0.046	(0.852)
Change in Leverage	-0.033022	0.010976	-0.032384	-0.023148	-0.038355	-0.005	(-0.347)
Change in Debt Due (2-3y)	0.004414	-0.061259	0.027955	0.012108	-0.034053	-0.038	(-0.495)
United States - Covid	1	2	3	4	5	Difference	*(t-stat)*
Cumulative total return 01/2020 - 12/2020	-0.457783	-0.254659	-0.123143	0.007917	0.240509	0.698***	(16.093)
Market Leverage	0.573902	0.402168	0.305205	0.358199	0.359933	-0.214***	(-3.976)
Share of Debt Due (2-3y)	0.274225	0.153347	0.154024	0.199232	0.106778	-0.167***	(-3.607)
Change in Leverage	-0.001949	-0.024213	-0.038528	-0.038442	-0.014539	-0.013	(-0.718)
Change in Debt Due (2-3y)	-0.009155	-0.001545	-0.026577	0.023680	-0.003874	0.005	(0.089)

Table 4 is based on the methodology of Pavlov, Steiner and Wachter (2018) and compares company characteristics across CTR-based quintiles for the pre-crisis period 2006 (GFC) and 2019 (COVID).

Performance Sorting and Capital Structure Profiles During the GFC

Sorting firms by cumulative total return quintiles reveals structural differences between winners and losers of the GFC. The performance gap between the highest and lowest quintiles, with 0.660***, is highly significant and shows that the crisis produced a wide dispersion in realized

equity returns. More importantly, the performance difference is clearly connected to capital structure prior to the crisis: REITs in the top quintiles revealed significantly lower leverage levels than REITs in the lowest quintiles (difference = -0.250***). This confirms that conservative capital structures provide meaningful downside protection once market stress is intensified.

On the other hand, debt maturities showed no statistically significant differences between performance quintiles. Neither the amount of debt due in 2-3 years (difference = 0.046) nor the change of debt maturities differentiated between good or bad performance. Change in leverage in 2006 was also not significant in 2006 (-0.005). This indicates that, for the GFC, the level of leverage and short-term adjustment were not primary factors in determining crisis resilience.

Performance Sorting and Capital structure Profiles During the COVID-19 Crisis

The COVID crisis revealed a significant difference in performance (= 0.698***). As previously, REITs with lower leverage levels achieved significantly higher returns (difference Market Leverage = -0.214***). This confirms the role of low leverage across both crises as a resilience driver. However, in contrast to the GFC, the COVID-19 crisis differentiated significantly across quintiles. Debt maturities due in 2-3 years are significantly lower for the best-performing REITs in the COVID sample (difference = -0.167***). This indicates that short-term refinancing risk played a more prominent role in 2020 than in 2007–2009. As liquidity shocks and limited capital-market access characterized the COVID-19 crisis, these effects made short-term debt exposure more consequential.

As in the GFC period, differences in changes in leverage (-0.013) and changes in debt maturities prior to the crisis (0.005) were not significant across quintiles. This suggests that leverage levels and debt maturities were the main drivers of performance differences during the COVID sample, rather than their short-term changes.

Overall Interpretation

Table 4 shows that REITs with better crisis performance were characterized by lower leverage levels across both crises. While leverage was the primary driver during the GFC, debt maturities played an additional significant role during the COVID sample. These results build the foundation for the following regression analysis, which formally tests whether these relationships persist with structural differences and after controlling for firm characteristics and whether leverage and maturity adjustments translate into superior crisis performance.

5. Empirical Results

In this chapter, the main empirical results are presented to analyze the developed hypotheses in Chapter 3. This analysis follows a clear structure: First, the main OLS regressions will observe whether capital structure adjustments prior to the crisis window can explain REIT performance during the GFC and COVID-19 crisis (H1). Second, logistic models will which REITs are more likely to adjust their capital structure. This helps to answer the question "who prepares?" (H2). Finally, property-type-based regression will test whether there exists a variation of capital structure adjustments between cyclical and defensive property-type sectors (H3). To ensure a clear structure, the main results will be presented separately from the robustness analyses. The robustness analyses are based on alternative crisis windows and on an alternative variable definition of debt maturity. This structure follows the methodology of Pavlov, Steiner and Wachter (2018) to ensure that the interpretation of results is consistent across both crises.

5.1 Baseline: Leverage & Maturity Effects (H1)

Table 5 Regression results for cumulative total returns 2007-2009 & 2020

United States - GFC				
Dependent Variable:	(1)	(2)	(3)	(4)
(1+2) CTR GFC 01/2007-02/2009	United States	United States	United States	United States
(3+4) CTR Covid 01/2020-12/2020	GFC	GFC	Covid	Covid
Change in Leverage	-0.553*		0.150	
	(-1.88)		(0.32)	
Change in Debt Due (2-3y)		-0.048		-0.026
		(-0.40)		(-0.24)
Market Leverage	-0.613***		-0.306*	
	(-4.77)		(-1.68)	
Log of firm size	-0.033**	-0.034**	-0.023	-0.012
	(-2.48)	(-2.08)	(-1.15)	(-0.58)
Tobin's Q	-0.037	0.134***	0.028	0.080
	(-0.64)	(2.72)	(0.45)	(1.44)
Cash to assets	0.028	-0.027	0.168	0.355
	(0.12)	(-0.09)	(0.66)	(1.24)
Constant	-0.185	-0.691***	0.140	-0.135
	(-1.30)	(-6.72)	(0.73)	(-1.10)
Observations	100	100	163	163
R-squared	0.529	0.419	0.232	0.208
Sector effects	Yes	Yes	Yes	Yes

Table 5 reports the results of the cross-sectional OLS regressions estimated in this study, based on the model specification introduced above and following the methodological framework of Pavlov, Steiner and Wachter (2018). In this regression, the effect of capital structure

adjustments prior to the crisis window is tested to explain the crisis performance of Equity REITs. Hypothesis H1(a) predicts that REITs, which reduced leverage levels prior to a crisis, achieved better cumulative total returns, while hypothesis H1(b) expects that extending debt maturities leads to better crisis performance of REITs.

H1(a) Leverage Adjustments

The results in Table 5 provide moderate evidence for H1(a). The coefficient for *Change in Leverage* is negative and statistically significant at the 10% level (-0.553*, t = -1.88). This indicates that REITs which reduced leverage levels prior to the GFC (2006), achieved significantly higher returns during the crisis window 2007-2009. Compared to Pavlov, Steiner and Wachter (2018), the effect is weaker both in magnitude and statistical significance, but it points in the same direction and therefore remains consistent with their central finding that pre-crisis deleveraging improves crisis performance.

In contrast, the COVID sample showed no evidence of a relationship. The effect is statistically not significant (0.150, t = 0.32), which suggests that deleveraging prior to the COVID crisis in 2020 had no impact on crisis performance. Rather than being driven by the exogenous nature of the shock itself, this result is consistent with the substantially smaller magnitude of the COVID shock, as evidenced by markedly lower absolute cumulative total returns compared to the GFC. During the pandemic, investors appear to have perceived REIT cash flow risk as more contained, supported by rapid monetary and fiscal interventions that stabilized capital markets. As a result, balance sheet leverage reductions were less relevant for performance differentiation, while sectoral exposure and expectations about future cash flow stability played a more prominent role.

H1(b) Debt Maturity Adjustments

The results in Table 5 show no evidence for H1(b) – neither during the GFC nor during the COVID crisis. The coefficient for *Change in Debt Due (2-3y)* is small and statistically insignificant in both periods (GFC: -0.048, t = -0.40; COVID: -0.026, t = -0.24). This indicates that extensions of debt maturities prior to a crisis show no measurable performance advantage for REITs. A general conclusion might be that REITs are long-term financed since it's the nature of real estate asset financing, which limits the potential impact of maturity adjustments.

Overall, the regression models show that leverage reductions prior to the GFC significantly improved performance, while debt maturity adjustments had no significant impact in both crisis

periods. Furthermore, the results of the COVID crisis show that the mechanisms of the GFC cannot be directly transferred to a completely different type of crisis.

5.2 Who Prepares? (H2)

Table 6 Regression results for likelihood to reduce leverage or extend debt maturity 2006 & 2019

United States - GFC + Covid	GFC	GFC	Covid	Covid
Dependent Variables:	(1)	(2)	(3)	(4)
Market Leverage Debt Maturity Share	Leverage	Maturity	Leverage	Maturity
Market Leverage	5.278**		0.834	
	(2.24)		(0.64)	
Share of Debt Due (2-3y)		11.243***		10.018***
		(3.65)		(4.65)
Log of firm size	-0.018	0.236	-0.048	-0.003
	(-0.08)	(0.94)	(-0.31)	(-0.01)
Tobin's Q	0.949	-0.339	-0.200	0.044
	(0.86)	(-0.41)	(-0.34)	(0.08)
Cash to assets	4.328	1.329	1.779	-11.252***
	(1.14)	(0.22)	(0.79)	(-3.33)
Constant	-5.719**	-3897	-0.512	-2.702*
	(-2.02)	(-1.49)	(-0.32)	(-1.89)
Observations	100	100	163	163
Sector effects	Yes	Yes	Yes	Yes
Pseudo- R squared	0.120	0.309	0.063	0.097

The regression models in Table 6 follow the methodology of Pavlov, Steiner and Wachter (2018) and analyze which companies adjusted their capital structure prior to a crisis. Hypothesis 2 assumes that REITs with higher capital structure risk, especially high leverage and short-term debt, tend to reduce their leverage or debt maturities.

Leverage Adjustments (Columns 1 and 3)

The results presented in the table show significantly stronger evidence in support of H2 in the GFC sample. REITs with higher market leverage reduced their leverage significantly more frequently (coefficient 5.278**, t = 2.24). This indicates that highly leveraged REITs recognized higher refinancing risks prior to a crisis and accordingly adjusted their balance sheet positions. Other firm characteristics did not significantly explain leverage reductions during this sample.

The COVID sample showed no comparable pattern as in the GFC. The coefficient was positive but statistically not significant (0.834, t = 0.64). This suggests that highly leveraged REITs in 2019 did not systematically reduce leverage. One plausible reason could be the character of the COVID crisis, which had no clear pre-market indicators for the upcoming crisis.

Debt Maturity Adjustments (Columns 2 and 4)

The results of debt maturity adjustments support evidence for H2 across both crises. For the GFC sample, REITs with higher short-term refinancing risk measured by the share of debt due in 2-3 years were significantly more likely to extend debt maturity (11.243***, t = 3.65). This suggests that REITs with greater refinancing risk actively lengthened or reduced their short-term maturity profiles ahead of the crisis.

A nearly identical pattern can be observed for the COVID crisis. A higher share of debt due in 2-3 years leads again to a significantly higher probability of debt maturity extensions (10.018***, t = 4.65). In contrast to leverage adjustments, debt maturity management is a consistently used instrument for risk reduction in both crises.

Additional Patterns

It is noticeable that a significantly negative relationship exists between the cash-to-assets ratio and debt maturity adjustments in the COVID sample (-11.252***, t = -3.33). This indicates that REITs with lower liquidity buffers tend to reduce refinancing risk more strongly by extending debt maturities.

Summary

The regression results from Table 6 only provide partial support for H2. REITs with higher capital-structure-related risks, measured by market leverage and debt maturity due in 2-3 years, showed a higher likelihood of adjusting capital structures prior to a crisis. The missing leverage adjustments prior to the COVID-19 crisis clearly show that not all patterns of capital adjustments prior to a crisis were the same.

5.4 Property-Type Heterogeneity (H3)

Table 7 Regression results for cumulative total return for sectors 2007-2009 & 2020

United States - GFC + Covid	ΔLev	ΔDM	ΔLev	ΔDM
Dependent Variable: (1+2) CTR GFC 01/2007-02/2009 (3+4) CTR Covid 01/2020-12/2020	(1) United States GFC	(2) United States GFC	(3) United States Covid	(4) United States Covid
ΔLeverage (Defensive baseline)	-1.077**		-0.216	
	(-2.49)		(-0.35)	
ΔLeverage × Cyclical	0.962*		0.312	
	(1.70)		(0.39)	
ΔMat(2–3y) (Defensive baseline)		-0.192		-0.510**
		(-0.84)		(-2.00)
ΔMat(2–3y) × Cyclical		0.383		0.524*
		(1.29)		(1.92)
Market Leverage	-0.659***		-0.278	
	(-4.88)		(-1.57)	
Log of firm size	-0.041***	-0.043**	-0.024	-0.021
	(-2.67)	(-2.38)	(-1.24)	(-1.10)
Tobin's Q	0.053	0.235***	0.099*	0.169***
	(0.77)	(3.86)	(1.70)	(4.46)
Cash to assets	-0.089	-0.272	0.197	0.361
	(-0.31)	(-0.79)	(0.71)	(1.23)
Constant	-0.161	-0.662***	0.025	-0.226*
	(-1.12)	(-5.56)	(0.14)	(-1.69)
Observations	100	100	163	163
R-squared	0.314	0.197	0.112	0.110
Sector effects	No	No	No	No

The property-type based regressions in Table 7 extend Pavlov, Steiner and Wachter's (2018) by applying sectoral heterogeneity in the analysis of capital structure adjustments prior to a crisis. Instead of focusing on the average effects over the total REIT universe, this specification allows these effects of leverage and maturity adjustments to differ between defensive (e.g. Residential, Healthcare) and cyclical sectors (e.g. Office, Retail, Logistics). With the interaction of capital structure adjustments and a cyclical sector indicator, this model tests if "preparation matters" mechanisms vary across property-type risk profiles.

GFC Results

For the GFC sample, the results show that the performance effects of anticipated leverage-reductions are completely driven by defensive REITs. The coefficient on ΔLeverage for the defensive baseline is high and statistically significant (-1.077*, t = -2.49), indicating that defensive REITs strongly benefit from leverage reductions prior to a crisis.

The interaction term ΔLeverage × Cyclical is positive (0.962*, t = 1.70) and compensates for a large part of the defensive base effect. As a result, the effect of leverage reductions for cyclical REITs is economically small and statistically insignificant, which implies that did not significantly improve crisis performance for cyclical property types.

Regarding debt maturities, neither the defensive baseline effect nor the interaction term is statistically significant. This shows that debt maturity adjustments have no effects on crisis performance and underlines that leverage effects are the dominant and sector-specific channel.

COVID Results

During the COVID-19 crisis, leverage adjustments show no statistically significant effect for either defensive or cyclical REITs. The coefficients for ΔLeverage are small and insignificant for both groups, confirming that deleveraging was not a relevant performance driver during the pandemic.

In contrast, debt maturity plays a crucial role, but only for defensive REITs. The coefficient of ΔMat(2–3y) for the defensive basis is negative and statistically significant (–0.510**, t = –2.00), indicating that defensive REITs with higher short-term refinancing exposure show a poor crisis performance.

The interaction term with cyclic sectors is positive (0.524*, t = 1,92) and broadly compensates for the defensive basis effect. This leads to a net effect for cyclical REITs that is not statistically significant, implying that the duration channel observed during COVID-19 is entirely driven by defensive property types.

Interpretation

The results show distinct sectoral asymmetries in the impact of capital structure adjustments on crisis performance. During the GFC, the benefits of anticipated deleveraging focused on defensive REITs, while cyclical property types showed no statistically significant performance effects. Looking at debt maturities, a similar pattern arises during the COVID-19 pandemic: short-term refinancing exposure only has a negative impact on the performance of defensive REITs, whereas cyclical sectors remain largely unaffected. Overall, capital structure preparations do not have the same effect across all property types but are driven by defensive sectors whose stable but less flexible cash flow structures make them more sensitive to balance sheet risks in both credit market-driven and cash-flow-driven crises.

5.5 Robustness Tests

Table 8 Regression results for cumulative total return 2007-2009 & 2020 & 2020-2022

United States - GFC					
Dependent Variable:					
(1) CTR GFC 01/2007-02/2009	(1)	(2)	(3)	(4a)	(4b)
(2) CTR Covid 01/2020-12/2020	United States	United States	United States	United States	United States
(3+4) CTR Covid 01/2020-02/2022	GFC	Covid	Covid	Covid	Covid
Change in Leverage			0.366		
			(0.61)		
Change in Debt Due (2-3y)				-0.120	
				(-0.83)	
Change in Debt Due (1-5y)	0.001	0.135			0.235
	(0.01)	(1.49)			(1.54)
Market Leverage			-0.484*		
			(-1.87)		
Log of firm size	-0.034**	-0.007	-0.026	-0.010	-0.001
	(-2.07)	(-0.35)	(-1.17)	(-0.46)	(-0.05)
Tobin's Q	0.137***	0.068	-0.078	0.013	-0.017
	(2.79)	(1.21)	(-1.10)	(0.19)	(-0.26)
Cash to assets	-0.006	0.303	0.014	0.309	0.221
	(-0.02)	(1.17)	(0.04)	(0.66)	(.053)
Constant	-0.695***	-0.150	0.507*	0.069	0.047
	(-6.87)	(-1.24)	(1.79)	0.37)	(0.27)
Observations	100	163	163	163	163
R-squared	0.418	0.221	0.285	0.278	0.278
Sector effects	Yes	Yes	Yes	Yes	Yes

To ensure that the main regression results do not depend on specific variable definitions or the choice of a specific COVID window, Table 8 shows two robustness tests: (i) an alternative variable definition – debt maturity due in 1-5 years (instead of 2-3 years) and an extended COVID window with the same length as in Pavlov, Steiner and Wachter's (2018) approach by using a 26-month window, beginning in January 2020 and ending in February 2022.

(i) Alternative Debt Maturity Definition (Columns 1 and 2)

In columns 1 and 2, the original variable debt due in 2–3 years is replaced by debt due in 1–5 years. In the GFC sample, in column 1, the coefficient is almost at zero (0.001; t = 0.01), indicating that changes in debt maturities due in 1-5 years are therefore unrelated to crisis performance. For the COVID sample in 2020 (column 2), the picture is unchanged. The effect is statistically not significant (0.135; t = 1.49). The broader definition of debt maturities does not change results. There is still no evidence that debt maturity adjustments in terms of H1(b) explain crisis performance.

(ii) Extended COVID-window (Columns 3, 4a, 4b)

Columns 3, 4a, and 4b investigate whether COVID-19 results depend on the length of the COVID crisis window by extending the COVID window from January 2020 to February 2022. In column 3, leverage adjustments stay insignificant (ΔLeverage = 0.366; t = 0.61), while the level of market leverage still has a negative relationship with crisis performance (-0.484*; t = –1.87). In column 4a, debt maturity adjustments due in 2-3 years are investigated; the effect is small and insignificant (-0.120; t = -0.83). In column 4b, the regression from column 4a is repeated using the alternative maturity adjustment variable. In this case, changes in debt maturities due in 1-5 years were tested; results remained statistically insignificant (0.235; t = 1.54).

Regardless of the specification, it should be noted that neither leverage adjustments nor changes in debt maturities influence the performance during the extended COVID period; only the level of market leverage plays a role.

Conclusion

Robustness tests in Table 8 confirm the key message from H1: The results are insensitive to alternative debt maturity definitions – maturity adjustments remain insignificant. The extended COVID window does not change the fact that changes in leverage levels or debt maturities are not rewarded during the crisis window. To summarize, the differences between the GFC and the COVID period are not driven by arbitrary modeling choices but rather reflect fundamental differences in crisis mechanisms.

Table 9 Regression results for likelihood to reduce leverage or extend debt maturity 2006 & 2019

United States - GFC + Covid	GFC	Covid
Dependent Variable:	(1)	(2)
Debt Maturity Share	Maturity	Maturity
Share of Debt Due (1-5y)	3.504***	2.074***
	(3.33)	(2.72)
Log of firm size	0.144	0.001
	(0.68)	(0.01)
Tobin's Q	-0.478	0.181
	(-0.63)	(0.41)
Cash to assets	3.033	-2.657
	(0.63)	(-1.26)
Constant	-2.273	-1.975*
	(-1.57)	(-1.96)
Observations	100	163
Sector effects	0.160	0.097
Pseudo- R squared	Yes	Yes

Table 9 tests the robustness from H2 by exchanging the original debt maturity variable due in 2-3 years with a broader debt maturity measure due in 1-5 years. The dependent variable is still the probability of extending debt maturities prior to a crisis.

Robustness Results for the GFC

In column 1, the coefficient of the debt maturity due in 1-5 years is positive and highly significant (3.504***, t = 3.33). With these results, the robustness analysis confirms the main results: REITs with a high short-term debt are more likely to extend debt maturities prior to a crisis. The control variables remain insignificant, which indicates that refinancing pressure is the key driver for adjustment patterns in the pre-crisis year 2006.

Robustness Results for the COVID Crisis

Similarly, in column 2 for the year 2019, there is a clear significant relationship between refinancing pressure and adjustments: The coefficient is 2.074*** (t = 2.72). This indicates as well that prior to the COVID crisis, REITs systematically extended their debt maturities. As in the GFC, control variables do not play a role; the constant is weakly significant, -1.975* (t = -1.96), which underlines the relevance of refinancing risks.

Conclusion

The robustness results confirm H2 without restriction: (i) Regardless of the definition of debt maturity and regardless of the crisis (GFC and COVID), REITs with higher refinancing exposure extended their debt maturities systematically prior to the crisis. Overall, the key message remains: Refinancing risk is the main driver for maturity adjustments – not firm size, valuation, or liquidity.

Table 10 Regression results for cumulative total return for sectors 2007-2009 & 2020 & 2020-2022

United States - GFC + Covid	ΔDM	ΔDM	ΔLev	ΔDM	ΔDM
Dependent Variable:	(1)	(2)	(3)	(4a)	(4b)
(1) CTR GFC 01/2007-02/2009	United	United	United	United	United
(2) CTR Covid 01/2020-12/2020	States	States	States	States	States
(3+4) CTR Covid 01/2020-02/2022	GFC	Covid	Covid	Covid	Covid
ΔLeverage (Defensive baseline)			-0.903		
			(-0.85)		
ΔLeverage × Cyclical			1.309		
			(1.10)		
ΔMat(2–3y) (Defensive baseline)				-0.793*	
				(-1.92)	
ΔMat(2–3y) × Cyclical				0.680	
				(1.54)	
ΔMat(1–5y) (Defensive baseline)	-0.104	0.004			0.032
	(-0.39)	(0.03)			(0.07)
ΔMat(1–5y) × Cyclical	0.234	0.083			0.100
	(0.76)	(0.44)			(0.21)
Market Leverage			-0.309		
			(-1.20)		
Log of firm size	-0.043**	-0.013	-0.022	-0.024	-0.010
	(-2.31)	(-0.61)	(-0.82)	(-0.91)	(-0.36)
Tobin's Q	0.235***	0.140***	0.089	0.187***	0.134*
	(3.81)	(2.68)	(1.04)	(2.96)	(1.69)
Cash to assets	-0.198	0.333	0.047	0.210	0.171
	(-0.52)	(1.16)	(0.10)	(0.43)	(0.36)
Constant	-0.666***	-0.244*	0.276	0.014	-0.009
	(-5.57)	(-1.76)	(1.06)	(0.07)	(-0.04)
Observations	100	163	163	163	163
R-squared	0.187	0.093	0.049	0.054	0.035
Sector effects	No	No	No	No	No

Table 10 investigates the property type results of the main regression with two additional robustness tests: An alternative definition of the debt maturity variable (due in 1-5 years) and an extended COVID window (January 2022 – February 2022). The aim is to check whether the main results from the baseline regression remain constant.

GFC Robustness (Column 1)

For the GFC period, the debt maturity structure also does not have a significant impact on crisis performance. Neither defensive REITs (-0.104, t = -0.39) nor cyclical REITs (0.234, t = 0.76) show significant effects. This confirms the main results that, during the GFC, especially leverage adjustments, played a major role in comparison to debt maturity. At the same time, the control variables remain significant, particularly firm size and Tobin's Q, which underlines the consistency of the models.

COVID Robustness – (Columns 2, 3, 4a&b)

For the 2020 COVID period, the debt maturity definition due in 1-5 years does not show significant differences across property types (column 2). In the extended COVID window, clear differences across sectors emerge: Defensive REITs show a significant negative effect for ΔMat(2–3y), with a coefficient of –0.793* (t = –1.92), while cyclical REITs are not significantly affected (0.690, t = 1.54). This confirms the main results that during the COVID crisis, defensive property type REITs suffered more from short debt maturities. The alternative debt maturity definition due in 1-5 years in column 4b shows no significant results relative to column 4a (0.032, t = 0.07), which indicates that the tighter debt maturity due in 2-3 years is the more appropriate risk measure.

COVID Robustness – Leverage Adjustments (column 3)

The extended COVID window also confirms that leverage adjustments during the COVID period had no sectoral differences in crisis performance. Neither the defensive basis (-0.903, t = -0.85) nor the interaction term of cyclical REITs is significant (1.309, t = 1.10).

Interpretation

In general, the robustness analysis confirms the crisis dependence of sectoral effects: During the GFC, deleveraging was the key adjustment instrument – especially for the defensive sector. During the COVID crisis, debt maturity adjustments were the dominant mechanism, with significant disadvantages for defensive sectors. This clearly shows that H3 does not apply uniformly. The benefit of capital structure adjustments depends on the sectoral differences as well as on the type of crisis – there is no such thing as a "universally effective" preparation concept.

6. Discussion

This chapter summarizes empirical results and places them within a broader analytical framework. While chapter 5 presented the regression results per hypothesis, this discussion aims to relate individual findings in relation to the existing literature, underlying economic mechanisms, and their practical consequences.

6.1 Comparison with Pavlov, Steiner and Wachter (2018)

H1 – Crisis Performance

Placing the results in relation to Pavlov, Steiner and Wachter (2018), this section explores how the effectiveness of capital structure adjustments depends on the nature of the crisis. For the GFC period, the results largely correspond with the findings of Pavlov, Steiner and Wachter (2018). In line with their key message that "preparation matters", a reduction of leverage prior to a crisis leads to a better crisis performance during the GFC, while high market leverage leads to significantly worse performance during the crisis.

Looking into the debt maturity structure, this study reveals a different picture from Pavlov, Steiner and Wachter (2018). While extending debt maturities in Pavlov, Steiner and Wachter's (2018) study leads to a significant positive effect on crisis performance, this study reveals small coefficients in the GFC sample that are statistically not significant. The findings of this study do not support the statement that extending/reducing short-term debt maturities prior to a crisis leads to significantly better crisis performance. This deviation can be plausibly explained by differences in the sample of this study (choice of Equity REITs, different filters) or in variances of variable definitions (Compustat-based data, while Pavlov, Steiner and Wachter (2018) used SNL Finance data).

For the COVID-period, there is a much stronger deviation in results and pattern comparison from Pavlov, Steiner and Wachter (2018). Neither leverage reductions nor changes in debt maturities show a statistically significant relationship with crisis performance. A reduction of leverage prior to 2020 does not lead to higher returns in the pandemic, while the level of market leverage has a weakly significant connection to performance. Also, changes in debt maturities do not affect the crisis performance.

H2 – "Who Prepares?"

The empirical results of this study for the GFC sample are consistent with Pavlov, Steiner, and Wachter (2018). In both analyses, REITs with high leverage were more likely to reduce leverage prior to a crisis. This confirms the observed mechanism of Pavlov, Steiner and Wachter (2018) that REITs with an ex-ante higher risk profile were more likely to act and prepare for worse market conditions. This study also finds a consistent relationship between short-term debt maturities and the probability that REITs extend debt maturities prior to a crisis. A high proportion of short-term debt maturities increases the probability of proactive adjustments prior to a crisis – consistent with Pavlov, Steiner and Wachter's (2018) results. This underlines that refinancing risk is a key driver for preparatory actions.

This pattern is partly observed for the COVID sample: REITs with a high level of short-term debt maturities show a higher probability of adjusting their capital structure by extending maturities to stabilize risk profiles. This indicates that the motive for risk reduction across different crises remains constant, while other mechanisms, such as leverage adjustments, lost their significance in the COVID crisis.

Overall, H2 "who prepares" is clearly supported. Despite different crises, market dynamics, and data sources, it appears that the decision-making mechanisms identified by Pavlov, Steiner and Wachter (2018) remain robust: REITs with higher structural risk tend more to prepare for a crisis.

6.2 Economic Mechanisms and Context

This section interprets empirical results in crisis-specific economic mechanisms. The results show that capital restructuring measures are not universal; they are influenced by the type of crisis, functionality of financial markets, and sectoral risk situations of REITs.

GFC Mechanisms:

The GFC was a credit market-driven shock, characterized by the breakdown of interbank lending, liquidity withdrawals, and refinancing constraints. In such circumstances, deleveraging is economically rewarded: Lower leverage levels reduce refinancing risks, mitigate debt-overhang, and protect against fire-sales-effects that depress asset values during systemic breakdowns. Furthermore, the collapse of real-estate valuations and banks' balance sheet impairments further increased the cost of high leverage, making pre-crisis deleveraging a highly effective protective measure. Against this background, it is clear why leverage adjustments

during the GFC sample had such a strong impact on crisis performance, while debt maturity structures played a less significant role, even though it is in theory relevant.

COVID Mechanisms:

In comparison, the COVID crisis was an exogenous and short shock, dominated by a temporary collapse in economic activity rather than a long-term disruption of capital markets. Central banks acted early and provided extensive liquidity support, stabilizing credit spreads and ensuring market access even for highly leveraged firms. Governmental aid programs further supported companies to reduce refinancing risksLeverage as an explanatory variable appears to have lost significance. Property sectors, which were more exposed to lockdowns or mobility restrictions, such as office or retail, suffered more than stable sectors, such as residential or healthcare, which produced consistently stable cash flows. In this economic environment, debt maturity mattered more because of heightened uncertainty about future cash flows instead of refinancing risks due to restricted capital markets. Shifting from a pure financing shock in the GFC to a predominantly operational cash flow shock during COVID helps to explain why debt maturities gained relevance in the COVID regressions.

Integrating Both Mechanisms:

The differences show that the effect of capital structure adjustments is crisis-specific. Deleveraging works, especially in a credit-market crisis, while the relevance of debt maturity structures strongly depends on the stability of operating cash flows during a crisis. The degree of market liquidity, differences in systemic stress, and the interaction between balance sheet vulnerability and sector-specific cash flow risk exposure jointly determine why crisis strategies across different crises lead to different outcomes.

6.3 Implications

This section explains the main implications of the results from the theory, management practice, and investors, highlighting why the crisis-specific behavior of capital structure adjustments matters.

Implications for Theory

The results show that the principle “preparation matters” cannot be applied universally. The effect of leverage and debt maturity structure depends strongly on the respective crises. Furthermore, the sectoral heterogeneity indicates that REITs are by no means a homogeneous

asset class. This study extends existing literature by clarifying that the relationship between balance sheet structure and sector-specific cash flow risks is crucial for crisis performance.

Implications for REIT Management and CFOs

The results suggest that practitioners should adapt capital structure strategies to the type of crisis anticipated. In a GFC-type crisis, the reduction of leverage has the highest priority, as refinancing risks and balance-sheet weaknesses are at the center. In a COVID-type crisis, liquidity buffers and a robust debt-maturity profile are more relevant than leverage reductions. The management of defensive property-type sectors should pay particular attention to leverage levels ahead of a financial market-driven crisis and to short-term debt maturities when shocks primarily affect operating cash flows like in the COVID crisis. Cyclical sectors are less affected, indicating that flexibility is more important than conservative balance sheet structures.

Implications for Investors

For investors, risk evaluation must take place in a crisis-specific manner. Leverage risks are especially priced accurately in a financial crisis, while debt maturity gains importance in exogenous, non-financial shocks. Sector rotation strategies should be applied based on the type of crisis: Defensive sectors can outperform in normal times but tend to be more affected during cash-flow shocks such as COVID. Overall, the results underline that a standardized approach to REIT valuation is inappropriate – capital structure and sector exposures must be valued and analyzed together.

7. Conclusion

This dissertation examined how capital structure choices of U.S. Equity REITs before a crisis influenced their performance during two fundamentally different economic shocks – the Global Financial Crisis (GFC) and the COVID-19 pandemic. Based on Pavlov, Steiner and Wachter's (2018) framework, leverage adjustments, debt maturity profiles, and property type differences were analyzed, complemented by robustness tests and a conceptual discussion of the underlying mechanisms.

First, the analysis showed that preparation of capital structure adjustments is crisis-specific rather than universal. While deleveraging prior to the GFC was rewarded with significantly higher crisis performance, this was not the case during the COVID crisis. Leverage adjustments prior to the COVID crisis had no statistically significant impact on crisis performance – even

leverage levels played a lesser role than during the GFC. Second, debt maturity extensions showed neither in the GFC nor in the COVID crisis significant improvements in crisis performance. The debt maturity definition of debt due in 2-3 years and even the broader maturity period of 1-5 years in the robustness test showed no significant effects on crisis performance. What matters is not if REITs extend debt maturities prior to a crisis, but the structural exposure embedded in their existing maturity profile. Third, the analysis of "who prepares?" provides a consistent picture. Similar to Pavlov, Steiner and Wachter (2018) the following applies to the GFC: REITs with high debt levels are deleveraging significantly more frequently prior to a crisis, indicating that REITs reacted to expected refinancing risks with a fragile balance sheet structure. This pattern unfolds for REITs during COVID. On the other hand, refinancing pressure – measured by short-term debt maturities – is stable and a highly significant driver of adjustments in both crises. For COVID, there is further evidence that REITs with lower liquidity buffers more frequently extended maturities. Fourth, the heterogeneity of property types is crucial to understanding different crisis responses. During the GFC, defensive property type sectors, such as Residential and Healthcare, gained clear advantages of prior deleveraging, while maturity adjustments had no advantageous effects. In COVID, there is a different pattern: Leverage adjustments are irrelevant; however, a high degree of short-term debt maturities had a significantly negative effect on defensive REITs, while cyclical sectors are less affected. Robustness tests confirm that these sectoral differences are not influenced by variable definitions, but rather by window period lengths. Overall, there does not exist a "one-size-fits-all" adjustment concept – the effect of leverage and maturity adjustments depends on the type of shocks (credit versus cash flow) and on the underlying property-type risk profile of a REIT.

Several limitations qualify these findings. The analyses were restricted to U.S. Equity REITs, which limits external validity for mortgage REITs, non-listed REITs or international REITs. Further, the dataset was based on Compustat and CRSP information, whereby detailed loan-level data or covenant structures cannot be observed directly. The methodology in this study relies on cross-sectional regressions with one pre-crisis year and fixed crisis windows. This design maps the link between pre-crisis adjustments and subsequent performance, but it cannot fully address dynamic capital structure adjustments during the crisis window. Furthermore, the debt maturity variables are based on simplified maturity structures (2-3 years or 1-5 years), which only approximately reflects the true economic maturity structure. Finally, the sectoral heterogeneity is based on a relatively coarse binary split between defensive and cyclical

property types, which captures broad patterns but may hide important differences within single property types, e.g., Office vs Residential.

Based on the limitations outlined above, several research perspectives emerge. First, future research could apply panel or event-study approaches with higher-frequency data, which allows researchers to check how REITs adjust leverage and maturities both before and during crises, and how markets price such adjustments in real time. Second, combining balance sheet data with loan level data, bond spreads, and covenant structures could be integrated to precisely determine which financing sources REITs gain or lose their financial flexibility. Thirdly, by applying this approach to international REIT markets, this opens the possibility of incorporating institutional differences such as insolvency law, profit taxation, or monetary policy responses into the analysis. Fourth, the analysis of property-type heterogeneity could be intensified by implementing asset-level information such as leasing structures, tenant quality, and geographic diversification. This would allow us to test whether certain property types can compensate for their inherent cash flow risks through capital structure measures. Finally, future research could also take ESG and climate risk into account in performance because long-term crisis resilience is determined increasingly by regulatory requirements, physical climate risks, and transformation processes. The interaction between balance sheet strength, sustainability investments, and physical risk exposure will be increasingly important for REITs, which face both cyclical crises and structural transitions in demand.

Overall, the results of this dissertation show that financial flexibility supports crisis resilience for REITs during crisis periods – their significance depends on the type of economic shock and the underlying property portfolio. Managers and investors should therefore treat capital structure policy as a crisis-specific and sector-specific tool, rather than as a universal recipe for stability.

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