



**Impact of firm level attributes on listed real estate company performance**

Journal:	<i>Journal of Property Investment &amp; Finance</i>
Manuscript ID	JPIF-03-2020-0030
Manuscript Type:	Academic Paper
Keywords:	Listed Real Estate, Firm Specific Attributes, European Listed Real Estate Market, Performance Analysis, Company Level Performance, Herfindahl Index

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## Impact of firm level attributes on listed real estate company performance

### Abstract

*Purpose:* The purpose of this paper is to test the extent to which company specific attributes including market capitalisation, corporate governance, capital structure and investment focus impact upon the performance of European listed real estate companies. Enhanced understanding of firm level performance drivers is important for investors in order to diversify their investment portfolios and to mitigate company specific risks at different points in the real estate cycle.

*Methodology:* The study centres on six key listed European real estate markets selected on the basis of market capitalisation, diversity, transparency and maturity. A series of statistical tests are undertaken using EPRA and Bloomberg data for the period of 2007–2017 using 113 listed property companies all of whom were contemporaneous constituents of EPRA indices in this period. A series of customised performance indices were constructed to evaluate firm-level performance attributes.

*Findings:* Firm level attributes collectively account for more variation of risk-adjusted return than sector level attributes over the investigation period. The impact of firm specific attributes on performance varies significantly from country to country attributable to the contrasting cyclical property market trends in the pre and post GFC period. REITs outperformed non-REITs on a risk-adjusted basis attributed to the strong performance of 'niche' market entrants allied with stronger regulatory structure. Finally, the findings showcase that sector specialist firms outperform diversified companies inferring that investors should seek to attain diversification through portfolio based approaches rather than firm level strategies.

*Originality:* The research integrates EPRA and Bloomberg datasets to create a series of bespoke index constructs to measure the impact of firm specific attributes on European listed real estate companies. Additionally, we construct a Herfindahl Index (H.I.) to further the debate on the impacts of diversification within the listed real estate sector.

*Implications:* The results have implications for real estate companies aiming to raise capital internally for growth as higher return on equity in general signals reduced cost of capital. Secondly, the findings should be of practical use to multinationals specialising in international real estate trading in designing their business plans in general, and formulating cross-country investment strategies in particular. Last but not least, a more refined conceptualisation of corporate level performance drivers should complement existing professional practices in relation to business/company appraisal.

## 1 Introduction

Over the past three decades the growing diversity of listed real estate markets around the world has provided investors with the opportunity to increase their exposure to commercial real estate without the burden of acquiring, managing, and disposing of direct property investments and promoting cross-border investment in commercial real estate assets (Ling and Naranjo, 2002; Brounen et al., 2012; Giacomini et al., 2015). Indeed, recent years have witnessed a significant escalation in the volume of capital flows into listed real estate markets by institutional investors seeking exposure to 'tangible' assets whilst simultaneously benefiting from the liquidity and regulated market structure. The underperformance of conventional asset classes, most notably government bonds, has undoubtedly been a factor in the increased capital flows nonetheless the importance of the listed real estate sector within investor portfolios will continue to expand and evolve relative to investor need.

Following a period of subdued growth, the European listed real estate market has evolved markedly over the course of the last fifteen years with a series of countries including the UK and Germany (in 2007) and Ireland and Spain (in 2013) all enacting REIT-enabling legislation and adding to the 'attractiveness' and global 'accessibility' of the listed market. At the end of Q4 2019, the total value of assets under management within the European listed sector stood at €503bn comprising 225 REITs (combined market cap of €215bn) and non-REITs (combined market cap of €238bn). The listed sector constitutes circa 6.9% of the European commercial real estate market in terms of AUM<sup>1</sup>. Traditional sectors including office, retail and residential still dominate in terms of overall market composition; however, niche industries such as self-storage and healthcare are gaining traction with growing investor appetite apparent in recent years. Given the increased market depth and diversity of the listed real estate universe, understanding the key drivers of performance at market, sectoral and company level has assumed increased importance and is of practical benefit for informing portfolio allocation strategies. Specifically, this paper addresses two fundamental questions;

(1) How have European listed real estate companies/markets performed in terms of risk-adjusted return? and,

(2) What are the key attributes affecting the performance of European listed real estate at (i)sector and (ii)company levels and how does this change relative to the real estate cycle?

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<sup>1</sup> EPRA, 2019. Global Real Estate Total Markets Tables – Q4 2019.

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3 As outlined by Giacomini et al. (2015), whilst a wealth of studies have examined fundamental  
4 and behavioural factors on listed real estate returns (Bond et al., 2003; Serrano and Hoesli,  
5 2009; Haran et al., 2013) there remains limited insights on the extent to which firm specific  
6 attributes and characteristics influence performance. Consistent with Giacomini et al. (2015),  
7 this paper examines the 'drivers' of performance of individual listed real estate companies by  
8 exploring the effects of firm characteristics on risk-adjusted returns performance.  
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14 Accordingly, this research focuses on the historical performance of six major European  
15 markets, namely France, Germany, the Netherlands, Sweden, Switzerland and the U.K. The  
16 six markets were selected on the basis of market capitalisation, diversity, transparency and  
17 maturity. A series of statistical tests are undertaken using EPRA and Bloomberg data on the  
18 six countries, for the period of 2007 – 2017<sup>2</sup>. The analysis explores the relationship between  
19 listed real estate performance and a wide spectrum of attributes at sectoral and firm levels to  
20 coincide with the GFC market correction and subsequent recovery in the European listed real  
21 estate sector. In the study, ten real estate sectors are identified using EPRA categorisation.  
22 The firm-specific attributes include (a) market capitalisation, (b) loan-to-value, (c) dividend  
23 yield, (d) revenue growth, (e) return on equity, (f) corporate structure, (g) investment focus and  
24 (h) degree of business diversification. A comparison between REIT and non-REIT companies,  
25 together with an examination of listed real estate companies with different investment focus  
26 (rental versus non-rental) are documented to contextualise the analysis.  
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36 The remainder of the paper is presented in a series of sections. Section 2 presents a critical  
37 review of the associated literature and positions the work relative to previous studies. Section  
38 3 affords an overview of the European listed real estate investment markets, describing the  
39 historical performance of various sectors and submarkets. Section 4 presents the research  
40 methodology whilst the empirical results and discussion are detailed in Section 5. Section 6  
41 highlights the key findings and the main learning outcomes of the research.  
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## 47 **2 Literature review**

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50 Whilst it could be argued that firm-specific characteristics are generally idiosyncratic in nature,  
51 and thus diversifiable within a portfolio context, this in many ways downplays the intricacies of  
52 the firm-to-market returns relationship and the explanatory power of firm specific attributes -  
53 particularly at different points within a real estate cycle. Indeed, an extensive body of literature  
54 much of which originated in the US has explored and debated the extent to which firm level  
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59 <sup>2</sup> EPRA provided the time series data to allow for exploration of key performance indicators of listed real estate  
60 across the sample countries, which is complemented by firm-specific data extracted from the Bloomberg database.

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3 attributes impact upon returns, risk and asset allocation strategies of listed real estate firms.  
4 Historically, studies have focussed on attributes which can be broadly categorised into market  
5 capitalisation, capital structure, leverage profile, investment focus and governance framework.  
6 The remainder of this section will detail the key learning outcomes of existing studies under  
7 these thematics.  
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### 11 12 13 14 15 16 **Market capitalisation**

17 Early investigations by McIntosh et al. (1991) showed evidence of a size effect in US REITs.  
18 Their findings highlighted that smaller REITs provided greater return without greater risk whilst  
19 also showcasing a negative relationship between size and return. In contrast, Conover et al.  
20 (1998) found that larger firms reveal enhanced returns relative to risk in comparison to smaller  
21 firms signalling that risk associated with beta was not significant with the REIT performance.  
22 In a similar vein, Ambrose and Linneman (2001) also found a statistically positive coefficient  
23 on firm size including a statistically negative coefficient on the quadratic size effect, indicating  
24 that firm profitability increases with firm size but at a decreasing rate. Meanwhile, Lee (2009)  
25 used a fixed-effects dynamic panel data model for over 7,000 US publicly-held firms during  
26 the period 1987–2006 to provide evidence that profit rates are positively correlated with firm  
27 size in a non-linear manner, holding an array of firm- and industry-specific characteristics  
28 constant.  
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38 Beyond the US market a growing body of research has emerged on the impacts of firm size  
39 on listed real estate performance. Jalil and Ali (2012) examined market capitalisation for  
40 Malaysian REIT performance between 2006 and 2008 showing market capitalisation to be  
41 significant with the REIT performance. In comparable studies also on the Malaysian market,  
42 Mohamad and Zolkifli (2014) and Olanrele (2014) investigated the effect of firm size on REIT  
43 performance and also reported a positive significant impact. Indeed, the study of Olanrele  
44 indicated that smaller REIT firms generated enhanced returns compared to larger firms without  
45 increasing risk. Meanwhile, Ma'in et al. (2016) scrutinised the determinants of Islamic real  
46 estate investment trust performance from Asian and Middle East countries taking account of  
47 macroeconomic factors and firm-level characteristics. Using the Net Asset Value via panel  
48 data analysis for quarterly data between 2011 to the 3rd quarter of 2015, the authors found  
49 firm size measured by the market capitalisation was positively related to the performance of  
50 Islamic REITs.  
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3 Within the European listed market context, Moss and Lux (2014) explored the liquidity  
4 premium associated with listed real estate securities following the 2008 GFC. Using a  
5 valuation based methodology their findings identify market capitalisation to be the key  
6 discriminating factor that drives companies' liquidity. The authors report that trading turnover  
7 for large firms, as a percentage of market capitalisation, increased during the market upturn,  
8 whereas smaller companies did not benefit as much from a rising market. This has resulted in  
9 a valuation premium of larger companies' vs small companies (by 20-40 per cent) highlighting  
10 the increased value placed on liquidity by investors post GFC.  
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### 17 **Capital structure**

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20 The seminal work by Modigliani and Miller (1958), provided the basis for positing the  
21 relationship between firm capital structure and expected returns on equity, whereby increases  
22 in financial leverage directly increase the risk of the cash flows to equity holders raising the  
23 required rate of return. A series of research has emerged since exploring the role of capital  
24 structure and leverage ratios of publicly-traded real estate companies and the impacts upon  
25 returns performance (Bhandari, 1988; Howe and Shilling 1988; Fama and French, 1992;  
26 Brown and Riddiough 2003; Kishore, 2004; Feng et al. 2007; Giambona et al. 2008; Boudry  
27 et al. 2010; Hardin and Wu 2010; and Harrison et al. 2011).  
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35 One of the most significant studies on the capital structure of listed real estate firms was  
36 undertaken by Wald in 1999. Wald's research examined the factors correlated with capital  
37 structure in France, Germany, Japan, the United Kingdom, and the United States. Although  
38 establishing that mean leverage and many firm factors appeared to be similar across countries,  
39 Wald's findings illustrated that some significant differences remain, principally the level of  
40 correlation between long-term debt/asset ratios and the firms' riskiness, profitability, size, and  
41 growth. Wald attributes these differences to tax policies and agency problems, including  
42 differences in bankruptcy costs, information asymmetries, and shareholder/creditor conflicts  
43 (Wald, 1999).  
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51 Bhabra, et al. (2008) studies the capital structure decisions of listed firms in China between  
52 1992 and 2001. They find that Chinese firms use little long-term debt, which is positively  
53 (negatively) related to firm size and tangibility (profitability and growth options). These results  
54 are robust to the degree of seasoning after the initial public offering and controlling for private  
55 versus state ownership. Although industry membership is important, the development and  
56 growth of the stock market did not affect the long-term debt ratios over the years. Comparably,  
57 Zou and Xiao (2006) find positive relationships that firm size and asset tangibility have with  
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3 firm leverage, which are consistent with the predictions of the static trade-off capital structure  
4 model. Moreover, they do not show state ownership, legal person ownership and foreign  
5 ownership to comprise important influences on the capital structure choices of Chinese firms.  
6 Given the tight regulatory control over equity issues and acute owner–manager incentive  
7 conflicts in state-owned firms, they also hypothesise, and find evidence to support that  
8 Chinese firms have built-in incentives for raising equity. This provides one explanation of the  
9 negative effect of profitability on firm leverage and shows that some of the unique Chinese  
10 institutional features do help shape corporate financing behaviour.  
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17 Salim and Yadav (2012) meanwhile, investigate the relationship between capital structure and  
18 firm performance using panel data on a sample of 237 Malaysian listed companies between  
19 1995 and 2011. Utilising four performance measures (namely return on equity (ROE), return on  
20 asset (ROA), Tobin's Q and earning per share (EPS)) as dependent variables and five capital  
21 structure measures (namely long term debt, short term debt, total debt ratios and growth) with  
22 firm size as a control variable, they indicate that firm performance as measured by ROE, ROA  
23 and EPS comprise negative relationships with short- and long-term debt and total debt.  
24 Conversely, they find a positive relationship between the growth and sectoral performance  
25 with the Tobin's Q showing significantly positive relationships between short and long-term  
26 debt. In a similar study, Ebaid (2009) evaluates the impact of capital-structure choice on firm  
27 performance in Egypt based on a sample of non-financial Egyptian listed firms from 1997 to  
28 2005. Employing three accounting-based measures of financial performance (i.e. ROE, ROA,  
29 and gross profit margin), Ebaid uses regression analysis for estimating the significance of the  
30 leverage level revealing that capital structure choice decision, in general terms, has a  
31 weak-to-no impact on firm's performance.  
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### 43 ***Leverage and idiosyncratic risk***

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46 Specifically, in respect of leverage, Gomes and Schmid (2010) controlling for firm size reveal  
47 positive relationships between leverage and expected returns. This view is shared by Ling and  
48 Naranjo (2015) who found that leverage significantly impacted US REIT returns. In an  
49 extension of this work Giacomini et al. (2015) examined the role of financial leverage, with  
50 emphasis placed on the variation in REIT firm level capital structures within and across  
51 countries, and the cross-country differences in liquidity, ownership, economic, institutional,  
52 and capital market structures. Controlling for leverage effects on firm-level returns using  
53 standard asset pricing models, their findings indicate that leverage has a significant impact on  
54 returns both unconditionally and conditionally. Interestingly, they show that the greater use of  
55 leverage during the 2007–2008 REIT crisis period resulted in larger share price declines. Their  
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3 findings are consistent with a number of other studies in and around the GFC period which  
4 served to highlight the negative impacts of high levels of gearing on the listed real estate sector  
5 including Penman et al. (2007), Dimitrov and Jain(2008) and George and Hwang(2010),  
6 amongst others.  
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11 A number of studies have used times series analysis to showcase the complex interactions  
12 pertaining to the exponential growth effects of leverage and ceiling effects indicating non-  
13 linearity, diminishing marginal effects and increased volatility (Garlappi et al., 2007; Cheng  
14 and Roulac, 2007; Korteweg, 2010). Indeed, Allen et al. (2000) found a positive and significant  
15 relation between leverage and the sensitivity of US REIT returns to general stock-market  
16 returns, supporting the hypothesis that the market risk (beta) of REITs is directly related to the  
17 firm-level leverage. Chaudhry et al. (2004) concluded that leverage was an important  
18 determinant of REIT idiosyncratic risk; however, the sign of the relation between financial  
19 leverage and idiosyncratic risk depends on the regression specification. By way of contrast,  
20 Sun and Yung (2009) estimated the relation between idiosyncratic volatility and expected  
21 returns in REITs using various asset pricing model specifications, they found mixed evidence  
22 on the relationship between leverage and REIT volatility.  
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31 Sagalyn (1996) argued that whilst leverage can be utilised to stimulate performance the  
32 application of gearing can be a problematic issue when external managers are compensated  
33 according to the volume of assets under management. In essence a bias in favour of  
34 enhanced leverage can impinge upon investment strategies. This view is shared by Capozza  
35 and Seguin (2000) who highlight that external managers tend to expand their asset base  
36 through the use of high gearing as their base fee depends on the amount of assets under  
37 management (Ooi et al., 2010). To prevent high debt levels, it is notable that a number of REIT  
38 markets have defined limits on the overall extent of gearing (Brueggeman and Fisher, 2011)  
39 but the extent to which this has prompted diligent and responsible leverage remains a source  
40 of consternation with firms finding creative ways of circumventing ratio compliance. From an  
41 investor viewpoint, and of particular relevance to this investigation, high levels of gearing may  
42 adversely affect cost of capital and net results (Striewe et al., 2013) which in turn serves to  
43 reduce returns on equity (Ooi et al., 2011) something which we will detail later in the empirical  
44 section of the paper.  
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### 54 55 ***Corporate governance and disclosure*** 56

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58 Taking a corporate governance perspective Leng and Mansor (2005) examined 120  
59 Malaysian-listed companies over a four-year period between 1996 to 1999 to analyse  
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3 performance of the firms using both fixed effects and random effects models. Their findings  
4 infer that dominant CEOs, the size of firm and gearing ratio (borrowing) significantly influenced  
5 the ROE performance of firms. Furthermore, they found that the impact of size on the  
6 performance of firms followed a quadratic fashion with performance increasing with the size  
7 of the firm up to an optimal size. In contrast, they found borrowing comprised a negative effect  
8 on earnings with 1% increase in borrowing having a 0.13% decrease in ROE.  
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14 Meanwhile, Uyar et al. (2013) examined the association between firm characteristics and  
15 corporate disclosure for Turkish listed companies. Their paper empirically investigates the  
16 factors that impact voluntary information disclosure level of Turkish manufacturing companies  
17 listed in the Istanbul Stock Exchange (ISE). The findings provide evidence of a positive  
18 association between voluntary information disclosure level and the variables such as firm size,  
19 auditing firm size, proportion of independent directors on the board, institutional/corporate  
20 ownership, and corporate governance. However, leverage and ownership diffusion were found  
21 to have negative significant association with the extent of voluntary disclosure. The remaining  
22 variables, namely, profitability, listing age, and board size were found to be insignificant. By  
23 way of contrast, Dewi et al. (2014) in a study examining firm characteristics and intellectual  
24 capital disclosure on 226 service companies listed on the Indonesia stock exchange analysed  
25 firm size, firm age, industry type, listing status and managerial ownership on capital disclosure.  
26 Their findings showed that firm size, firm age, and listing status affect intellectual capital  
27 disclosure significantly. While the type of industry and managerial ownership does not affect  
28 intellectual capital disclosure significantly.  
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#### 40 ***Investment focus/diversification***

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43 In a diversification and portfolio setting, Bond and Glascock (2006) examined the performance  
44 and diversification characteristics and benefits of European public real estate markets. They  
45 determined that the inclusion of listed real estate decreased risk and enhanced return, and  
46 that the characteristics such as liquidity and small market capitalisations provide benefits  
47 within institutional portfolios and asset allocation desires. A series of studies which included  
48 the exploration of diversification on the performance of Australian REITs (Newell  
49 (2006), Giambona *et al.* (2008) and Chikolwa (2009)) found that geographically diversified  
50 asset investment provides REIT firms with access to cheaper debt, thus, creating the  
51 conditions for a negative correlation between risk and debt levels. Anderson et al. (2015)  
52 examined the effect of property-type diversification in US REITs from 1995 to 2006. The  
53 authors report strong positive relationships between property-type diversification and ROA,  
54 ROE, and Tobin's Q. Their findings highlight that diversified REITs produce higher cash flows  
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3 relative to equity as a result of a broader opportunity set; moreover, return on assets increases  
4 with the degree of diversification, which suggests significant shielding to property-type specific  
5 risk.  
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10 In a key study aligned to firm level attributes Sun and Yung (2009) examined idiosyncratic risk  
11 and expected returns of real estate investment trusts in relation to portfolio diversification.  
12 Applying firm-level data, and controlling for firm characteristics and variables typically related  
13 to idiosyncratic volatility, the authors find a significant positive relationship between  
14 idiosyncratic volatility and expected REIT returns. When excluding small, low-priced, and  
15 illiquid REITs from the sample, the authors find that the relationship between idiosyncratic  
16 volatility and expected REIT returns becomes insignificant signalling some implications for  
17 investor allocations strategies in respect of firm size and diversity of investment focus.  
18 Interestingly, Colak (2010) in a paper focusing on diversification and the refocussing of  
19 investment decisions relative to firm level characteristics suggest that refocusing occurs  
20 generally due to firm-specific reasons, with diversification due to external factors, such as  
21 industry and economic conditions. Using a 2SLS estimation procedure, Colak (2010) models  
22 and estimates the valuation consequences that are sustained by the firm after it undertakes a  
23 refocusing or a diversification action, findings exhibit no evidence of a 'diversification discount'  
24 or 'refocusing premium.' In a developing market context, Ooi and Liow (2004) conducted  
25 research scrutinising the risk-adjusted performance of real estate stocks listed in seven  
26 developing markets in East Asia between 1992 and 2002. Using panel regressions, they show  
27 that market diversification has a significant influence on the performance of real estate  
28 securities.  
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41 Finally, an extensive study by Brounen and de Koning (2014) in an international examination  
42 of REITs coinciding with their fifty-year existence reveal some important insights pertaining to  
43 the investment focus of REITs adding to the debate on diversification and sectoral  
44 specialisation. In their study the authors find that in the period 2000-2010 REIT stock  
45 outperformance was highest in Europe, which they attribute to firm size, the level of property  
46 type specialization, and geographic portfolio focus. Interestingly, the same study identifies that  
47 systematic REIT risk is highest amongst Asian REITs which they suggest is a consequence  
48 of firm leverage.  
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### 55 **3 Performance of the European Listed Real Estate Markets**

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3 Table 1 shows that the Developed Europe<sup>3</sup> listed real estate market is an integral component  
4 of the global investment universe with a market capitalisation of over €212bn<sup>4</sup>, posting a ten-  
5 year annualised total return (2007-2017) of 3.53%. It also highlights the historical trends and  
6 other performance characteristics of the six European listed real estate markets over the past  
7 decade. Sweden and Switzerland have led performance with 10-year annualised total returns  
8 of 12.08% and 11.25% respectively. In fact, the former has outperformed the other five  
9 markets over the short (1 year) and medium-term (5-year) periods. Despite being the largest  
10 market in the sample, the U.K. posted a negative 10-year annualised total return (-1.31%).  
11 The German and French markets performed relative to the European average (excluding the  
12 U.K.) over the investigation period.  
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22 Figure 1 and Table 2 depicts the total return performance of the six markets over time and  
23 their correlations respectively. It is noteworthy that total returns in the Swiss market depict a  
24 low level of correlation with the other European markets - due in part to its unique financial  
25 openness and status as a country outside of the European Union. All other European listed  
26 real estate markets are strongly correlated with coefficients in excess of 80%. Most noticeably,  
27 the performance of the U.K. market is substantially correlated (90.17%) with that of the  
28 Developed Europe index (excluding the UK). Consequently, investors may not be able to gain  
29 significant diversification benefits anticipated by expanding their investment portfolios at a  
30 pan-European level.  
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### 46 *Key Investment Trends*

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49 Utilising the FTSE EPRA/NAREIT Developed Europe Sector Index Series<sup>5</sup>, the research  
50 initially categorised the constituent companies by country and sub-sector focus<sup>6</sup>. With regards  
51 to market capitalisation across the sub-sectors, companies with a Diversified investment focus  
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56 <sup>3</sup>Developed Europe" in this study is defined as a collection of European markets that are tracked by FTSE EPRA/NAREIT  
57 Developed Europe Index Series.

58 <sup>4</sup>As at the end of October 2017.

59 <sup>5</sup>Note that FTSE EPRA/NAREIT Developed Europe Sector Index Series is a Europe-wide time series that tracks the performance  
60 of both sample and non-sample companies listed on stock exchanges in Europe.

<sup>6</sup> Namely (i) diversified, (ii) residential, (iii) retail, (iv) office, (v) industrial, (vi) industrial and office, (vii) healthcare, (viii) self-storage, (vi) lodging/resorts and (x) speciality. Some of the sample companies were re-categorised by EPRA during the investigation period.

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3 topped the list in terms of market capitalisation, accounting for circa 32.35% (or €68.62bn) of  
4 the entire Developed Europe listed real estate universe. Residential and Retail specialist  
5 companies comprised 24.14% (or €51.20bn) and 22.27% (or €47.23bn) respectively. Other  
6 traditional real estate sectors such as Office and Industrial occupied a relatively less prominent  
7 position, respectively comprising 11.26% (or €23.88bn) and 5.42% (or €11.49%) of the market.  
8 The 'niche' sectors, though growing in popularity in recent years, still account for a relatively  
9 small portion of the market with Healthcare, Self-storage and Lodging/resorts collectively  
10 equating to less than 2.5% of total market value.  
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17 As evidenced in Figure 2, the historical performance of the sectors has followed broadly similar  
18 trends/patterns with varying magnitudes of volatility over the analysis period. This is confirmed  
19 within the correlation analysis which clearly illustrates sectoral total returns to be highly aligned  
20 and associated. Most evidently, Diversified, Residential and Retail are highly correlated with  
21 coefficients in excess of 96%<sup>7</sup>.  
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26 <<<Insert Figure 2>>>  
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29 When examining the performance of different corporate structures on the performance of listed  
30 real estate (See Table 3), as at the end of Q3 2017, REITs in Developed Europe collectively  
31 account for €122bn of the listed real estate market while non-REITs account for circa €90bn.  
32 In terms of performance, non-REITs, on average, have outperformed REITs over a 5-year  
33 time horizon by a sizable margin (13.36% vs 9.43%), despite the former having a lower level  
34 of volatility. At the country level, the German non-REIT sector has seen the most notable  
35 growth among the sample countries over the period of 2012-2017 with a total return of 18.41%.  
36 In contrast, the German REIT sector displays significantly lower total returns of 9.97% over  
37 the same five-year investment horizon. A similar, albeit inverse phenomenon, can be  
38 evidenced in the UK where the REIT sector has grown more rapidly than its non-REIT  
39 counterpart over the time horizons under investigation.  
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51 The differentiation between rental and non-rental business was deemed a key dimension of  
52 performance dynamics. As such, the research employed the FTSE EPRA/NAREIT Developed  
53 Investment Focus indices in order to designate the existing constituents into both Rental and  
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<sup>7</sup> Full results of correlation analysis at the sector level are available upon request.

Non-Rental indices<sup>8</sup>. As shown in Table 4, the European rental market<sup>9</sup> is substantially larger than its non-rental counterpart by market capitalisation (€193bn vs €20bn). The non-rental sector has delivered an average total return of 30.49% over the five years to the end of October 2017, compared to 10.80% generated by its rental counterpart over the same time period. The analysis further indicates that the non-rental sector is characterised by greater volatility (40.20%) compared to the rental sector (11.90%) over a ten-year investment time horizon. Comparatively, the UK rental sector delivers slightly lower total returns over both the 5-year (8.46%) and 1-year time horizons (11.83%). This is perhaps due to its higher sensitivity to uncertainty inherent in the wider stock market, the non-rental real estate of the UK appears to have been more volatile than its rental counterpart over the past ten years, although the differences are not as large as those between rental and non-rental in mainland Europe.

<<<Insert Table 4>>>

#### 4 Methodology

This section presents the methodology and data employed in the study. The main regression model (Model 1) that was developed to explain the performance of listed real estate companies is specified as follows:

$$R_i = c + \mathbf{t} + C_i + S_i + Cap_i + LTV_i + D_i + ROE_i + REV_i + REIT + I + r.f. + e.....(Eqn 1)$$

where the subscript  $i$  denotes the cross-sectional dimension of the companies included in the sample. The dependent variable,  $R$ , is the risk adjusted return (or Sharpe ratio) of the company<sup>10</sup>.  $c$  is a constant.  $\mathbf{t}$  is a set of yearly time dummy variables with year 2007 being the base group. Since the study covers the period of 2007-2017, ten dummy variables are created.  $C_i$  is a set of country dummy variables with the U.K. being the base group. In total, five country dummies are created to account for the six sample countries.  $S_i$  is a set of sector dummy variables. We use the sector classification system for listed real estate companies designed by EPRA (2007-2017) in order to assign sector dummies to the observations. Ten sectors – namely (i) diversified, (ii) residential, (iii) retail, (iv) industrial, (v) office, (vi) industrial/office, (vii) lodging/resorts, (viii) health care, (ix) self-storage and (x) speciality – are classified with diversified being the base group<sup>11</sup>.

<sup>8</sup> According to EPRA's definition, a company is included in the Rental index if its rental revenue from investment properties is greater than or equal to 70% of total revenue. On the other hand, a company is included in the Non-Rental index if its rental revenue from investment properties is less than 70% of total revenue.

<sup>9</sup> Rental and Non-Rental universe premised on the 'entire' European listed real estate market.

<sup>10</sup> Sharpe ratio and risk-adjusted return are used interchangeable throughout the paper.

<sup>11</sup> It must be emphasised that some companies in our sample have switched from one sector to another during the sample period, resulting in changes of their sector dummies.

To empirically separate the effects of company-specific characteristics from those of  $C_i$  and  $S_i$ , we incorporate a number of company-level attributes in the model: (i)  $Cap_i$  is the market capitalisation of company  $i$ , which indicates the size of the company as defined as the sum of its equity and debt. Consistent with the approach adopted in previous studies, logarithmic transformation is applied to this variable; (ii)  $LTV_i$  refers to the loan to value ratio of company  $i$ , which describes its capital structure equal to total amount of debt divided by total value; (iii)  $D_i$  is the dividend yield, which is equal to sum of gross dividend divided by current stock price; (iv)  $ROE_i$  is return on equity of company  $i$ , which indicates the company's profitability by revealing how much profit it generates with the money shareholders have invested; (v)  $REV_i$  denotes growth in revenue over the prior twelve months (a positive  $REV_i$  suggests an increased level of cash inflows to the company); (vi) REIT is a binary variable, which is equal to one if the company is a REIT, zero otherwise; (vii)  $I$  represents the investment focus of the company, which is equal to one if the company's rental revenue from investment properties is greater than or equal to 70% of total revenue, zero otherwise;  $r.f.$  refers to the risk free rate, which captures the risk-free opportunity cost of capital. In our study, we employ the yield of ten-year government bond of the country in which the company is listed as the appropriate risk free rate. The inclusion of this variable is to control for the impact of interest rate movements over the sample period; lastly,  $e$  is an error term. A summary of the key variables in our regression analysis is provided in Table 5.

<<<Insert Table 5>>>

The Sharpe ratio is used to measure the risk-adjusted returns of real estate companies in this study. It is defined as the mean of excess returns divided by the standard deviation of returns of a given investment portfolio over a given time period. Mathematically, it is expressed as follows:

$$S_{i,t} = \frac{\bar{R}_{i,t} - r.f._t}{\sigma_{i,t}} \dots \dots (Eqn 2)$$

where  $S_{i,t}$  is the Sharpe ratio of company  $i$  at year  $t$ ,  $\bar{R}_{i,t}$  is the mean rate of return of company  $i$  during year  $t$ .  $r.f._t$  is the risk free rate of return at year  $t$ .  $\sigma_{i,t}$  is the standard deviation of the rate of return of company  $i$  during year  $t$ , which indicates the degree of return volatility during the period. Monthly closing year-on-year total returns of the individual company are utilised to compute the annual mean returns as well as return volatility of the individual companies.  $S_{i,t}$ , therefore measures the amount of mean excess return generated per unit of volatility. In our study, we compute Sharpe ratios for each sample company on a quarterly basis for the period



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3 Q1 2007-Q3 2017. The same time basis is consistently applied to construct time series for  
4 other variables used in the regression models.  
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### 8 *Data*

9 To empirically test the regression models in the study, we utilise data provided by EPRA,  
10 supplemented where necessary, with financial and company level data obtained from  
11 Bloomberg. For interpretation consistency, all financial data are measured in Euro's and on a  
12 quarterly basis. Our dataset comprises 6 countries, 10 real estate sectors, and 113 listed real  
13 estate companies tracked by FTSE EPRA/NAREIT Developed Europe Index Series during  
14 the period of Q1 2007 – Q3 2017.  
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### 20 *Robustness Models and Sector-level Models*

21 To check the robustness of our regression models and variable selection, we perform a  
22 number of robustness checks (empirical tests) for each methodological step – where  
23 appropriate. Due to sample size limitations (for econometric modelling purposes) a re-  
24 categorisation of the RE sectors was necessary. In this regard, the research re-categorises  
25 the above mentioned ten real estate sectors into five main groups, namely (1) diversified, (2)  
26 residential, (3) retail, (4) industrial/office (comprising the original sector classifications  
27 industrial, office and industrial/office) and (5) speciality (comprising the original sector  
28 classifications lodging/resorts, health care, self-storage and speciality). Thus, a new model  
29 (Model 2) is developed by redefining the original sector dummies taking the five-sector  
30 approach. For the sake of interpretation, the original sector classification method is hereinafter  
31 referred to as the “10-sector method” and the new one as the “five-sector method”. Since  
32 Models 1 and 2 cover all sample real estate sectors, the regression model on which they are  
33 based is hereinafter referred to as the aggregate model.  
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44 To explore the time dimension of our models, we further create splines and run our analysis  
45 across two sub-periods (Models 3 – 6). Sub-period one comprises Q1 2007 to Q4 2011, which  
46 is characterised by extreme market volatility due to the GFC; Sub-period two comprises Q1  
47 2012 to Q3 2017, which reflects the relatively gradual recovery stages of the markets post  
48 GFC. The approach further performs sector-level tests by estimating regression models  
49 (Models 7 – 15) separately for each defined real estate sector. In total, nine real estate sectors  
50 are investigated, namely (i) diversified, (ii) residential, (iii) industrial/office, (iv) retail, (v)  
51 speciality, (vi) REIT, (vii) non-REIT, (viii) rental and (ix) non-rental. The first five groups are  
52 mutually exclusive, so are REIT and non-REIT, and rental and non-rental. Due to data  
53 limitations, the five-sector classification method is adopted in assigning sector dummies for all  
54 sector level models. For the same reasons, only three time windows are defined to create time  
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dummies – (a) 2007-2009, (b) 2010 – 2013 and (c) 2014-2017 – with (a) being the base group.

### *Diversification Models*

One of the objectives of this study is to explore whether the degree of business diversification of a listed real estate company is value-enhancing. To achieve this, we construct a Herfindahl Index (*H.I.*) for each company-year observation over the period of 2012 – 2016<sup>12</sup> using annual company-level portfolio data provided by EPRA. Mathematically, *H.I.* is expressed as follows:

$$H.I._{i,t} = \sum_{j=1}^n INV_{j,t}^2 / (\sum_{j=1}^n INV_{j,t})^2 \dots\dots (Eqn 3)$$

with *i* and *t* denoting the cross-sectional and time dimensions of the observations respectively.  $INV_{j,t}$  represents the proportion of investment portfolio of company *i* allocated to sector *j* at time *t*. *H.I.*, therefore, indicates the extent to which a firm's portfolio is concentrated within its industry/sector segments. It takes the value of one if the firm focuses on only one particular sector and decreases as the degree of diversification increases. Incorporation of the *H.I.* into the regression models to examine its effect on risk-adjusted return can be observed in Model 16. To increase the robustness of our analysis, we substituted *H.I.* with a dummy variable, *S.S.* – which is equal to one if *i* is a sector-specific company (i.e. *H.I.*=1), zero otherwise (Model 17).

### *Tests on the Explanatory Powers of Attributes*

Following the approach adopted by Connor (1995) and Chaumeton et al. (1996), we analyse the explanatory power (or partial  $R^2$ ) of the key identified attributes/ sets of attributes of our regression models in order to compare their significance to risk-adjusted performance of listed real estate. The explanatory power of an attribute can be examined in two ways: (i) By measuring the coefficient of determination of the regression model when the attribute under investigation is the only regressor in the model (Method A), and (ii) by measuring the marginal increase in the coefficient of determination of the model (i.e.  $R^2$ ) after adding the attribute to a set of existing explanatory variables (Method B). The tests are conducted across our regression models in order to determine the influence of different attributes/sets of attributes on risk-adjusted return for different time periods.

<sup>12</sup> We have attempted to increase the size of the research sample, however, due to data availability issues, only the period 2012-2016 is examined.

## 5 Empirical Results and Discussion

### *Aggregate Models*

The findings emanating from the study analyse a suite of regression models<sup>13</sup> premised on the EPRA indices (constituent companies) supplemented with the company specific performance characteristics extracted from Bloomberg. The models developed and specified offer a systematic approach for examining the various country, sectoral<sup>14</sup>, and company specific attributes across a range of time periods.

At the aggregate level, over the entirety of the time series (Models 1-2 – Table 6), the findings reveal Healthcare is the best performing real estate sector, followed by Industrial ( $p < .01$ ). The results for other sectors are less statistically significant with Industrial and combined Industrial/Office (5 sector model) tending to outperform the market average. The Retail sector performs poorly in comparison to the other sectors, arguably a consequence of the transformation within the sector – the shift to online retailing and wider exogenous shocks from economic uncertainty. When analysed by factoring in the reclassification of the sectors, the Speciality sector outperforms all others, with Retail continuing to exhibit underperformance with risk-adjusted returns below that of the base sector (Diversified).

**<<<Insert Table 6>>>**

Examination of the company-specific characteristics over the entire period shows a number of noteworthy findings. With regards to the Loan to value parameter (L), this appears to have had a dampening effect on risk-adjusted return ( $p < .01$ ). This is also similar for the Dividend yield (D) which appears to marginally depress risk-adjusted return. Conversely, both Return on Equity (ROE) and Growth in Revenue (REV) enhances risk-adjusted return (albeit risk adjusted return is not statistically significant for REV). Across all findings, Market Capitalisation (Cap) and Investment Focus (I) do not have any statistically significant relationships with the performance variables at any conventional statistical levels. One explanation for this is that constituents with larger market Caps have more concentrated exposures to 'traditional' real estate sub-sectors which have performed less favourably than many of the niche sub-sectors across the study period. Further to this, larger constituent companies also exhibit, on average, higher loan-to-value ratios. It is a common misconception that greater leverage generates higher returns, however, in a downturn companies with higher leverage generally underperform.

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<sup>13</sup> Eighty regression models were specified for the analysis.

<sup>14</sup> As discussed in the methodology, to comply with statistical assumptions the sectors were reclassified (grouped).

Pertinently, in times of volatility and high risk, the nature of REITs (for example) may be hampering the return as it would be preferable for companies to retain dividend particularly in uncertain market conditions. The Dividend yield however can be misleading as some companies pay out yields too aggressively and fail to reinvest profit to sustain operations through market turbulence. Moreover, as discussed by George and Hwang (2010) for equity returns, endogenous leverage choice may imply a negative and significant relation between debt (or leverage or distress risk) and expected returns. Pertinently, the corporate structure appears to have played a key role in terms of performance.

Return on Equity also displays a positive effect ( $p < .001$ ) suggesting that efficiently invested funds (management) generates superior return. Higher ROE also implies that the company is able to raise capital for growth more easily (i.e. it is more capable of generating cash internally) and hence it explains the positive impact on risk adjusted return. This is in line with theoretical propositions<sup>15</sup> in that expected return on equity should increase with the amount of debt in a firm's capital structure. Nonetheless as highlighted by Rappaport (1986) it must be caveated that Return on Equity (asset turnover) is sensitive to inflation in that it may increase even when assets do not produce better returns - illustrating that in an environment where earnings decrease, ROE can increase through heightened levels of asset turnover and gearing leading to misled 'better performance' (Black et al. 2001) - ROE can be increased by increasing debt, even if the company is destroying value.

### *Sub-period Models*

Spline analysis, based on differing points in the market cycle, has been undertaken for the aggregate models. We examine the sub-periods of 2007-2011 (Models 3 and 4) and 2012-2017 (Models 5 and 6). The former is a period characterised by extreme market volatility caused by GFC. In contrast, the latter is a relatively more stable period of recovery. It was deemed that comparison between the two cycle periods offers insight into how the various sectors have responded to different market fundamentals and to garner further insights as to the sectoral and company specific performance measures in these distinct periods within the market cycle.

An interesting picture emerges when comparing the company level variables across the time periods (See Table 7). The negative effects of loan to value and dividend yield on risk adjusted return become more pronounced during 2012-2017, as the magnitude of the coefficients on L and D increase. On the other hand, the positive effect of Return on Equity on the risk adjusted

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<sup>15</sup>Modigliani-Miller(1958).

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3 return becomes greater as revealed by the larger magnitude of its coefficient. With regards to  
4 company structure, the REIT coefficient displays a positive effect on performance in the latter  
5 period perhaps reflective of their increasing maturity and the improved regulatory regime. In  
6 terms of sector insights, Health care is the best performing RE sector ( $p < .01$ ) across both sub-  
7 periods.  
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11 <<<Insert Table 7>>>  
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### 13 14 15 16 *Sector-level Analysis*

17 Sector level analysis is conducted in order to ascertain how company level attributes impact  
18 upon returns performance for a particular real estate sector and over different time periods<sup>16</sup>.  
19 Overall, the sector-level analysis exhibits a very mixed bag of results across both sectors and  
20 sub-periods (see Table 8<sup>17</sup>). This is undoubtedly attributable to the different economic  
21 fundamentals, business cycles and supply-demand dynamics of the sectors, which respond  
22 differently to the changing market climates over the investigation period. The results for the  
23 company level variables are elucidated as follows<sup>18</sup>:  
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35 Over the entire sample period, market capitalisation appears to drive the risk-adjusted return  
36 of industrial/office, speciality, non-REIT, non-rental and residential (in ascending order of  
37 magnitude of influence), whilst seemingly depressing that of REIT and diversified (in an  
38 ascending order of magnitude of influence). When considering the time dimension, a different  
39 picture emerges. Over the first sub-period, in ascending order of magnitude of influence, *Cap*  
40 has a positive effect on a number of sectors such as non-REIT, speciality, non-rental and  
41 residential. On the other hand, it negatively impacts the performance of rental, REIT and retail  
42 (in ascending order of magnitude of influence) during the second sub-period.  
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49 With regards to Loan-to-Value, this appears to have an average limiting effect on the risk  
50 adjusted performance over the entire sample period. The coefficient is negative across a  
51 number of real estate sectors including rental, REIT, diversified and retail (in ascending order  
52 of magnitude of influence). At the sub-period level, the attribute has a negative effect on  
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57 <sup>16</sup> Consistent with the treatment for the aggregate models, we employ the same three splines in our sub-sector analysis: (i) 2007-2017,  
58 (ii) 2007-2011 and (iii) 2012-2017. Only results for the full sample period are reported and the results for the subperiods are available upon  
59 request.

<sup>17</sup> We report findings on the entire sample period only due to space limitations. Full results of the sub-sector analysis are available upon  
60 request.

<sup>18</sup> All findings are based on the 10% level of statistical significance.

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3 diversified, non-rental and residential. It is noteworthy that the magnitude of its effect on the  
4 residential sector is particularly acute as indicated by its relatively high coefficient value,  
5 compared to that of the diversified sector over the same time period. For the subperiod of  
6 2012-2017, the attribute seemingly drives the performance of industrial/office and speciality  
7 despite some sectors such as rental, diversified and residential being limited by it.  
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12 Similarly, the Dividend yield has a noticeable detrimental effect on performance across the  
13 majority of sectors investigated, with the coefficient being negative and statistically significant  
14 across the sectors of non-REIT, REIT, diversified, rental, retail and residential (in ascending  
15 order of magnitude of influence). On closer inspection, its effect is less 'apparent' during the  
16 market downturn period given that only residential and rental display a negative coefficient on  
17 dividend yield. For the market recovery phase, the coefficient of Dividend yield is negative and  
18 significant for seven out of the nine sectors, namely diversified, non-REIT, REIT, rental,  
19 industrial/office, retail and speciality (in ascending order of magnitude of influence).  
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27 Overall, the Return on Equity coefficient is positive and statistically significant at the  
28 conventional significance levels for most sectors with residential being the only exception. The  
29 findings imply that the Return on Equity moves more or less in tandem with risk adjusted return  
30 over the sample period. By comparing the magnitude of the coefficients across the sectors,  
31 the attribute exhibits an ascending order of impact on industrial/office, non-rental, REIT,  
32 speciality, rental, diversified, non-REIT and retail. The sub-period analysis further confirms the  
33 growing importance of the attribute for European real estate. Not only does it show that the  
34 sign of coefficient of the attribute is positive and statistically significant for eight out of the nine  
35 sectors for 2012-2017 (with Speciality being the exception), it also reveals its magnitude has  
36 become greater over the two sub-periods<sup>19</sup>.  
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45 When the entire sample period is considered, growth in revenue is a driver of risk adjusted  
46 return for three sectors, namely residential, REIT and rental. In particular, it affects the  
47 residential sector most markedly with a regression coefficient of 0.77, compared to 0.21 and  
48 0.13 for REIT and rental respectively. However, when the sub-periods are examined, a  
49 different outcome arises: None of the nine sectors displays a statistically significant  
50 relationship with the attribute for the first sub-period. In other words, growth in revenue  
51 appears to have no statistically noticeable effect on risk adjusted return when the market is in  
52 a state of extreme volatility such as the GFC. In addition, only the sector of speciality displays  
53 a positive and statistically significant coefficient on REV for the second sub-period. The  
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<sup>19</sup> The conclusion is drawn based on the results of sectors with ROE having a statistically significant coefficient at the 10% level.



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3 discrepancy between the results for different investigation periods seem to suggest REV being  
4 a long-term determinant of growth of a company for certain sectors.  
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8 In terms of REITs, the findings suggest that they tend to enhance the performance of the  
9 majority of real estate sectors including Retail, Speciality, Rental and Residential (in ascending  
10 order of magnitude of influence based on the size of coefficients). This confirms the commonly  
11 held view that REITs are relatively more regulated and therefore less risky investment vehicles  
12 than non-REITs – which in turn explains their superior risk-adjusted return over a longer  
13 investment horizon. However, the conclusion should be treated with caution when the  
14 temporal context is considered. For the period of 2007 to 2011, only Speciality and Non-rental  
15 sectors show a positive and statistically significant relationship with the REIT attribute. More  
16 notably, REIT companies underperform their non-REIT counterparts in the retail sector. On  
17 the other hand, the results for the 2012 -2017 period are largely in accord with those of the full  
18 period. In particular, REITs in the sectors of Diversified, Rental, Retail, Residential and  
19 Speciality outperformed their non-REIT market peers over the five-year horizon.  
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28 In terms of investment focus and its effect on a company's risk adjusted return, it reveals  
29 significant variations across sector and time period. The full period analysis reveals that  
30 investment focus has no statistically significant relationship with most of the sectors under  
31 investigation except for residential, which is negatively impacted by the attribute. On the other  
32 hand, companies that focused on rental business in the retail sector outstripped their market  
33 competitors with a non-rental focus during the first sub-period as the positive coefficient on I  
34 implies. In addition, three sample real estate sectors, namely diversified, residential and  
35 speciality have their risk adjusted return negatively correlated with the attribute for the second  
36 sub-period, whilst companies with a rental focus in Industrial/Office achieved a superior risk  
37 adjusted return during the same time period of market recovery.  
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45 A summary of the attributes across the varying time period splines is displayed in Table 9.  
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### 52 *Diversification Findings* 53

54 When considering whether the degree of business diversification of a listed real estate  
55 company is value-enhancing, we further construct a Herfindahl Index (*H.I.*) for each sample  
56 company over each predetermined period of time, using annual company-level portfolio data  
57 as furnished by EPRA. The results (Table 10) unequivocally suggest that diversification tends  
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3 to subdue the value of a firm as indicated by the positive and statistically significant coefficient  
4 (*H.I.*). In other words, companies that diversify by investing in more sectors appear prone to  
5 having lower total returns than their industry peers with a concentrated business focus. The  
6 results appear robust in that the diversification effect remained negative and statistically  
7 significant when S.S. is used.  
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### 15 *Decomposition Analysis*

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17 Decomposition analysis was further undertaken to test the explanatory power of the attributes  
18 in order to determine how much each attribute (or group of attributes) account for the variation  
19 of risk adjusted return<sup>20</sup> (See Table 11 for the results). The analysis explores the explanatory  
20 power of the attributes over the three sub-periods and at the aggregate and sub-regional levels  
21 (U.K. and collective continental European countries). In addition, it is revealed that the country  
22 specific variables can explain the variation of risk adjusted return more than the sector  
23 dummies (when method A is utilised, the opposite is observed when method B is employed).  
24 In terms of company specific attributes, unsurprisingly, Return on Equity has the highest  
25 explanatory power, both individually (41.14%) and marginally (4.63%), with Market  
26 capitalisation accounting for 6.33% and 0.02% respectively. Other regressors such as growth  
27 in revenue, REIT and investment focus play a much less significant role in terms of explanatory  
28 power.  
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38 Comparison between the two sub-periods further suggests that the time variables, consistent  
39 with our expectation, explain significantly more of the variation of risk adjusted return during  
40 the first sub-period given the extreme market volatility caused by the aftermath of the GFC.  
41 For example, they respectively account for 55.84% and 16.10% of the variation of the  
42 dependent variable over the first period (using both decomposition methods). Pertinently, the  
43 values drop to 27.76% and 15.48% respectively during the second period – reflecting market  
44 recovery. Moreover, the results also highlight that the heterogeneity between sectors across  
45 the sample countries has grown over time, as indicated by the increase in explanatory power  
46 of the sector dummies over the two sub-periods: from 3.51% to 4.10% and 0.82% to 2.80%  
47 employing both methods .  
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58 <sup>20</sup> The decomposition approach employs a “partial  $R^2$ ” contribution to the models as advocated by Connor (1995). Method A:  
59 assessment of the coefficient of determination of a regression model with risk-adjusted return as the dependent. Method B:  
60 assessing the difference in the level of coefficient of determination between two regression models; 1 with all attributes as  
independent variables except the subject attribute(s); the other with all attributes as independent variables – the marginal increase  
in explanatory power through an additive approach which already includes all other regressors.

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3 By comparing the change in the size of explanatory power, we observe that market  
4 capitalisation has shown a reduced significance in terms of explanatory power over time. The  
5 results for return on equity are, however, slightly more ambiguous. Over the two sub-periods,  
6 the variable has displayed a rise in explanatory power at the margin (from 3.73% to 5.44%)  
7 but a remarkable reduction (49.44% to 20.7%) when it is encapsulated alone as the  
8 independent variable in the regression model. It is also interesting to note that dividend yield  
9 has become a much more important attribute in explaining risk adjusted performance over  
10 time, judged by its change in partial  $R^2$  contributed to the regression models. When all  
11 company specific attributes are considered as one block, their collective explanatory power  
12 (43.62% individually and 10.53% marginally) is considerably larger than that of the sector level  
13 attributes combined (1.94% individually and 6.15% marginally) over the whole investigation.  
14 In this sense, company specific characteristics cannot be underestimated in their contribution  
15 to overall performance dynamics and in essence require due diligence on a par with sectoral  
16 focus.

17 <<<Insert Table 11>>>

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### 6 Conclusions

Institutional investors considering European listed real estate companies need to more fully understand and comprehend the performance drivers attributable to corporate structures and firm specific attributes. Indeed, given that the performance of listed real estate companies is predicated on underlying real asset portfolios, the impact and significance of company specific attributes is more pronounced than for other listed companies. Firm specific attributes play an important role in the optimisation of performance in real estate upcycles and in 'sheltering' listed firms in down-cycles. This study has demonstrated that higher LTV ratios have a negative impact on risk-adjusted performance. Further to this, the relationship between dividend yield and risk-adjusted performance implies that companies that retain and reinvest profits amidst turbulent market conditions have realised superior performance over the investigation period Q1 2007 – Q3 2017.

The continued growth and development of new sectors is a pertinent feature of the listed real estate sector. This offers expanded scope for investors to diversify their portfolios beyond the conventional office, and retail allocations. Indeed, this research has demonstrated the capacity of these new 'niche' sectors to outperform and to offer investors opportunities in more economically resilient assets. In terms of 5-year total return, self-storage, industrial and residential have been the best performing sectors posting total returns of 25.29%, 21.16% and 20.66% respectively since 2012. By contrast, retail has been the worst performing sector with

total return rates of 6.49% over the same period. It is further noteworthy for investors seeking more stable income flows that the healthcare sector posted the best risk-adjusted performance over the sample period.

The means by which investors seek exposure to 'new' sub-sectors and the optimal weighting allocation is the next logical step in the decision making process. The need for sector 'specialist expertise' and established competent networks is perhaps even more pronounced within the 'niche' sub-sectors. This study contributed to the ongoing debate pertaining to sector specialists versus diversified listed real estate companies. Using H.I time series constructs the analysis determines that sector specialists outperformed in the period Q1 2007–Q3 2017. Furthermore, the regression analysis details value enhancing attributes attributable to sector specialisation. In terms of portfolio construction, the results suggest that sectoral diversification is better attained by investing across a number of sector-specialist companies (thus gaining from sector specialist knowledge) than from seeking diversification within an individual company level structure.

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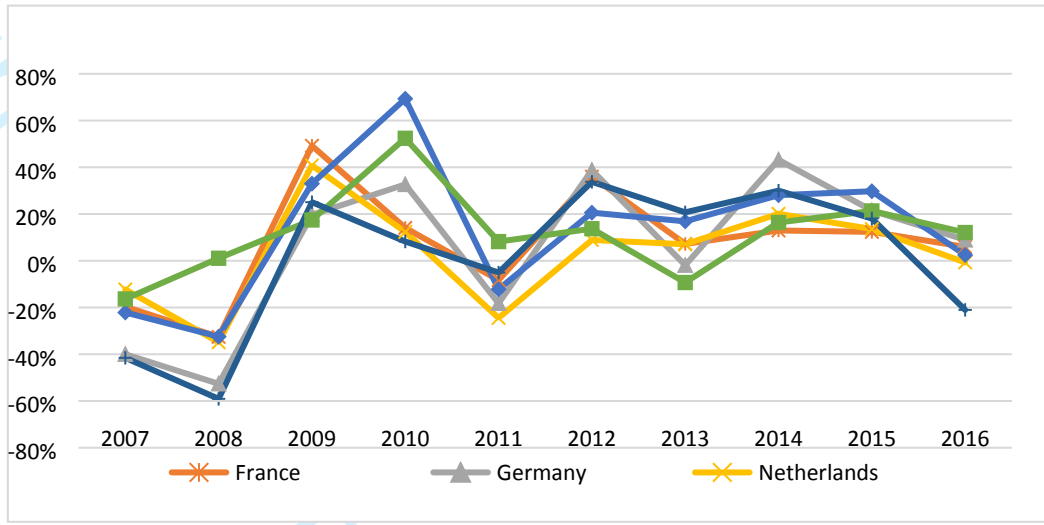
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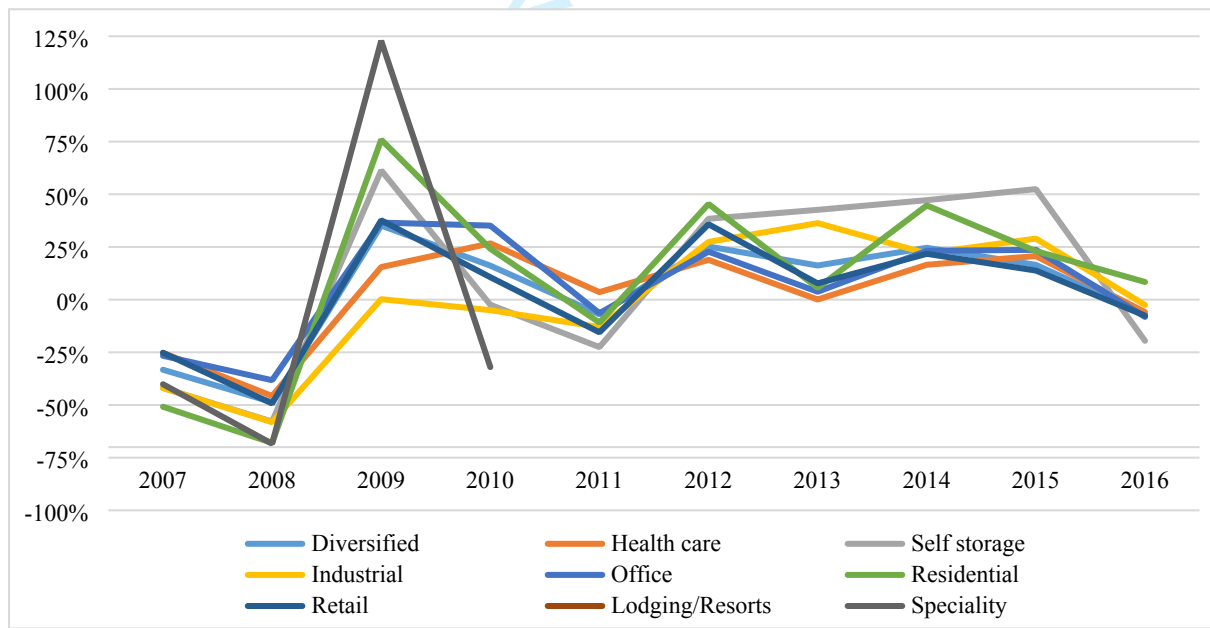
Figures

**Figure 1: Historical total returns of the six selected European listed real estate markets**



Source: EPRA (2017) and authors compilation

**Figure 2: Historical sector-level annual total returns of the European market**



Source: Authors' compilation based on FTSE EPRA/NAREIT Developed Europe Sector Index Series.

## Tables and Figures

### Tables

**Table 1: Descriptive statistics of the sample European listed real estate markets**

Country/ Region	M. Cap (€B)	Total. Rtn (%) - 10 Yrs	Total. Rtn (%) – 5 Yrs	Total. Rtn (%) – 1Yr	10 Yrs Vlty (%)	36M Vlty (%)
Developed Europe	212.11	3.53	11.98	12.57	16.99	12.35
D. Europe Ex. UK	151.73	5.89	13.05	12.68	16.91	12.79
France	20.62	6.92	9.49	6.78	19.01	15.34
Germany	48.44	4.33	17.96	19.43	23.63	15.63
Netherlands	25.77	1.35	7.83	3.94	18.21	15.35
Sweden	18.18	12.08	18.10	15.44	22.86	14.30
Switzerland	5.08	11.25	7.09	0.67	14.35	14.27
U.K.	60.38	-1.31	8.78	12.52	21.56	16.92

Source: EPRA (2017)

**Table 2: Correlation coefficients of total returns of the six sample countries (2007-2017)**

	Developed Europe	France	Germany	Netherlands	Sweden	Switzerland
Developed Europe	100.00%					
France	93.78%	100.00%				
Germany	92.79%	82.86%	100.00%			
Netherlands	90.46%	89.88%	80.71%	100.00%		
Sweden	82.99%	72.78%	85.63%	79.28%	100.00%	
Switzerland	52.66%	46.32%	66.78%	43.68%	81.04%	100.00%
U.K.	96.62%	85.30%	88.03%	80.23%	75.52%	41.40%

Source: Authors' calculations based on FTSE EPRA/NAREIT Developed Europe Index Series

**Table 3: Descriptive statistics and performance-related features of REIT and non-REIT sectors**

Country/ Region	Sector	M. Cap (€B)	Div Yld (%)- 10 Yrs	Total. Rtn (%) - 10 Yrs	Total. Rtn (%) – 5 Yrs	Total. Rtn (%) – 1Yr	Total. Rtn (%) – QTD	10 Y Vlty (%)	36 M Vlty (%)
Developed Europe	REITs	122.39	4.11	NA	9.43	9.56	0.85	13.60	13.77
	Non- REITs	89.72	4.80	6.95	13.36	7.31	-0.60	11.81	12.29
France	REITs	20.62	4.74	6.97	9.49	6.78	1.23	19.21	15.34
	Germany	2.30	4.41	4.45	9.97	7.17	0.19	26.41	12.16
Netherlands	Non- REITs	46.15	2.82	NA	18.41	20.13	3.02	15.14	16.01
	REITs	25.77	5.06	NA	7.83	3.94	3.45	15.11	15.35
Sweden	Non- REITs	18.18	2.57	NA	18.10	15.44	1.29	14.77	14.30
	REITs	11.48	4.01	7.09	11.09	0.67	3.57	12.68	14.27
Switzerland	Non- REITs	53.45	3.68	NA	8.44	12.11	0.26	16.35	17.30
	REITs	6.94	2.41	NA	10.42	15.12	1.13	15.24	16.17

Source: EPRA Research Monthly Statistical Bulletin (October 2017)

**Table 4: Descriptive statistics of rental and non-rental sectors in Europe and the U.K.**

	Country/ Region	Sector	M. Cap (€B)	Div Yld( %)	Total. Rtn (%) - 10 Yrs	Total. Rtn (%) – 5 Yrs	Total. Rtn (%) – 1Yr	Total. Rtn (%) – QTD	10 Y Vlty (%)	36 M Vlty (%)
Rental/ Non-rental	Europe	Rental	193.92	3.56	NA	10.80	12.49	1.30	11.90	12.65
		Non-rental	20.01	3.77	4.33	30.49	8.17	-1.56	40.20	10.04
	U.K.	Rental	58.74	3.58	-1.15	8.46	11.83	0.24	21.73	12.65
		Non-rental	1.64	1.91	-5.05	15.67	30.95	3.92	26.11	17.98

Source: EPRA Research Monthly Statistical Bulletin (October 2017)

**Table 5: Summary of key variables**

Variable	Abbreviation	Definition of Variables
Risk adjusted return	R	Annualised total excess return of company divided by standard deviation of returns over a twelve-month period.
Raw return	R'	Annualised total return of company.
Market capitalisation	Cap	Sum of total equity and total debt
Loan to value	LTV	Total amount of debt divided by the total value of company.
Risk free rate	r.f.	The rate of return of a ten-year government bond for the subject time period.
Dividend yield	D	Sum of gross dividend per share amounts that have gone ex-dividend over the prior 12 months, dividend by the current stock price. All cash dividend types are included in the yield calculation.
Return on equity	ROE	Net income available for common shareholders divided by average total common equity.
Growth in revenue	REV	Percentage change in revenue generated from real estate operating activities over the prior twelve months. The revenue includes rental income, real estate sales (for real estate operating companies), management and advisory fees, mortgage and note income and other operating income.
Return volatility	V	Standard deviation of monthly excess return over the prior twelve months.
REIT	REIT	Equal to one if the company is classified as REIT by EPRA; zero otherwise.
Investment focus	I	Equal to one if the company's rental revenue from investment properties is greater than or equal to 70% of total revenue; zero otherwise.

**Table 6: Regression results – all countries at the aggregate level (2007-2017)**

Dependent Variable	Risk-adjusted Return (R)	
	Model 1	Model 2
Independent Variables		
C	-2.381206	-2.167843

		(0.0155) **	(0.0259) **
	<b>Market Capitalisation (Cap)</b>	0.104514	0.063260
		(0.2938)	(0.5186)
	<b>Loan to Value (L)</b>	-1.429240	-1.211183
		(0.0000) ***	(0.0001) ***
	<b>Dividend Yield (D)</b>	-0.071747	-0.065916
		(0.0000) ***	(0.0000) ***
	<b>Return On Equity (ROE)</b>	0.042413	0.043140
		(0.0000) ***	(0.0000) ***
	<b>Growth in Revenue (REV)</b>	0.064805	0.076782
		(0.2566)	(0.1788)
	<b>REIT (REIT)</b>	0.298739	0.378545
		(0.0107) **	(0.0007) ***
	<b>Investment Focus (I)</b>	-0.023849	0.000507
		(0.8404)	(0.9965)
	<b>Residential</b>	-0.159578	-0.120126
		(0.2775)	(0.4126)
	<b>Retail</b>	-0.315058	-0.299048
		(0.0036) ***	(0.0058) ***
	<b>Industrial/Office</b>		
	<b>Industrial</b>	0.550200	0.169453
		(0.0014) ***	(0.0962) *
	<b>Office</b>	0.034288	
		(0.7679)	
	<b>Industrial/Office</b>	0.593242	
		(0.2835)	
	<b>Lodging/Resorts</b>	-0.336248	0.423914
		(0.7236)	(0.0074) ***
	<b>Health care</b>	0.984589	
		(0.0000) ***	
	<b>Self-storage</b>	0.053821	
		(0.8254)	
	<b>Speciality</b>	0.188440	
		(0.5820)	
	<b>Risk free (r.f.)</b>	53.34203	53.64914
		(0.0000) ***	(0.0000) ***
	<b>Included Obs.</b>	1616	1616
	<b>R<sup>2</sup></b>	0.643524	0.639435
	<b>Adjusted R<sup>2</sup></b>	0.636318	0.633304
	<b>Prob (F Stat)</b>	0.0000	0.0000

Note: p-values are in brackets; \*\* indicates significance at the 10% level, \*\*\* indicates significance at the 5% level; \*\*\*\* indicates significance at the 1% level. Full results are available upon request. Country-level attributes and time effects are accounted for but the results are not reported. Full results are available upon request.

**Table 7: Regression results – sup-period models**

Sub-period		2007-2011		2002-2007	
Dependent Variable		Risk-adjusted Return (R)			
Company-specific Variables	Independent Variables	Model 3	Model 4	Model 5	Model 6
	C	-5.852474	-5.067967	2.181113	1.840647
		(0.0002) ***	(0.0006) ***	(0.0862) *	(0.1453)
	Market Capitalisation (Cap)	0.358811	0.264763	-0.209640	-0.209926
		(0.0398) **	(0.1136)	(0.1157)	(0.1133)
	Loan to Value (L)	-0.868311	-0.972414	-1.635346	-1.079115
		(0.0825) *	(0.0478) **	(0.0003) ***	(0.0136) **
	Dividend Yield (D)	-0.037910	-0.036829	-0.145835	-0.132240
		(0.0104) **	(0.0109) **	(0.0000) ***	(0.0000) ***
	Return On Equity (ROE)	0.032985	0.033610	0.060172	0.059446
	(0.0000) ***	(0.0000) ***	(0.0000) ***	(0.0000) ***	
Growth in Revenue (REV)	0.076941	0.072237	-0.014342	0.010122	
	(0.2623)	(0.2913)	(0.8893)	(0.9223)	
REIT (REIT)	-0.143507	0.079905	0.594881	0.628123	

		(0.4947)	(0.6605)	(0.0000) ***	(0.0000) ***
	Investment Focus (I)	0.103187 (0.6268)	0.050543 (0.8105)	0.079064 (0.5911)	0.166806 (0.2498)
	Residential	-0.677459 (0.0071) ***	-0.600215 (0.0157) **	0.030177 (0.8670)	0.071365 (0.6945)
	Retail	0.094369 (0.5618)	0.101672 (0.5324)	-0.612497 (0.0000) ***	-0.613056 (0.0000) ***
	Industrial	0.184271 (0.5460)	-0.612497 (0.0000) ***	0.620607 (0.0023) ***	0.120807 (0.3385)
	Office	0.201598 (0.2778)		-0.124645 (0.3984)	
	Industrial/Office	NA		0.428556 (0.4226)	
	Lodging/Resorts	NA	0.525893 (0.0498) **	-0.274794 (0.7645)	0.261367 (0.1886)
	Health care	1.071103 (0.0037) ***		1.102228 (0.0001) ***	
	Self-storage	-0.109516 (0.8471)		-0.270728 (0.3077)	
	Speciality	0.140134 (0.7155)		NA	
	Risk free (r.f.)	73.90278 (0.0000) ***	74.77414 (0.0000) ***	15.78916 (0.2792)	16.58724 (0.2607)
	Included Obs.	662	662	954	954
	R <sup>2</sup>	0.719029	0.716934	0.485839	0.472184
	Adjusted R <sup>2</sup>	0.708443	0.707646	0.471418	0.459712
	Prob (F Stat)	0.000000	0.000000	0.000000	0.000000

Note: p-values are in brackets; "\*" indicates significance at the 10% level; "\*\*" indicates significance at the 5% level; "\*\*\*" indicates significance at the 1% level. Country-level attributes and time effects are accounted for but the results are not reported. Full results are available upon request. Sector base = Diversified.

**Table 8 – Regression results of all countries at the sub-sector level, 2007-2017**

Dep. Var.	Risk adjusted Return (R)									
	Indep. Variables Sector	Model 7 Diversified	Model 8 Resid.	Model 9 Industrial/Office	Model 10 Retail	Model 11 Speciality	Model 12 REIT	Model 13 Non-REIT	Model 14 Rental	Model 15 Non-Rental
Company-specific Variables	C	1.594182 (0.2227)	-19.14795 (0.0016) ***	-13.88755 (0.0004) ***	-3.464666 (0.2144)	-18.90108 (0.0157) **	-0.978748 (0.4630)	-19.32314 (0.0000) ***	-3.755214 (0.0006) ***	-21.46211 (0.0000) ***
	Market Cap	-0.285724 (0.0364) **	2.003414 (0.0024) ***	1.112015 (0.0044) ***	-0.030022 (0.9229)	1.749984 (0.0385) **	-0.224435 (0.0755) *	1.758580 (0.0000) ***	0.019382 (0.8654)	1.957934 (0.0003) ***
	Loan to Value (L)	-1.605393 (0.0004) ***	-2.641001 (0.2363)	0.649385 (0.6313)	-2.241030 (0.0307) **	-0.605144 (0.5484)	-1.360512 (0.0089) ***	0.109079 (0.8291)	-1.268210 (0.0008) ***	0.059812 (0.9542)
	Dividend Yield (D)	-0.080120 (0.0000) ***	-0.490633 (0.0002) ***	0.010574 (0.7667)	-0.269820 (0.0000) ***	-0.014965 (0.9024)	-0.074654 (0.0003) ***	-0.056297 (0.0021) ***	-0.084045 (0.0000) ***	-0.003896 (0.9488)
	Return On Equity (ROE)	0.047090 (0.0000) ***	0.002087 (0.8628)	0.063042 (0.0000) ***	0.033237 (0.0000) ***	0.052149 (0.0025) ***	0.052589 (0.0000) ***	0.036478 (0.0000) ***	0.047919 (0.0000) ***	0.059006 (0.0000) ***
	Return Volatility (V)	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Growth in Revenue (REV)	0.025017 (0.7985)	0.765303 (0.0127) **	0.236305 (0.3213)	-0.034055 (0.7020)	0.228309 (0.2406)	0.207509 (0.0420) **	-0.004421 (0.9548)	0.128872 (0.0922) *	-0.138315 (0.1779)
	REIT	0.190415 (0.2468)	2.453477 (0.0118) **	-0.900701 (0.4423)	1.332290 (0.0043) ***	1.338740 (0.0025) ***	NA	NA	0.231731 (0.0714) *	0.486806 (0.4399)
	Investment Focus (I)	0.077686 (0.6481)	-0.898162 (0.0609) *	0.425847 (0.3681)	0.672039 (0.1934)	0.985463 (0.3248)	-0.205103 (0.5726)	0.069365 (0.6206)	NA	NA
	Residential	NA	NA	NA	NA	NA	0.307680 (0.6369)	-0.850991 (0.0000) ***	-0.283623 (0.1560)	-0.257606 (0.3276)
Retail	NA	NA	NA	NA	NA	-	-0.918243 (0.0000) ***	-0.224962 (0.0776) *	-0.201451 (0.6818)	
Industrial/Office	NA	NA	NA	NA	NA	0.014750(0.9185)	0.350859 (0.0106) **	-0.183169 (0.3549)	0.282518 (0.0160) **	
Speciality	NA	NA	NA	NA	NA	0.625926 (0.0048) ***	-0.568071 (0.0499) **	0.399053 (0.0287) **	-0.239980 (0.8091)	
Risk free (r.f.)	94.41704 (0.0000) ***	73.12003 (0.0147) **	76.78098 (0.0000) ***	75.51258 (0.0000) ***	50.18806 (0.0354) **	76.10999 (0.0000) ***	82.65509 (0.0000) ***	78.30422 (0.0000) ***	104.1146 (0.0000) ***	
Included Obs.	791	130	312	280	100	825	791	1402	214	
R <sup>2</sup>	0.555819	0.739224	0.642328	0.555840	0.686885	0.612078	0.549333	0.575627	0.555078	
Adjusted R <sup>2</sup>	0.547222	0.714915	0.625468	0.534375	0.651703	0.604397	0.540017	0.570104	0.518942	
Prob (F Stat)	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	

Note: p-values are in brackets; "\*" indicates significance at the 10% level; "\*\*" indicates significance at the 5% level; "\*\*\*" indicates significance at the 1% level.



\*\*\* indicates significance at the 1% level. Country-level attributes and time effects are accounted for but the results are not reported. Full results are available upon request.

**Table 9: Summary of sector level regression tests of the effects of various company specific attribute on risk adjusted return**

<i>Investigation Period= 2007-2017</i>									
Attribute/Sector	Diversified	Residential	Office/ Industrial	Retail	Speciality	REIT	Non-REIT	Rental	Non-rental
Dividend Yield	↓	↓		↓		↓	↓	↓	
LTV	↓					↓		↓	
M. Cap	↓	↑	↑		↑	↓	↑	↓	↑
1-year Rev.		↑				↑		↑	
Growth									
ROE			↑	↑	↑	↑	↑	↑	↑
Risk Free	↑	↑	↑		↑	↑	↑	↑	↑
REIT		↑		↑	↑	NA	NA	↑	
Rental		↓						NA	NA
<i>Investigation Period= 2007-2011</i>									
Dividend Yield	↓							↓	
LTV	↓	↓							↓
M. Cap		↑			↑		↑		↑
1-year Rev.									
Growth									
ROE	↑	↑		↑		↑	↑	↑	
Risk Free	↑		↑	↑		↑	↑	↑	
REIT				↓	↑	NA	NA	↑	↑
Rental				↑				NA	NA
<i>Investigation Period= 2012-2017</i>									
Dividend Yield	↓			↓		↓	↓	↓	
LTV	↓	↓	↑		↑			↓	
M. Cap				↓		↓		↓	
1-year Rev.				↑					
Growth									
ROE	↑	↑	↑	↑		↑	↑	↑	↑
Risk Free	↑								↑
REIT	↑	↑		↑		NA	NA	↑	
Rental	↓	↓	↑	↓	↓			NA	NA

“↑” indicates the attribute enhances the performance of the listed RE companies in the sector/group at the 10% level. “↓” indicates the attribute depresses the performance of the listed RE companies in the sector/group at the 10% level. Empty cell indicates regression results on the attribute are not statistically significant at the 10% level.

**Table 10: Results of diversification tests – All countries at the aggregate level, 2012-2016**

	Dependent Variable	Risk-adjusted Return (R)	
		Independent Variables	
		Model 16	Model 17
Company-specific Variables	c	-1.193783 (0.5818)	-2.148663 (0.3266)
	Market Capitalisation (Cap)	0.148089 (0.4717)	0.280256 (0.1744)
	Loan to Value (L)	-1.680170 (0.0685) *	-1.552696 (0.0910) *
	Dividend Yield (D)	-0.031445 (0.1080)	-0.028863 (0.1411)
	Return Volatility (V)	NA	NA
	REIT (REIT)	0.191163 (0.4874)	0.216232 (0.4311)
	Investment	0.133282	0.148873

Diversification Variables	Focus (I)	(0.6702)	(0.6346)
	H.I.	0.768596 (0.0217) **	NA
	S.S.	NA	0.461669 (0.0367) **
	Risk free (r.f.)	25.65190 (0.5246)	25.78575 (0.5232)
	Included Obs.	272	272
	R <sup>2</sup>	0.440788	0.438801
	Adjusted R <sup>2</sup>	0.405701	0.403589
Prob (F Stat)	0.000000	0.000000	

Note:  $p$ -values are in brackets; “\*\*” indicates significance at the 10% level; “\*\*\*” indicates significance at the 5% level; “\*\*\*\*” indicates significance at the 1% level. Note that ROE and REV are removed due to data limitations. Country-level attributes and time effects are accounted for but the results are not reported. Full results are available upon request.

**Table 11: All Countries explanatory power of attributes over the three time regimes**

	2007-2017		2007-2011		2012-2017	
	Explanatory Power from using each (set of) variable(s) alone (Method A)	Increase in Explanatory Power from adding each (set of) variable(s) to all the others (Method B)	Explanatory Power from using each (set of) variable(s) alone (Method A)	Increase in Explanatory Power from adding each (set of) variable(s) to all the others (Method B)	Explanatory Power from using each (set of) variable(s) alone (Method A)	Increase in Explanatory Power from adding each (set of) variable(s) to all the others (Method B)
<b>Country Level</b>						
Country Variables	2.39%	1.45%	5.66%	1.77%	7.36%	1.20%
<b>Sector Level</b>						
Sector Variables	1.94%	6.15%	3.51%	0.82%	4.10%	2.80%
<b>Company Level</b>						
Market Capitalisation	6.33%	0.02%	7.12%	0.19%	1.16%	0.14%
Loan to Value	2.26%	0.45%	1.33%	0.13%	0.74%	0.73%
Dividend Yield	12.09%	0.77%	7.45%	0.29%	12.70%	1.98%
Return On Equity	41.14%	4.63%	49.44%	3.73%	20.70%	5.44%
Growth in Revenue	0.10%	0.03%	0.07%	0.06%	0.68%	0.00%
REIT	0.10%	0.15%	0.02%	0.02%	0.10%	0.95%
Investment Focus	0.00%	0.00%	0.04%	0.01%	0.18%	0.02%
All company specific attributes	43.62%	10.53%	51.18 %	9.53%	25.91%	11.51%

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