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Capital structure of listed property firms: Lessons from a property investment reform

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Background: In 2013, most South African listed properties converted from legal structures allowing unlimited leverage and tax-deductible interest to real estate investment trusts (REITs), which limit leverage and eliminate interest tax-shield benefits.

Aim: This study investigates listed property capital structure determinants in the context of capital structure-relevant regulatory changes to ascertain the importance of regulatory limits and the capital structure trade-off theory for listed property.

Setting: South African listed property provides a unique opportunity to investigate capital structure decisions when subject to regulatory limits.

Method: Variables theoretically related to capital structure were regressed against leverage, with property firm legal form as an indicator variable, for an unbalanced panel of Johannesburg Stock Exchange-listed property firms between 2005 and 2019.

Results: Under the unlimited leverage regime and tax-shield benefit, capital structure decisions are better explained by trade-off theory, but with leverage restrictions and reduced tax-shield relevance, such decisions are better described by market timing and pecking order theories. Share price volatility is the key leverage determinant across the sample. Unexpectedly, under the limited leverage regime, leverage peaked well below regulatory limits, which are therefore less important than distribution limits.

Conclusion: Trade-off theory and regulator leverage limits are irrelevant to understanding capital structure decisions of REITs.

Contribution: Our results imply that listed property firm capital structures are not fully determined by regulations. The REITs, whose capital structure determinants are share price volatility and REIT size, consistent with market timing and pecking order theories, differ from non-property firms, whose capital structure typically accords with trade-off theory-based determinants.

Keywords: listed property; REITs; capital structure; leverage; regulatory change; South Africa.

Introduction

Background

The purpose of this article, which is in part based on master's degree research conducted by one of the authors (Calvoso 2020), is to investigate what the determinants of the capital structure of listed property firms are before and after a regulatory change into the real estate investment trusts (REITs) form in South Africa. This is important because the REIT form places leverage and payout restrictions that should have capital structure consequences on firms. Also, the change into the REIT form makes the tax deductibility of interest a non-issue, again a change with important capital structure consequences. Therefore, this study addresses the impact of a change in regulation on the capital structure decisions of listed property companies, a topic that should be of interest to regulatory authorities, the management of listed property companies and investors.

Capital structure is one of the most debated and researched topics in finance. Sixty-five years after Modigliani and Miller's (1958) landmark paper on capital structure and firm value, there is still little consensus on the determinants of capital structure. Three main capital structure theories have emerged: trade-off theory (Kraus & Litzenberger 1973), which sees capital structure decisions as a trade-off between the debt-related tax-shield and financial distress costs, pecking order theory (Myers & Majluf 1984), which postulates a capital source preference ranking based on costs resulting from information asymmetries between firm insiders and financiers, and market timing theory (Baker & Wurgler 2002), which postulates that debt or equity decisions are affected by market conditions – that is, management selects specific financing options when market conditions make these cheapest.

However, despite much research covering many countries, industries and time periods, no theory has emerged to fully explain the observed mix of retained earnings, share capital and debt used to fund firms. Thus, Graham and Leary (2011) conclude that a 'one size fits all' approach to capital structure across multiple industries is insufficient to explain observed capital structures. Further, industries subject to regulatory capital structure restrictions, such as banking and listed property, are typically excluded from capital structure studies on the argument that they have limited funding flexibility. However, it is the impact of these regulatory constraints that motivate increased interest in the determinants of the capital structure of listed property companies (Dogan, Ghosh & Petrova 2019).

In many jurisdictions, listed property firms (usually structured as REITs) are subject to leverage ceilings, required to pay out a large proportion of net earnings and tax exempt if certain conditions are met. This has important implications for the application of capital structure theories. Firstly, earnings payout requirements reduce firms' ability to utilise internal funding, reducing flexibility in terms of the pecking order theory. Secondly, where listed property firms do not pay tax, no debt-related tax-shield exists, which reduces the relevance of trade-off theory. Thus, compared to non-regulated industries, listed property firms should find debt comparatively less attractive relative to equity, yet Breuer, Nguyen and Steininger (2019) find that U.S. REITs are twice as leveraged as non-property firms. Also, specific to regulated listed property firms is that constraints on the use of internal funding, combined with a regulatory leverage ceiling, could lead to distress when equity capital needs to be raised and property shares are out of favour with investors. Thus, financial flexibility and market timing theory can be expected to play a greater role in REIT capital structure decisions compared to non-regulated industries.

In summary, because listed property is subject to different capital structure drivers and considerations compared to other industries, it offers an attractive environment to test whether empirical observations from listed property accord with theoretical capital structure expectations. South Africa provides an interesting case for investigating listed property capital structure within the context of regulatory change. Four aspects make this country's listed property sector especially interesting.

Firstly, South Africa has a long history of listed property, with the first property fund listing on the Johannesburg Stock Exchange (JSE) in 1969. In addition, with 30 listed REITs and a market capitalisation of €17.64 billion as at 30 June 2021 (EPRA 2021), South Africa's REIT industry consistently ranks among the four largest in emerging markets by market value. Thus, for example, it was the largest among developing countries in 2019 (EPRA 2019), and in 2021 only trailed Brazil, Hong Kong and (marginally) Mexico within this group (EPRA 2021). Its REIT industry is further larger than those of many developed markets.

Secondly, South Africa's listed property industry only adopted the standard global REIT structure in 2013, previously using legal structures known locally as property unit trusts (PUTs) and property loan stocks (PLSs). Subsequently, new South African property firms have listed as REITs, and pre-existing ones have converted to this structure. This change, now with sufficient data before and after 2013, allows for a form of natural experiment with a balanced sample period before and after conversion to test whether regulatory changes play a role in the capital structures of listed property companies as per Dogan et al's (2019) findings that legal requirements in twelve sample countries, including South Africa, played an important role in capital structure. That study is, to our knowledge, one of only three property capital structure studies that include South Africa (the other two were by Le & Ooi 2012 and Rovolis & Feidakis 2014), but all ended before 2013, thus, largely excluding South African REIT data. Table 1 shows the key differences between South African PLSs, PUTs and REITs.

The two trust-type structures (PUTs and REITs) are effectively conduits for property-related earnings, with no income tax or Capital Gains Tax (CGT) liabilities provided they meet certain regulatory requirements. Property loan stocks, on the other hand, are companies subject to income tax and CGT and whose distributions to equity holders are not tax-deductible. To circumvent this problem while retaining the unlimited gearing benefits of PLSs, these companies, which before REIT conversion represented about three-quarters of listed South African real estate firms, issued a financial instrument known as a 'linked unit'. This consists of a share linked to a much larger debenture, typically in a face value ratio of 1:999. The term of the debt was usually of very long duration (25 years or more), or, in some instances, only repayable on firm dissolution. 'Interest payments' were determined as a predefined multiple of the dividend payments on the equity portion. Although this effectively made these instruments

TABLE 1: Comparison between property unit trusts, property loan stocks and real estate investment trusts in South Africa.

Basis of comparison	Property loan stock	Property unit trust	Real estate investment trust
Legal entity	Company	Trust (unit trust fund structure)	Company or trust
Investment instrument	Linked unit, consisting of a share and a (much larger) debenture	Units that are effectively shares	Common shares
Leverage limits	None	30% of underlying assets	60% of gross total assets
Distribution requirements	None	Must be paid out to avoid income tax	Must pay out 75% of income to retain REIT status
Tax treatment	• Liable for company income and dividends tax on residual profits after debenture interest • Interest received taxed in the hands of linked unitholders • Liable for capital gains tax on disposals	• No tax liabilities (capital gains tax or income) within the trust • Income distributions taxed in hands of unitholders	• Tax deduction of distribution to shareholders makes mostly tax-exempt subject to maintaining REIT status • Income distributions taxed in the hands of shareholders

Source: Adapted from Calvoso, A., 2020, 'Determinants of capital structure in the South African listed property sector', Masters Thesis, University of Cape Town, viewed 19 June 2025, from https://open.uct.ac.za/items/1c3c8f49-9c41-406f-a419-a1cf8c19697d

REIT, real estate investment trust.

quasi-equity, they were reported under long-term liabilities, and 'debenture interest' was deducted for income tax purposes.

The third unusual feature of South African listed property relevant to capital structure decisions is that South African annual rental escalations are contractually fixed throughout the duration of a lease, unlike most other countries where contractual rental escalation clauses that underpin property income are based on actual inflation (Property24 2024; Wilson 2014). This implies greater certainty of future rental income and volatility, which could support the market timing theory in the South African market. Specifically, capital structure decisions by management could signal to investors that the capital value of their equity should be adjusted when interest rates change, given the bond-like nature of their fixed cash flows.

Lastly, and perhaps most importantly with regards to capital structures, South Africa's regulatory minimum earnings payout requirement of 75% for REITs is less onerous than that of other large REIT markets, whereas its REIT leverage limit of 60% is more restrictive (see Table 1-A1 in Appendix 1 for a comparison). Thus, our expectation is that the trade-off theory plays less of a role in South Africa than in these other listed property markets, particularly post-REIT conversion, because of the minimum earnings payout requirement and the lower financial distress risk resulting from contractually supported revenue streams. The pecking order theory is similarly expected to play a lesser role, with retained earnings being less available as an option for REITs and PUTs. Overall, we hypothesise that capital structures of South African listed property companies are mostly influenced by market timing and financial flexibility considerations.

This study, therefore, investigates the correlation between a wide range of capital structure determinants and the leverage ratios of South African listed property firms, both before and after REIT conversion, within the framework of the main existing capital structure theories. We find evidence of two distinct capital structure regimes. Before 2013, when leverage was unlimited and interest tax-deductible, trade-off theory better explains capital structure decisions. After 2013, with limited leverage and unimportant interest tax deductibility, market timing and pecking order theory better explain capital structure decisions.

The study makes the following contributions to both the limited research on listed property in emerging markets (and in particular Africa) and to the small number of studies addressing questions of capital structure within the REIT context. Regulatory limits are not binding on REITs with the equilibrium leverage level for South African REITs being between 30% and 35% of debt to gross assets, much lower than maximum leverage levels. However, the REIT regulatory changes, that made the tax deductibility of interest a non-event, had a material impact making REIT leverage no longer sensitive to trade-off theory determinants. REIT leverage is most sensitive to share price volatility. It means that REIT leverage is not fully determined by regulations and is not similarly determined as for non-property firms. REIT leverage seems to be mostly influenced by market timing and financial flexibility considerations.

The remainder of this article is structured as follows: *Capital structure theories and determinants* section provides an overview of capital structure theory and empirical findings, particularly for listed property; *Methods* section outlines our sample, data and methodology; *Results and discussion* section presents and discusses our results, and *Conclusion* section concludes.

Capital structure theories and determinants

The limited literature on firms deciding to convert into the REIT structure seems most relevant for this investigation. Mendell, Mishra and Sydor (2008) and Piao, Mei and Zhang (2017) used event study methods to investigate the conversion of four forest industry firms into REITS and found that the conversion adds value to shareholders, which they ascribe to tax and liquidity benefits. Ling et al. (2023) investigated the reasons why some firms choose 'REITing' and others 'De-REITing', arguing that tax and dividend implications are driving the choice. The literature review will progress by presenting three main theories for understanding capital structure choice, starting with trade-off theory that incorporates tax effects, shown previously as important for listed property.

In 1958, Modigliani and Miller introduced the irrelevance theorem, suggesting that a firm's value is independent of its leverage ratio provided considerations such as taxes, bankruptcy and transaction costs are ignored. This theorem was subsequently updated by the introduction of the tax-shield benefit concept resulting from the reduction of tax liability because of tax-deductible interest on debt (Modigliani & Miller 1963). Thus, as a firm's leverage increases, its market value should increase by the present value of the debt tax-shield benefit – motivating management to maximise debt within the capital structure. However, Solomon (1963) pointed out that extreme debt levels increase the cost of capital as capital markets demand higher rates of return, and Baxter (1967) suggested that excessive debt increases the probability of default and hence bankruptcy. The tax-saving benefit of more debt has a cost.

These arguments led to the trade-off theory of capital structure (Kraus & Litzenberger 1973), which suggests that capital structures trade-off reduced taxes because of the tax-shield benefit of interest and financial distress costs. Thus, firms with higher marginal tax rates benefit more and may be inclined to increase their leverage (Miglo 2010). Mackie-Mason (1990) found that firms with higher marginal tax rates are indeed more leveraged, and Barclay, Heitzman and Smith (2013) found that taxable US real estate firms use more debt than their non-taxable counterparts (Calvoso 2020). This finding lends credence to the idea of a lack of a tax-shield effect for non-taxable real estate firms. Further, because of financial distress costs, less risky firms can leverage more than riskier ones (Myers 1984).

Pecking order theory (Myers & Maljuf 1984) posits a cost-based preference order for financing sources, resulting from the pricing of asymmetry of information between insiders and financiers. Equity is considered to have the highest information asymmetry cost, followed by debt, and then retained earnings with no cost. Because of regulatory capping of debt levels and mandatory profit payouts in most REIT markets, the pecking order theory is only partly applicable for listed property. Thus, Ott, Riddiough and Yi (2005) find that US REITs placed little reliance on retained earnings, and Feng, Ghosh and Sirmans (2007), considering US REITs between 1991 and 2003, concluded a debt preference whenever the cost of discounted equity exceeds financial distress costs.

Lastly, market timing theory claims that firms attempt to time debt or equity issuances with favourable market conditions. The dynamic asymmetric information version of market timing (Myers & Maljuf 1984) assumes that firms can create their own market timing by publicly releasing positive firm information before equity issuance. Further, market participant irrationality may cause temporary stock mispricing, which managers of firms can use to issue (repurchase) equity when shares are over(under)priced, regardless of actual financing need (Baker & Wurgler 2002). In the United States, market timing theory is supported by the REIT studies of Ooi, Ong and Li (2010) and Boudry, Kallberg and Liu (2010).

Giacomini, Ling and Naranjo et al (2017) present the following stylised facts regarding REIT leverage. REITs are highly levered, and leverage is persistent. They then interpret their results as showing evidence consistent with trade-off theory. It is unlikely that regulations, or trade-off theory, will fully explain the capital structure choices of listed property firms in South Africa that chose to convert to the REIT legal form because the South African regulations are less restrictive than those in other jurisdictions (see Table 1-A1 in Appendix 1) leaving more room for flexibility. We will, therefore, investigate the determinants of leverage for these South African property firms, without restricting the choice of determinants. Table 2 summarises the expected relationship between various determinants and leverage in terms of the three capital structure theories presented.

The literature and arguments presented up to this point create the expectation that the 2013 regulatory change in South Africa will probably lead to a move away from trade-off theory-based determinants of leverage. However, this cannot be assumed as the listed property literature reviewed above shows listed property sensitive to determinants across all three main types of capital structure theories. The impact of the change will have to be empirically determined.

Methods

Our sample comprises the 39 South African listed property companies (PLSs, PUTs and REITs) listed on the JSE for at least 2 years between 2005 and 2019. This represents an unbalanced panel of 314 firm years, consisting of 137 REIT observations post-2013, and 53 PUT and 124 PLS observations, nearly all up to 2013. Dual-listed firms and firms domiciled outside South Africa were excluded. To avoid survivorship bias, delisted, renamed, taken over or merged firms were included in the sample. Data were obtained from Bloomberg or annual financial statements. We rely on panel regressions for our models, similar to Giacomini et al. (2017) and Ling et al. (2023). Panel regressions are particularly relevant for REITs where leverage is 'persistent' (Ling et al. 2023). The demeaning process removes the persistent component of leverage. Because of the small sample size, and the fact that the sample is unbalanced, we could not use the Generalised Method of Moments (GMM) approach.

South Africa's regulatory REIT debt limit is based on the book value of total assets, and hence the book value ratio of total interest-bearing debt-to-total assets was used as our leverage proxy. As managers generally cannot influence the constantly changing market values of firms, book leverage is more appropriate to research actual capital structure decision making, in line with Versmissen and Zietz (2017) and Breuer et al. (2018). Internal or intercompany financing arrangements were excluded from total interest-bearing debt as they do not represent true third-party financing (and hence external financing risk) and often are merely structured for tax purposes and do not reflect true capital structure decisions. The linked debenture financing instruments characteristic of PLSs were treated as equity, given their quasi-equity nature. The independent variables used are shown in Table 3.

F-tests for poolability indicated that two-way fixed effects were valid across all models, but both 'between' (pooled regression) and 'within' (fixed effects regression) models were run. In the pooled regression, cross-sectional effects would dominate as the data panel is wider than deep over time, thus called 'between' as the difference between firms is emphasised. In the fixed effects regression, time-series effects would dominate as the cross-sectional effects are absorbed, thus called 'within'. Note that the fixed effects model incorporates time effects, which displaced the impact of macro-economic variables such as inflation and interest rates (inflation and lagged interest rates were statistically significant in models excluding time fixed effects). These variables, as well as the fixed sectoral diversification dummy, were therefore not included in the fixed effects model. As robustness check for possible endogenous variables, the fixed effects model was regressed with lagged growth, lagged share price volatility and lagged share performance. Model specifications are as follows:

Pooled regression model:

$$\begin{aligned} Lev_{i,t} = {} & \alpha + \beta_1 Tang_{i,t} + \beta_2 Growth_{i,t} + \beta_3 Prof_{i,t} \\ & + \beta_4 \log(Size)_{i,t} + \beta_5 \log(Age)_{i,t} + \beta_6 Vol_{i,t} + \beta_7 Perf_{i,t} \\ & + \beta_8 ICR_{i,t} + \beta_9 OTypePLS_{i,t} + \beta_{10} OTypePUT_{i,t} \\ & + \beta_{11} SDiv_{i,t} + \beta_{12} Inf_{i,t} + \beta_{13} IRate_{i,t} + \varepsilon_{i,t} \end{aligned} \quad [\text{Eqn 1}]$$

TABLE 2: Determinants of listed property leverage.

Determinant	Theoretical relationship	Argument	Literature evidence
Tangible assets	Trade-off theory: +	Tangible assets = better collateral: therefore, favours debt	Rajan and Zingales (1995); Gwatidzo, Ntuli and Mlilo (2016); Chikolwa (2011); Harrison, Panasian and Seiler (2010); Alcock and Steiner (2017); Zarebski and Dimovski (2012)
	Pecking order theory: -	Tangible real estate assets are simple and easy to understand and hence exhibit low information asymmetry, which reduces the cost of equity	Feng et al. (2007); Erol and Tirtiroglu (2011)
Growth opportunities	Trade-off theory: -	High growth = greater risk of financial distress Also, less tangible assets as collateral	Rajan and Zingales (1995); Deesomsak, Paudyal and Pescetto (2004); Chikolwa (2011); Alcock and Steiner (2017); Dogan et al. (2019); Harrison et al. (2010)
	Pecking order theory: +	High growth companies have greater investment needs and greater information asymmetry – hence more debt before issuing more expensive equity	Feng et al. (2007); Le and Ooi (2012); Zarebski and Dimovski (2012)
	Market timing theory: -	High market-to-book ratios = high firm market value relative to book value. Equity overvaluation leads to equity issuance	Harrison and Widjaja (2014)
Profitability	Trade-off theory: +	Higher profits = better ability to pay off debt	Liang et al. (2014); Dogan et al. (2019)
	Pecking order theory: -	More retained profits available to fund, therefore less debt (limited for REITs, which must distribute profits)	Rajan and Zingales (1995); Fama and French (2002); Gwatidzo and Ojah (2009); Nguyen et al. (2017); Harrison et al. (2010)
Firm size	Trade-off theory: +	Bigger firm likely more mature with lower risk of financial distress: favours increased debt	Rajan and Zingales (1995); Deesomsak et al. (2004); Gwatidzo et al. (2016); Harrison et al. (2010); Yousef (2019)
	Pecking order theory: -	Decreasing information asymmetry costs with firm size reduces cost of equity	Howton, Howton and McWilliams (2003); Giambona, Harding and Sirmans (2008); Dogan et al. (2019); Breuer et al. (2019)
Firm age	Trade-off theory: +	Older = more established and hence lower financial distress risk	Gwatidzo and Ojah (2009); Wong (2017)
	Pecking order theory: -	Older = less information asymmetry and hence more equity	Gwatidzo et al. (2016)
Operating risk	Trade-off theory: -	Higher operating risk = greater risk of financial distress	Alcock and Steiner (2017); Zarebski and Dimovski (2012); Breuer et al. (2019)
	Pecking order theory: +	Greater earnings volatility = greater information asymmetry	Giambona et al. (2008); Gwatidzo et al. (2016); Breuer, Steininger and Nguyen (2018)
Share price volatility	Trade-off theory: -	More volatility = greater risk of financial distress	Morri and Artegiani (2015)
	Pecking order theory: +	Higher share price volatility = higher cost of equity and hence less equity	Versmissen and Zietz (2017)
Share performance	Market timing theory: -	Equity issuance more likely when overvalued after good share price performance	Deesomsak et al. (2004); Howton et al. (2003); Harrison et al. (2010); Versmissen and Zietz (2017); Breuer et al. (2019)
Interest cover ratio	Trade-off theory: +	Indicator of debt capacity: higher ratio should correlate to higher leverage	Harrison et al. (2010); Rovolis and Feidakis (2014); Handoo and Sharma (2014)
Corporate structure	No clear theory connections	Determined by specifics of regulations governing structures (e.g. PLSs, PUTs and REITs in South Africa)	Harrison et al. (2010); Morri and Artegiani (2015);
Sectoral diversification	No clear theory connections	Tangibility and cash flow risk of real estate assets differ depending on sector (e.g. industrial, office, retail and diversified in South Africa). More diversified could mean less financial distress risk	Chikolwa (2011); Harrison et al. (2010); Dogan et al. (2019); Ertugrul and Giambona (2011)
Inflation	Trade-off theory: +	Value of tax-shield increases with higher inflation - therefore firms increase debt with high inflation. May be less applicable for largely tax-exempt entities like REITs	Frank and Goyal (2009); Breuer et al. (2019)
Market interest rate	Trade-off theory: -	Higher interest rates = greater financial distress risk if too much debt	Rovolis and Feidakis (2014)
	Market timing theory: -	Higher interest rates = higher cost of debt, therefore less leverage	Harrison et al. (2010); Morri and Artegiani (2015); Cashman, Harrison and Seiler (2016)

Source: Adapted from Calvoso, A., 2020, 'Determinants of capital structure in the South African listed property sector', Masters Thesis, University of Cape Town, viewed 19 June 2025, from https://open.uct.ac.za/items/1c3c8f49-9c41-406f-a419-a1cf8c19697d

REITs, real estate investment trust; PUTs, property unit trusts; PLSs, property loan stocks.

Fixed time effects model:

$$Lev_{i,t} = \alpha + \beta_1 Tang_{i,t} + \beta_2 Growth_{i,t} + \beta_3 Prof_{i,t} + \beta_4 \log(Size)_{i,t} + \beta_5 \log(Age)_{i,t} + \beta_6 Vol_{i,t} + \beta_7 Perf_{i,t} + \beta_8 ICR_{i,t} + \beta_9 OTypePLS_{i,t} + \beta_{10} OTypePUT_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \quad [Eqn\ 2]$$

Lagged fixed time effects model:

$$Lev_{i,t} = \alpha + \beta_1 Tang_{i,t} + \beta_2 Growth_{i,t-1} + \beta_3 Prof_{i,t} + \beta_4 \log(Size)_{i,t} + \beta_5 \log(Age)_{i,t} + \beta_6 Vol_{i,t-1} + \beta_7 Perf_{i,t-1} + \beta_8 ICR_{i,t} + \beta_9 OTypePLS_{i,t} + \beta_{10} OTypePUT_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \quad [Eqn\ 3]$$

All variables are as defined in Table 3. μ and ג are the intercept terms of each firm and time-specific effects, respectively, for the fixed effects regressions; α is the common intercept, and ε is the error term.

Both variance inflation factor (VIF) statistics and correlations (see Table 4 with no correlation coefficients larger than 0.6) indicated the probable absence of multicollinearity. However, it is to be expected that inflation and short-term policy interest rates would be collinear under an inflation targeting monetary policy regime. This is not the case here because our interest rate variable is a long-term market determined rate. Heteroscedasticity was addressed by using White two-way clustered standard errors and covariances across all models.

Ethical considerations

This study observed ethical standards for research and is based solely on publicly available financial data, with no direct involvement of human or animal subjects. In terms of

TABLE 3: Variables for determinants of capital structure used.

Characteristic	Variables	Abbreviation	Definition	Used in REIT literature	Source
Firm-specific	Book leverage	Lev	Ratio of total interest-bearing debt-to-total assets	Chikolwa (2011), Versmissen and Zietz (2017); Breuer et al. (2018)	Financial statements
	Tangibility	Tang	Ratio of net property investments to total assets	Harrison et al. (2010); Ooi (1999), Le and Ooi (2012); Versmissen and Zietz (2017); Breuer et al. (2018)	
	Growth opportunities	Growth	Market-to-book ratio	Le and Ooi (2012); Versmissen and Zietz (2017)	Bloomberg
	Profitability	Prof	Ratio of Earnings before Interest, Tax, Depreciation and Amortisation (EBITDA) to total assets	Le and Ooi (2012); Alcock and Steiner (2017); Morri and Artegiani (2015); Breuer et al. (2018)	Financial statements
	Firm size	Size	Natural log of total assets	Le and Ooi (2012); Breuer et al. (2018); Yousef (2019)	
	Firm age	Age	Years since firm's JSE listing	Hardin and Wu (2010); Harrison et al. (2010); Versmissen and Zietz (2017)	Bloomberg
	Share volatility	Vol	Standard deviation of share returns for the 12 months preceding the leverage observation	Howton et al. (2003); Versmissen and Zietz (2017)	
	Share performance	Perf	Share returns for the 12 months preceding the leverage observation	Harrison et al. (2010); Versmissen and Zietz (2017); Breuer et al. (2019)	
	Interest cover ratio	Interest Coverage Ratio (ICR)	Ratio of net property income to interest expense for the year of observation. Using net property income instead of EBITDA differs from some literature. The Interest Coverage Ratio (ICR) serves as a measure of firms' ongoing ability to repay a level of debt. The authors argue using that Net Property Income (NPI) gives a better measure of the recurring income actually available to cover interest expenses as it assesses only the realised cashflows, rather than including non-cash flow fair value profits that are not available for debt-related payments. Debenture interest expenses associated with PLSs was also excluded as not being reflective of firms' ability to repay creditors	Harrison et al. (2010); Dogan et al. (2019)	Financial statements
Industry secific	Organisational type	OTypePLS OTypePUT	Dummy variables, jointly 0 for REIT, OTypePLS = 1 for PLS, 0 otherwise, OTypePUT = 1 for PUT, 0 otherwise	Harrison et al. (2010), Morri and Artegiani (2015)	
	Sectoral diversification	SDiv	Dummy variable, 0 for diversified property portfolio, 1 for single strategy property portfolio	Chikolwa (2011); Dogan et al. (2019)	
Economic	Inflation	Inf	South African annual inflation rate, measured by consumer price index (CPI) in year of observation	Howton et al. (2003); Le and Ooi (2012); Breuer et al. (2019); Erol and Tirtiroglu (2011)	Bloomberg
	Market interest rates	Irate	Average 12-month yield in the South African R186 government bond yield in year of observation, aligned to each firm's financial year end	Harrison et al. (2010); Morri and Artegiani (2015); Cashman et al. (2016)	

Source: Adapted from Calvoso, A., 2020, 'Determinants of capital structure in the South African listed property sector', Masters Thesis, University of Cape Town, viewed 19 June 2025, from https://open.uct.ac.za/items/1c3c8f49-9c41-406f-a419-a1cf8c19697d

TABLE 4: Descriptive statistics of sample used in this study.

Variables	Mean	Standard deviation	Minimum	Maximum	25th P'tile	Median	75th P'tile
Lev	0.28	0.11	-	0.62	0.21	0.30	0.37
Tang	0.85	0.12	0.36	1.00	0.80	0.89	0.94
Growth	0.94	0.18	0.07	1.52	0.85	0.94	1.04
Prof	0.10	0.07	-0.11	0.81	0.07	0.09	0.12
Size	8.86	1.22	4.84	11.86	8.14	8.91	9.52
Age	9.64	6.86	1.00	32.00	4.00	8.00	13.00
Vol	0.06	0.04	0.00	0.33	0.04	0.05	0.07
Perf	0.08	0.25	-0.95	1.17	-0.07	0.07	0.23
ICR	3.78	2.04	-	8.00	2.37	3.23	4.68
OTypePLS	0.39	0.49	-	1.00	-	-	1.00
OTypePUT	0.17	0.37	-	1.00	-	-	-
SDiv	0.40	0.49	-	1.00	-	-	1.00
Inf	0.05	0.02	0.02	0.09	0.04	0.05	0.06
IRate	0.08	0.00	0.07	0.09	0.08	0.08	0.09

PLS, property loan stock; PUT, property unit trust; ICR, interest coverage ratio; Lev, leverage; Tang, tangibility; Prof, profitability; Vol, volatility; Perf, share performance; SDiv, sectoral diversification; Inf, inflation; IRate, interest rate.

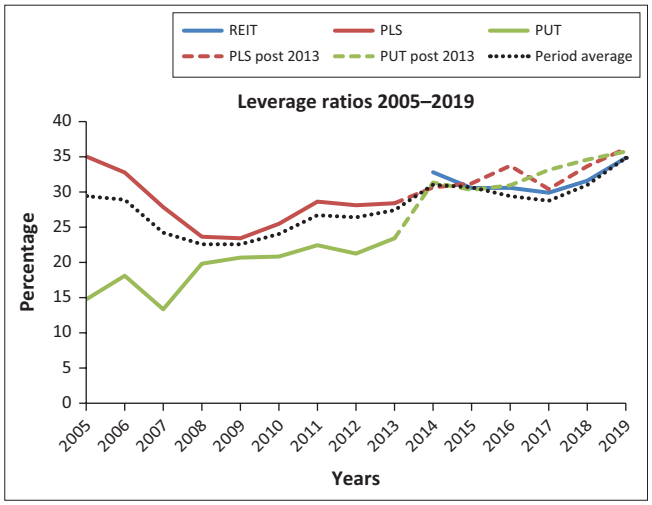
the University of Cape Town's policy, this study therefore did not require any specific permission or ethical clearance.

Results and discussion

Table 4 presents descriptive statistics. The mean leverage ratio for South African listed property over the sample period was 28.2% (PLSs: 29.8%, PUTs: 16.8% and REITs: 31.2%). It is surprising that the mean for REITSs is higher than the mean for PLSs as REIT leverage is limited by regulation while that for PLSs is not. Most observations lie between 20% and 40% – well below the 60% REIT regulatory limit. This may be because firms wish to maintain buffers to the limits in case of external shocks, market downturns or liquidity issues (Calvoso 2020).

Figure 1 depicts average leverage ratios over the sample period. Understandably, because of debt restrictions, PUTs exhibited lower leverage than PLSs prior to the REIT regime. After REIT introduction in South Africa in 2013, PUTs that converted to REITs took advantage of the additional debt allowance by increasing leverage ratios, as did PLSs, but to a

lesser degree (Calvoso 2020). It seems that a long-term market-equilibrium leverage ratio is around 30-35% debt to gross assets with clear convergence after 2013. Interestingly, Wesson and Carstens (2019) find that the introduction of REITs in South Africa seems to have decreased leverage on average, although their sample ends in 2016 and hence only includes 3 years of post-REIT data.



Source: Adapted from Calvoso, A., 2020, 'Determinants of capital structure in the South African listed property sector', Masters Thesis, University of Cape Town, viewed 19 June 2025, from https://open.uct.ac.za/items/1c3c8f49-9c41-406f-a419-a1cf8c19697d

PLS, property loan stock; PUT, property unit trust; REIT, real estate investment trust.

FIGURE 1: Average leverage ratios of South African property unit trusts, property loan stocks and real estate investment trusts.

Table 5 shows correlations between the variables with probabilities less than 5% in bold. Firm size, share price volatility and PLS structure show statistically significant positive correlations with leverage. Profitability, share performance, interest coverage ratio, PUT structure, sectoral diversification and inflation show statistically significant negative correlations with leverage. The coefficients for size and share price performance support trade-off theory, while the coefficients on the interest coverage ratio and inflation can be seen as opposing trade-off theory. The coefficients on profitability and share price volatility support pecking order theory, while the coefficient on share performance supports market timing theory. Thus, univariate correlations seem to lean towards pecking order and market timing theory but require confirmation in a multivariate setting.

Table 5 presents univariate correlation coefficients at the top of each block with the statistical significance of the coefficient indicated at the bottom of each block in italics. Statistical significance is bold when it is below 0.05, indicating that the correlation coefficient is likely different from zero. The data used comprise an unbalanced panel from 39 listed property firms in South Africa for the years 2005 to 2019.

TABLE 5: Correlations.

Variable	Correlations and probability	Lev	Tang	Growth	Prof	Size	Age	Vol	Perf	ICR	OType PLS	OType PUT	SDiv	Inf	IRate
Lev	UCC	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-
	SS	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tang	UCC	-0.02	1.00	-	-	-	-	-	-	-	-	-	-	-	-
	SS	0.77	-	-	-	-	-	-	-	-	-	-	-	-	-
Growth	UCC	0.01	-0.10	1.00	-	-	-	-	-	-	-	-	-	-	-
	SS	0.79	0.07	-	-	-	-	-	-	-	-	-	-	-	-
Prof	UCC	-0.22	-0.05	0.20	1.00	-	-	-	-	-	-	-	-	-	-
	SS	**0.00**	0.38	**0.00**	-	-	-	-	-	-	-	-	-	-	-
Size	UCC	0.16	-0.35	0.16	-0.08	1.00	-	-	-	-	-	-	-	-	-
	SS	**0.01**	**0.00**	**0.01**	0.14	-	-	-	-	-	-	-	-	-	-
Age	UCC	-0.03	-0.13	-0.02	-0.10	0.53	1.00	-	-	-	-	-	-	-	-
	SS	0.57	**0.02**	0.73	0.08	**0.00**	-	-	-	-	-	-	-	-	-
Vol	UCC	0.18	0.06	-0.14	-0.09	-0.28	-0.06	1.00	-	-	-	-	-	-	-
	SS	**0.00**	0.29	**0.01**	0.13	**0.00**	0.27	-	-	-	-	-	-	-	-
Perf	UCC	-0.17	-0.03	0.38	0.27	-0.22	-0.03	-0.03	1.00	-	-	-	-	-	-
	SS	**0.003**	0.56	**0.00**	**0.00**	**0.00**	0.60	0.56	-	-	-	-	-	-	-
ICR	UCC	-0.54	0.18	0.13	0.45	-0.07	-0.15	-0.12	0.21	1.00	-	-	-	-	-
	SS	**0.00**	**0.00**	**0.02**	**0.00**	0.19	**0.01**	**0.03**	**0.00**	-	-	-	-	-	-
OTypePLS	UCC	0.11	-0.09	-0.02	0.15	-0.33	-0.09	0.09	0.33	-0.10	1.00	-	-	-	-
	SS	**0.05**	0.11	0.76	**0.01**	**0.00**	0.11	0.11	**0.00**	**0.07**	-	-	-	-	-
OTypePUT	UCC	-0.46	0.22	0.08	0.15	0.00	0.02	-0.02	0.07	0.37	-0.36	1.00	-	-	-
	SS	**0.00**	**0.00**	0.17	**0.01**	0.98	0.66	0.71	0.20	**0.00**	**0.00**	-	-	-	-
SDiv	UCC	-0.23	-0.04	-0.14	0.03	-0.19	0.10	0.14	0.02	-0.01	0.14	-0.21	1.00	-	-
	SS	**0.00**	0.52	**0.01**	0.63	**0.00**	**0.07**	**0.01**	0.68	0.80	**0.01**	**0.00**	-	-	-
Inf	UCC	-0.12	0.00	-0.11	-0.02	0.01	-0.01	0.07	-0.22	0.01	0.13	0.03	0.02	1.00	-
	SS	**0.03**	0.94	**0.05**	0.72	0.92	0.88	0.25	**0.00**	0.83	**0.02**	0.54	0.74	-	-
IRate	UCC	0.06	-0.09	-0.21	-0.29	0.25	0.13	-0.17	-0.29	-0.25	-0.39	-0.13	0.06	-0.21	1.00
	SS	0.26	0.11	**0.00**	**0.00**	**0.00**	**0.02**	**0.00**	**0.00**	**0.00**	**0.00**	**0.02**	0.26	**0.00**	-

Note: Statistical significance is bold when it is below 0.05, indicating that the correlation coefficient is likely different from zero. The data used is an unbalanced panel from 39 listed property firms in South Africa for the years 2005 to 2019.

PLS, property loan stock; PUT, property unit trust; ICR, interest coverage ratio; UCC, unvariant correlation coefficients; SS, statistical significance of the coefficient; Lev, leverage; Tang, tangibility; Prof, profitability; Vol, volatility; Perf, share performance; SDiv, sectoral diversification; Inf, inflation; IRate, interest rate.

Table 6 shows the regression results. In the 'between' firm model, where cross-sectional effects dominate, statistically significant positive correlations are found between leverage and tangibility of assets, log of size and share price volatility, and statistically significant negative correlations between leverage and interest coverage ratio, PUT structure, diversified property portfolios and inflation. All signs correspond to the correlation table, and interpretations are therefore the same, except to note that the 'between' model will emphasise differences between firms rather than changes over time.

Log of firm size, share price volatility, interest coverage ratio and the PUT legal structure retain statistical significance and the same sign across all three models. Further, the PLS structure variable is highly statistically significant in both the 'within' firm models, implying that PLS structure firms have higher leverage, explained by the unlimited debt capacity available to PLSs compared to the 30% regulatory cap on PUTS and 60% on REITs, resulting in PLSs utilising greater leverage compared to the other structures, and PUTs less. This is consistent with Dogan et al.'s (2019) multi-country findings that regulatory restrictions affect listed property leverage ratios.

Although the firm size finding is consistent with trade-off theory, the highly statistically significant negative coefficients for inflation and the interest coverage ratio provide strong evidence against this theory in explaining the capital structures. The information asymmetry of a larger firm should be less because of a greater analyst following. Thus, the positive coefficient can also support pecking order theory. The significant positive coefficient on growth, in the fixed effects model without lags, supports trade-off theory. The strongly significant positive coefficient on share price volatility across all models is in line with pecking order theory and with prior work on REITs (Versmissen and Zietz 2017). Further, although the negative sign on share price performance is consistent with timing theory, it is not statistically significant. Lastly, the validity of time fixed effects and its displacement of macro-economic variables such as inflation, interest rates and GDP is indicative of market timing theory.

The strongest evidence indicating the validity of trade-off theory explanations for PLSs, and not for PUTs or REITs, is found when interacting the indicator variable for the PLS legal structure with the other independent variables. We found a statistically significant positive interaction between the PLS firm type and profitability (coefficient of 0.429 and statistical significance of 0.023), which leaves the total correlation between leverage and profitability positive, as would be expected under trade-off theory. We also found a statistically significant positive interaction between the PLS firm type and the interest coverage ratio (coefficient of 0.015 and statistical significance of 0.054), again indicating that trade-off theory predictions are more valid during the PLS regime.

In combination, the above evidence supports both market timing theory and pecking order theory, with evidence against trade-off theory during the REIT regime. Unsurprisingly, market timing theory and pecking order theory overlap as both rely on information asymmetry. The findings, therefore, align with our expectations. It is likely that, for the regulated listed property industry, the lack of tax-shield benefits resulting from REITs' non-taxable status and, less so, the regulatory leverage constraints eliminate trade-off as a major capital structure consideration. This supports Barclay et al's (2013) finding that taxable US listed property companies are more leveraged than tax exempt ones.

As per Figure 1, after the introduction of REIT structures in South Africa, converted PUTs converged to the mean PLS leverage range of around 30% to 35%. This supports previous findings that regulatory restrictions affect capital structure.

TABLE 6: Regression results.

Variable	'Between' firm model (pooled regression)		'Within' firm models (firm and period fixed effects)			
			No lags		With one lag	
	Value	SE	Value	SE	Value	SE
Constant	-0.02	0.18	-0.84	0.28***	-1.12	0.24***
Tangibility	0.18	0.04***	0.10	0.06	0.09	0.06
Growth	0.02	0.03	0.08	0.03**	0.04	0.03
Profitability	0.10	0.13	-0.03	0.07	-0.04	0.04
Log (size)	0.22	0.08**	0.43	0.14***	0.59	0.12***
Log (age)	-0.01	0.01	0.02	0.02	0.01	0.03
Share price volatility	0.65	0.19***	0.51	0.21**	0.60	0.18***
Share price performance	-0.03	0.02	-0.04	0.03	-0.03	0.03
Interest coverage ratio	-0.02	0.00***	-0.02	0.00***	-0.02	0.00***
Type: PLS	0.01	0.012	0.10	0.02***	0.10	0.02***
Type: PUT	-0.11	0.02***	-0.06	0.01***	-0.05	0.01***
Sectoral diversification	-0.06	0.01***	-	-	-	-
Inflation	-1.06	0.33***	-	-	-	-
Interest rate	-2.10	1.54	-	-	-	-
Adjusted R^2	0.57	-	0.72	-	0.74	-
F-statistic probability	0.00	-	0.00	-	0.03	-

Note: The models generating the results above are all attempting to explain leverage. The data used comprise an unbalanced panel from 39 listed property firms in South Africa for the years 2005 to 2019. Standard errors are in parenthesis. Statistical significance of 1% and 5% are, respectively, indicated by *** and **.

PLS, property loan stock; PUT, property unit trust.

It is also interesting that the mean PUT historical leverage was for most of the pre-REIT period well below the regulated maximum of 30%, while PLS similarly maintained low ratios relative to their theoretically uncapped maxima. Thus, the 60% maximum leverage requirement for REITs seems to be higher than the natural leverage level in the industry and, therefore, is unlikely to play an important role in the leverage decisions of South African listed property companies.

In conclusion, listed property capital structure in South Africa is influenced by regulation but not determined by it. It seems as if leverage levels can find their natural market level within the regulatory limits set for REITs (30%–35%). We expected trade-off theory to be of little importance during the REIT regime because the main benefit of the tax deductibility of interest is of little importance. We also expected the pecking order theory to be of reduced importance because fewer profits are retained by REITs. It was difficult to distinguish between pecking order results and market timing results because of both theories relying on information asymmetry as foundation and tests that overlap. However, we argue that leverage in South African listed property companies is mostly determined by market timing considerations for the following reasons: (1) firms do not appear to use maximum leverage levels, and so retain some optionality for dealing with economic fluctuations, (2) the relationship between inflation and leverage is negative when considering that rental increases are mostly fixed (thus, an increase in inflation is related to a decrease in leverage, all else equal, which can be understood as responding to an expected economic downturn), (3) time fixed effects are valid predictors of leverage, and (4) leverage is consistently sensitive to the volatility of listed property equity.

Conclusion

South Africa's listed property industry is large and well-developed by developing world standards, with some unusual features that could affect listed property capital structure decisions, such as a fairly recent regulatory framework change and underlying rental agreements with fixed escalations. This makes South Africa an interesting emerging market context in which to test the empirical evidence against capital structure theories as applied to the listed property industry.

Our study applied ordinary least squares and panel regressions to an unbalanced panel of all property companies listed on the JSE between 2005 and 2019. Because South African listed property after 2013 is subject to regulatory leverage restrictions and the tax deductibility of interest is no longer important, we expected the trade-off theory to be least important in listed property capital structure decisions. This is supported by our findings. In contrast, as expected, evidence supporting both the market timing and pecking order theories are found. These results are in line with the current REIT regulatory requirements in South Africa, which, compared to most other larger REIT markets, are less restrictive regarding earnings payout requirements, thus leaving more scope for the pecking order theory, but more stringent in terms of leverage limits, thus (together with REITs' tax-free status) reducing the relevance of the trade-off theory.

We conclude that in South Africa, as an example of an emerging market, capital structure decisions of listed property companies seem mainly based on information asymmetry considerations, which is the common foundation of both the market timing and the pecking order theories. Further, we indirectly observe some evidence of the impact of regulatory restrictions on capital structure decisions, but particularly the leverage restriction of 60% of gross assets does not seem to be a constraint on South African listed property companies, whose leverage ratios are largely well below the maximum allowed and seems to be determined by non-regulatory considerations.

The reasons for capital structure decisions and their interaction with regulatory constraints remain of great interest to researchers and regulators. Our study sheds additional light on these questions, specifically within the under-researched context of listed property, which has peculiarities that impose additional constraints on this decision, as well as emerging markets, which similarly have received limited research attention.

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Authors' contributions

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Data availability

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Appendix 1

TABLE 1-A1: Real estate investment trust regime regulatory requirements relevant to capital structure.

Country	Leverage limit (%)	Minimum earnings payout (%)
South Africa	60%	75
Australia	Unlimited	100
Brazil	Unlimited	95
Canada	Unlimited	100
France	Specific rules	95
Japan	Unlimited	90
United Kingdom	ICR Test 1.25× ~ 65%	90
United States	Unlimited	90