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Interest rate risk of Australian REITS: A panel analysis

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Australian REITs adopt either internal or external property management structures. The sector's returns have been rewarding until the Global Financial Crisis, when rising costs of debt and years of aggressive borrowing eroded REIT values. Externally managed trusts had relatively higher levels of debt than internally managed counterparts, thus increasing the sensitivities to interest rate risks. Yet internally managed REITs engage in a wider set of operating activities which compound market and financial risks. This study uses panel and panel quantile regressions to examine the joint impact of financial leverage and management structure on REIT returns in terms of their sensitivities towards the stock market and changes to interest rates from 1980 to 2013 and how these vary at different parts of an economic cycle. It is found that the impact of market returns is greater for internally managed REITs and those with more debt. REITs are only negatively affected by changes to short-term interest rates at the lowest 5% quantile of returns. Changes to long-term interest rates have an adverse effect on REITs only at the upper 75% and 95% quantiles. The possibilities that rental yields and inflationary expectations may offset the influences of financing costs are considered. Internal management appears to compound the effects of the stock market and interest rates on REIT returns. This has implications for investors looking to select REITs as substitutes for direct property investments.

Keywords: REITs; internally managed REITs; financial leverage; interest rate risk; panel quantile regressions

Introduction

For 20 years, returns from the Real Estate Investment Trust (REIT) sector in Australia consistently outperformed general equities. However the sector lost more than half its market value during the Global Financial Crisis (GFC). The devaluations have been attributed to the high levels of borrowing incurred during the sector's boom phase from 2001 to 2007. Previously perceived as liquid alternatives to direct real estate investment with benefits of relatively lower levels of risk, REITs have enjoyed support from institutional investors. In 2006, 70% of the sector's market value was held by investment funds, superannuation companies and self-managed pension funds. REITs were attractive because they paid high levels of dividends and the underlying properties owned could, over time, achieve capital growth.

The traditional corporate structure of a REIT involves a holding entity which owns income producing real estate. Legislation in the United States dictates that at least 75% of a REIT's value must be invested in real estate and 90% of income to be distributed back to unit holders. In Australia, REITs are governed by the taxation rules on public

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unit trusts and Managed Investment Trusts (MIT). These rules only allow such entities to carry out "eligible investment business" to qualify for flow-through tax treatment. "Eligible investment business" includes investing in land for the purpose or primarily for the purpose of deriving rent or other passive investment type activities such as loans, portfolio share investments and derivatives. Public unit trusts that carry on a trading business such as developing land for sale will not receive flow-through tax treatment but instead be subject to the corporate tax rate (30%). There are no formal distribution requirements for Australian REITs. However undistributed income or gains are taxed at the highest rate (46.5%) so in general, full distribution occurs (EPRA, 2013; PwC, 2011).

In a typical trust structure, an external property manager will manage tenants, asset acquisitions and disposals and negotiate debt contracts. However, reliance on an external manager increases the likelihood of an agency problem to undermine a REIT's profitability and market performance (Ambrose & Linneman, 2001; Capozza & Seguin, 2000; Sagalyn, 1996). Between 2001 and 2005, many Australian REITs began adopting a stapled structure to internalise the asset management function. Each issued security comprised a unit in the trust, which owns the underlying property assets, and a share in the property management and development company, which pays dividends out of profits. Thus, internally managed REITs should be able to secure lower costs of borrowing and have lower debt ratios.

The trust portion of a stapled REIT faces the same risks as an externally managed counterpart. Factors which drive real estate returns, such as occupancy demand, affect rental yields and expectations on inflation will influence long-term cash flows and capital values. However, it is also expected that, because internally managed REITs engage in property development, they are considered riskier. From 2001 to 2007, Australian REITs borrowed aggressively to fund expansions. Early in the decade, average gearing levels were approximately 15% to 20% of total assets but a low interest rate environment and increased application of debt instruments saw an increase in gearing levels to 34% in 2006 and 44% in early 2007. Though debt laden REITs suffered the greatest losses from the GFC, since March 2009 most have recovered due to balance sheet restructuring, reduction of debt, capital raisings and recovery of the general equity market (BDO, 2007; Ernst & Young, 2010; Psaltis & Chubb, 2007).

Studies on the performance of REITs and the influence of factors such as interest rates, economic growth and inflation have applied indicators from the stock and bond markets. Findings in this area improve investors' understanding of what risk factors impact property investments and assist to increase the accuracy of forecasted returns.

Ibbotson and Seigel (1984) and Liow (2006) provide some theoretical reasoning to the linkages between property investments, the general stock market and interest rates. During times of economic growth, increased corporate profits and share prices enable business expansions. With increased rental demand in the short-term, the property market will experience improved rental yields. Expectations of higher inflation improve long-term cash flows as well as capital values. However, rising rents and capital values could lead to higher interest rates and borrowing costs and this could then have a negative impact on real estate returns.

A notable study by Allen, Madura, and Springer (2000) examined US REITs categorised according to asset structure, financial leverage, management structure and property-type specialisation against stock market and interest rate factors. The study found REITs with higher levels of debt and especially those externally managed are more sensitive to market risk. In addition, all types of REITs are inversely related to short and

long-term interest rates. The findings of this paper raise the importance of comparing the differences between internally and externally managed Australian REITs. In particular, the stapled structure could reduce a REIT's sensitivity to interest rate risk through better negotiations of debt contracts by managers. Since stapled REITs also engage in property development and management activities, they can be inclined to prefer lower levels of borrowing to free up cash flows, which can reduce the average cost of debt funding. Yet the addition of property development and management activities for a stapled REIT can increase its overall exposure to risks, which can in turn compound the impact of financial risk.

According to Swanson, Theis, and Casey (2002), the increased relevance of the stock market in pricing of REIT returns can be attributed to attention by institutional investors. The authors also contribute further evidence that the degree of financial leverage reduces returns when interest rates rise.

Using an international sample of 16 countries including Australia, Hoesli and Serrano (2007) observe that correlations between REITs and the general stock market have been decreasing since the 1990s. Nonetheless, results from multi-factor regressions confirm positive relationships with stock and property market factors and negative relationships with bonds. The authors suggest that a large portion of return variation of REITs unexplained by stocks and interest rates could be captured if differences to management structure and degree of financial leverage are accounted for.

A study of UK property companies by Stevenson, Wilson, and Zurbruegg (2007) finds that returns are highly affected by changes to long-term bond yields instead of short-term bills, even during periods of stable interest rates. This extends Liow's (2006) argument that rising interest rates not only increase borrowing costs but can signal impending economic contraction and falling demand for rental space. This will further reduce values of properties owned by such companies.

Studies of Australian REITs which examine the impact of a stapled structure on returns find increasing correlations with the stock market after 2003. Newell and Tan (2005) explain that because stapled trusts engage in property development, these REITs are more risky and result in higher returns. Ratcliffe and Dimovski (2007) also note that the defensive characteristics of REITs as a property investment against market risk have decreased. REITs have a significantly negative relationship with long-term interest rates but an insignificantly positive relationship with short-term rates. They suggest that REITs can reduce market and interest rate risk by maintaining lower debt ratios. During the GFC, Newell and Peng (2009) found gearing levels contribute to the underperformance of risk-adjusted returns. Externally managed trusts outperform internally managed counterparts because of lower debt levels and fewer holdings of international property assets.

This study aims to jointly examine the impact of borrowing and management structure in a sample period which includes the GFC and subsequent recovery of the REIT sector. Panel regressions on six unbalanced panels are employed. Panel quantile regressions of REITs on stock market returns and changes to short-term and long-term interest rates are also used, which allow observation whether the overall stock market and interest rates have consistent effects on returns at different ends of a business cycle.

Data and method

Data sources

The sample period of monthly data covers January 1980 to March 2013. Returns of REITs based on market capitalisation which are active, suspended and delisted are

included in the study. Each REIT is categorised according to management structure: external/traditional trust or internal/stapled trust denoted as *TT* and *ST*, respectively. The dataset covers equity REITs only. These are further assigned into debt groups: high or low-to- medium denoted as *HD* and *LD*.

In this study, a REIT is classified as high debt if the debt-to-assets ratio is greater than the annual average debt ratio of the sample for the prevailing year. The ratio is determined by dividing total debt, which comprises long- and short-term borrowings, with total assets. A REIT is classified as low debt if its debt-to-assets ratio is less than or equal to the sample's average for the year. In the event that a REIT's borrowing changed from low to high debt (or vice versa), it is removed from one group and reassigned into the other in the relevant month of the change. Figure 1 shows that debt ratios were low in the 1980s and 1990s because interest rates were remarkably high and so REITs were reluctant to undertake higher levels of borrowing. There was a steady rise in the borrowing of REITs after 1995, which peaked at an average of 55% before the GFC.

Of the 73 REITs studied, 15 of them remained within the low debt classification throughout their periods of inclusion within the study. The maximum ratios of the low debt group were consistently within 5% under the annual average through the duration of the study. Twenty-two REITs were classified as high debt throughout their inclusion in the sample period and the lowest ratios were consistently within 10% over the average ratio each year. The remaining 36 REITs had a switch of classification between low and high debt groups at some point during their inclusion in the sample period of study.

REITs are included and removed from the groups *TT* and *ST* in the relevant month of listing, delisting, suspension, and changes to management structure. There are six groups in this study. *ALLHD* and *ALLLD* comprise all REITs and consider the impact of borrowing regardless of management structure. *TTHD* and *TTLD* represent externally managed REITs while *STHD* and *STLD* comprised internally managed REITs and these four groups consider the joint impact of management structure and level of borrowing.

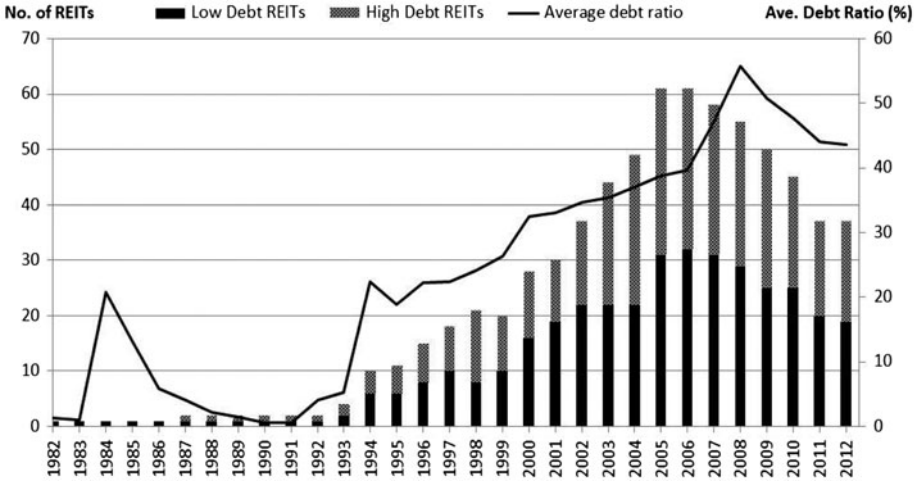

Figure 1. Ratio of total debt to total assets of Australian REITs in the study sample.
Source: Datastream, compiled by Authors.

Explanatory variables in this study comprise monthly logarithmic returns for the ASX100 stock market index (denoted as *STOCK*), along with changes in yields of 10-year government bonds and 90-day bank accepted bills (*BOND* and *BILL*) to represent a stock market factor and interest rate risks. It is expected that bonds proxy for long-term borrowing costs but can also reflect inflationary expectations. Bills represent short-term costs of debt and these may also be indicative of rental yields. Since yields of bonds and bills are highly correlated, changes in yields are used which were found to be less correlated at 0.29 over this sample period. A dummy variable to denote the GFC takes on the value of 1 for the months from September 2007 to August 2009 and zero otherwise.

Method

A linear panel data model is used first to analyse the effect of explanatory variables in the whole dataset. The basic linear panel model can be represented as follows:

$$y_{it} = \alpha + x'_{it}\beta + c_i + u_{it} \tag{1}$$

where:

- y_{it} represents the dependent variable of REIT returns across i entities for time t;
- x'_{it} are the explanatory variables *STOCK*, *BOND*, *BILL* and *GFC* minus the constant;
- α is the intercept;
- β is a vector of parameters;
- c_i captures the individual specific fixed or random effect; and
- u_{it} is the error term.

To accommodate the possibility of lagged effects, one month lags of REIT returns and explanatory variables are used in a panel autoregressive model. This is after residuals from Equation (1) are tested for serial correlation up to the order of 8 lags, allowing capture of the impact of past REIT returns and past changes to stock prices and interest rates.

The simple Ordinary Least Squares (OLS) regression method assumes a normal distribution between the dependent and the explanatory variable which focuses on the mean of the distribution. The assumption of normality makes the computation easy but is not useful when the variables have skewed distributions and where OLS regression is incapable of describing the conditional distribution of the dependent variable. Quantile regression was introduced by Koenker and Basset (1978) as an extension of OLS. It allows the relationships between dependent and independent variables to be quantified across different quantiles of the conditional distribution of the dependent variable. Quantile regression has advantages over OLS, as it is robust against outliers and it avoids the assumption that the error terms are independent and identically distributed.

The estimation process starts with the central median case, in which the median regressor estimator minimizes a sum of absolute errors, as opposed to OLS which minimizes the sum of squared errors. The estimation of other regression quantiles is achieved by minimising an asymmetrically weighted sum of absolute errors. Together, the ensemble of estimated conditional quantile functions offer a much more comprehensive view of the effect of covariates on the location, scale and shape of the distribution of the response variable.

According to the descriptive statistics in Table 1, REIT returns do not follow a normal distribution and so it is important to investigate the effect of independent variables across quantiles using panel quantile regressions. In this study, the penalized quantile regression approach is used for panel data proposed by Koenker (2004) to evaluate the relationship of REIT returns with *STOCK*, *BOND* and *BILL* in a fixed effects panel data model. Equation (1) can be rewritten according to the specification presented by Alexander (2008):

$$Y_{qit} = \beta_q X'_{qit} + e_{qit} \tag{2}$$

where:

Y_{qit} represents the dependent variable of REIT returns in the qth quantile across i entities for time t;

X'_{qit} are the explanatory variables *STOCK*, *BOND*, *BILL* and *GFC*;

β_q is a vector of parameters at the qth quantile; and

e_{qit} is the error term.

Equation (2) is estimated at the 5%, 25%, 50%, 75% and 95% quantiles of interest, ranging from lower to higher quantiles. These quantiles cover the extreme lower to extreme higher tails of the distribution of REIT returns and provide a more comprehensive picture of the relationships. While the lower quantiles capture REIT returns during a trough, higher quantiles allow comparisons if the sensitivities of returns to market and interest rate risks are similar during a boom phase. The empirical analysis is conducted using R. A random effects model in panel quantile regression cannot be estimated due to unbalanced panel data.

REITs are expected to be positively related to the general stock market because they are exchange-traded. However, due to their underlying holdings in real estate, they are also expected to be largely influenced by property market factors. It is expected to find a negative relationship with interest rate changes caused by the impact of borrowing costs, but the effects of changes in demand for rental space and inflationary expectations could result in positive associations instead.

Results and discussion

Table 1 reports the descriptive statistics of variables employed. Panel regressions of REITs with low debt contain more observations than those with high debt. REITs with higher levels of borrowing had negative average monthly returns and higher standard deviation of returns compared to counterparts with lower debt ratios. While returns of externally managed REITs were negatively skewed, internally managed REITs showed positive skewness. REIT returns were more volatile than stock market returns and changes to interest rates. According to the results of skewness and excess kurtosis the dependent and independent variables all do not conform to a normal distribution.

Due to the inclusion and removal of REITs based on market listing, delisting, change in debt groups and management structures, the panel data is unbalanced. This does not allow the study of two-way effects between cross sections and over time. Moreover, the use of monthly data would only capture monthly time effects instead of yearly effects. An attempt was made to study period effects but the results were

Table 1. Descriptive statistics.

	Dependent Variables						Explanatory Variables		
	ALLLD	***TTLD***	***STLD***	***ALLHD***	***TTHD***	***STHD***	***STOCK***	***BOND***	***BILL***
N obs.	7669	5083	2528	1943	1263	685	399	399	399
Min.	−2.6598	−2.6598	−1.0116	−1.8255	−1.3876	−1.8255	−0.4979	−0.0130	−0.0463
Max.	2.3336	2.3336	1.8739	3.6209	1.3148	3.6209	0.2074	0.0160	0.0573
Median	0.0040	0.0003	0.0080	0.0000	0.0000	0.0000	0.0101	−0.0002	−0.0001
Mean	0.0071	0.0071	0.0071	−0.0196	−0.0188	−0.0203	0.0065	−0.0002	−0.0002
Stdev.	0.1415	0.1490	0.1268	0.2361	0.2058	0.2832	0.0542	0.0037	0.0078
Skew.	0.1723	−0.4502	2.1902	1.8506	−0.6734	3.5236	−2.1658	0.3775	0.2860
Kurt.	63.6427	67.0083	42.6587	44.9635	11.0032	55.6656	21.9602	4.8542	17.2440

Notes: This table reports the summary statistics of monthly return data for REIT and stock market returns as well as changes to interest rates. The dependent variables comprise REITs sorted into groups based on management structure and debt ratios. Number of observations for STOCK, BOND and BILL are based on the entire sample period January 1979 to March 2013 and will match those of the dependent variables when regressions are conducted.
Source: Authors.

insignificant. Equation (1) was estimated using both one-way fixed and random effect models. The signs and significance of the resulting coefficients in Table 2 were the same in both cases. The results for the Hausman test indicate that while a random effects model can be used for low-debt REITs and externally managed REITs with high levels of debt, unobserved heterogeneity amongst high-debt REITs that are internally managed is not significant at the 5% level.

Results of the panel regressions in Table 2 show that sensitivities of REITs to the overall stock market increases with higher debt ratios. Changes to the stock market impact internally managed REITs to a greater extent than externally managed REITs. The impact of changes in long-term interest rates is only evident for internally managed trusts. REITs with lower levels of borrowing benefit from higher rental yields associated with positive changes to short-term interest rates and the effect is stronger for those managed internally. However, this benefit is eliminated with increased debt and the sensitivity to interest rate risk is compounded for REITs that engage in a wider set of operating activities. Interestingly, stapled REITs with high levels of debt did not display significance against the GFC dummy variable in the fixed effects model.

The residuals from each of the panel regressions were tested for serial correlation up to 8 lags. Residuals of the regressions for *ALLLD* and *TTLD* were found to be serially correlated up to 1 lag and for *STLD* up to 4 lags. No serial correlation was detected in the residuals of the regressions for *ALLHD, TTHD* and *STHD*. The panel regressions were extended to include REIT returns, stock market returns and changes to long and short-term interest rates from the previous month to allow for delayed impacts on the returns of REITs with low levels of debt.

The findings from Table 2 are mostly supported in the results of the panel autoregressive estimations of Table 3. REITs with low levels of debt were significantly

Table 2. Panel regressions.

	Low debt groups			***High debt groups***		
	ALLLD	***TTLD***	***STLD***	***ALLHD***	***TTHD***	***STHD***
Fixed effects model						
STOCK	0.7643***	0.6352***	1.0620***	1.4399***	1.2338***	1.8018***
BOND	−0.8036	−0.6386	−2.6579***	−2.8545	0.4288	−9.0019*
BILL	1.5908***	1.3071**	2.2086***	5.1387**	1.5832	−11.7377***
GFC	−0.0346***	−0.0365***	−0.0347***	−0.0668***	−0.0936***	−0.0247
Adjusted R^2	0.0595	0.0374	0.1357	0.1068	0.1271	0.0950
Random effects model						
STOCK	0.7633***	0.6349***	1.0602***	1.4600***	1.2545***	1.8451***
BOND	−0.8241	−0.6602	−2.6640***	−2.9279	0.2030	−9.1219**
BILL	1.5741***	1.3009**	2.2100***	4.8280**	1.6150	−10.9254***
GFC	−0.0366***	−0.0381***	−0.0347***	−0.0776***	−0.0939***	−0.0483**
Adjusted R^2	0.0609	0.0382	0.1362	0.1184	0.1411	0.1022
STOCK	0.7633***	0.6349***	1.0602***	1.4600***	1.2545***	1.8451***
Hausman Test Statistic	3.7056**	1.5634**	1.0032**	10.0632	6.8816**	10.2932

Notes: Results are based on estimations of Equation (1). *, ** and *** denote statistically significant coefficients at the 10%, 5% and 1% levels respectively. The Hausman test statistic is also reported where ** indicates cross-sectional random effects are significant at the 5% level. The individual fixed/random effects denoted c_i in Equation (1) are not reported here for each REIT for brevity.
Source: Authors.

related to previous month returns as indicated by the tests of serial correlated residuals. The effect of past stock market returns also persist across all REIT types. Changes to long-term interest rates have a contemporaneous effect on internally managed REITs and the impact is greater with higher debt levels. The impact of changes to short-term interest rates is only evident in the groups with low levels of debt. It should be noted that further tests on the residuals from the panel autoregressive estimations yielded no further evidence of serial correlation. These results were based on a fixed effect model. The test results based on a random effects model are not reported, as the Hausman test statistics for each group rejects the null hypothesis of significant unobserved heterogeneity effects.

Coefficients in panel quantile regressions in Table 4 show that sensitivities to interest rate changes vary in upward and downward market conditions. At the very worst of times (lowest 5% quantile), REITs are generally not influenced by the stock market. Despite decreasing interest rates during business cycle downturns, negative coefficients with the short-term interest rate risk factor provide evidence that lower rental yields underpin property investment returns. The relationship between long-term interest rates is positive for high-debt REITs, more so for those managed internally. So when 10-year bond yields decrease, expectations of lower inflation levels would mean constrained capital growth in property values and decreased rental income.

The impact of subdued rental yields versus modestly decreasing rates of 90-day bank bills start to negate each other at the lower 25% quantile. Returns of externally managed REITs with low debt start to increase as costs of borrowing remain relatively cheaper but the lack of a significant coefficient for internally managed counterparts show the effect of rental yields outweigh the easing of borrowing costs. REITs with high debt show no sensitivities to short-term interest rates, again likely due to the opposing effect of these two effects. It is also worthwhile to note that sensitivities to the stock market are significant and positive for REITs from this quantile and moving upwards along the return distribution.

Table 3. Panel autoregressive model with 1 lag.

	Low debt groups			***High debt groups***		
	ALLLD	***TTLD***	***STLD***	***ALLHD***	***TTHD***	***STHD***
ALLLD(-1)	−0.0415***					
TTLD(-1)		−0.0443***				
STLD(-1)			−0.0493***			
ALLHD(-1)				−0.0318		
TTHD(-1)					−0.0442	
STHD(-1)						−0.0248
STOCK	0.7575***	0.6394***	1.0195***	1.4210***	1.2184***	1.6827***
STOCK(-1)	0.3253***	0.2742***	0.4253***	0.5849***	0.5504***	0.5182*
BOND	−1.1427**	−0.8381	−3.6315***	−3.8603*	−0.5159	−8.2239*
BOND(-1)	−0.2389***	−0.2736	−0.5315	0.4088	1.8830	−1.4201
BILL	1.2905***	1.1809**	1.2540*	1.8334	−1.0201	6.3875
BILL(-1)	0.4709	0.2811	1.0830	1.3221	0.0271	3.8132
GFC	−0.0300***	−0.0327***	−0.0260***	−0.0615***	−0.0911***	−0.0338
Adjusted R^2	0.0681	0.0443	0.1692	0.1184	0.1394	0.0989

Notes: Results are based on fixed effects model estimations of Equation (1) and include one month lagged returns of REITs and stocks, as well as changes to interest rates. *, ** and *** denote statistically significant coefficients at the 10%, 5% and 1% levels, respectively.
Source: Authors.

Table 4. Panel quantile regressions.

	Low debt groups			*High debt groups*		
	ALLLD	***TTLD***	***STLD***	***ALLHD***	***TTHD***	***STHD***
Lowest 5% quantile						
STOCK	0.0588	0.0180	0.1713***	0.0575	0.0815	−0.1282
BOND	0.2455	−0.0496	1.3753	7.6305***	5.3542**	13.0701***
BILL	−1.0734***	−0.7381**	−2.2340**	−7.0013***	−5.4891*	−8.4999**
GFC	−0.3952***	−0.3997	−0.3748***	−0.6011***	−0.5844***	−0.6358***
Lowest 25% quantile						
STOCK	0.2728***	0.1875***	0.4906***	0.5384***	0.4580***	0.8568***
BOND	−0.1013	−0.2918	−0.3685	3.0902*	2.7833	3.3127
BILL	−0.6052***	−0.4958**	−0.6290	2.7218	2.8136	3.0955
GFC	−0.1202***	−0.1148***	−0.1260***	−0.1752***	−0.1651***	−0.1855***
Median: 50% quantile						
STOCK	0.4443***	0.3559***	0.6720***	0.8163***	0.7271***	1.0567***
BOND	−1.0105***	−1.0135***	−1.7265***	−1.5574*	−1.1910	−2.9562
BILL	−0.2120	−0.0519	−0.4424	2.7653	3.4171*	3.3225
GFC	−0.0236***	−0.0232***	−0.0241***	−0.0446***	−0.0389***	−0.0507***
Upper 75% quantile						
STOCK	0.5664***	0.4928***	0.8365***	0.8762***	0.8094***	1.1418***
BOND	−1.8735***	−1.6481***	−3.3604***	−3.7980***	−3.5015***	−5.7326***
BILL	0.1282	−0.0255	0.0830	1.5361	0.3733	4.7408
GFC	0.0396***	0.0492***	0.0390***	0.0439***	0.0376***	0.0613**
Upper 95% quantile						
STOCK	0.7068***	0.5781***	1.0023***	1.1468***	0.9564***	1.5795***
BOND	−2.6039***	−2.1169***	−4.6889**	−8.9530***	−6.6906***	−14.4624***
BILL	0.3617	0.2265	1.1637	8.4443***	4.3999	16.4890**
GFC	0.2771***	0.2890***	0.2611***	0.3414***	0.2673***	0.4252***

Notes: The results in this table are based on estimations of Equation (2). *, ** and *** denote statistically significant coefficients at the 10%, 5% and 1% levels, respectively.
Source: Authors.

At the median quartile, low-debt REITs are inversely related to changes in long-term interest rates. The descriptive statistics show that changes to interest rates are negative and this could mean that lower borrowing costs and low inflationary expectations boost REIT returns. The effect of interest rate changes on high-debt REITs is not clearly evident at this point of the distribution. In comparison, REITs display a significantly negative relationship with changes to 10-year bond yields at the upper 75% quantile. The effect is stronger for internally managed REITs and with higher levels of debt. So, when economic conditions start to improve, not even expectations of increased rental income outpace increased financing costs.

The upper 95% quantile represents the very best of market conditions. At this point, the results again show the importance of long-term interest rate risk underpinning REIT returns. Internally managed REITs with high levels of debt greatly benefit from robust rental yields, as the coefficient with short-term rates is significantly positive and large.

The results concur with much of the earlier research mentioned. In particular, similarities are found with Stevenson et al. (2007), Newell and Tan (2005) and Ratcliffe and Dimovski

(2007). However, in contrast to Newell and Peng (2009), the debt ratios of externally managed REITs were higher than stapled REITs. This study also finds the negative impact of interest rate risk only affects REITs during stable and expanding market conditions.

Conclusions

This study examines how the degree of financial leverage and choice of internal or external REIT management influence the sensitivities to market and interest rate risks. A sample period is used which includes the emergence of the sector, its boom phase, subsequent downturn due to the GFC and recovery. Four findings are evident in the research. First, the effect of stock market risk increases with higher debt ratios and has a greater impact on internally managed REITs. Second, sensitivities to interest rates vary during upward and downward market conditions. At the very worst of times, poor rental yields and low levels of inflation reduce cash flow and capital growth for all REIT types. Third, the impact of long-term financing costs undermining REIT returns is evident only during robust market conditions. As expected, REITs with higher debt levels are more affected than those which borrow less. Last, though internally managed REITs that borrow more are also more sensitive to interest rate risks, the increased spread of operating activities offers good returns when rental yields are high.

There are some implications from these findings. Portfolio managers looking to reduce exposure to interest rate risks inherent in property investments should choose externally managed REITs with low levels of debt. Internally managed REITs with high levels of debt have compounded benefits during extremely favourable market conditions, but also expose investors to extreme losses during market reversals. Investors looking to replicate direct real estate investments in their portfolios should select externally managed REITs or stapled REITs with less borrowing.

References

Alexander, C. (2008). *Market risk analysis: Practical financial econometrics* (Vol. II): Wiley Publishing.

Allen, M. T., Madura, J., & Springer, T. M. (2000). REIT characteristics and the sensitivity of REIT returns. *Journal of Real Estate Finance and Economics, 21*, 141–152.

Ambrose, B. W., & Linneman, P. (2001). REIT organisational structure and operating characteristics. *Journal of Real Estate Research, 21*, 141–161.

BDO. (2007). *BDO Kendalls listed property trust survey 2007 edition.* NSW: BDO Kendalls Corporate Finance Pty.

Capozza, D. R., & Seguin, P. J. (2000). Debt, agency, and management contracts in REITs: The external advisor puzzle. *Journal of Real Estate Finance and Economics, 20*, 91–116.

Ernst and Young. (2010). *Global real estate investment trust report 2010: Against all odds*. Ernst and Young.

EPRA. (2013). *Global REIT survey 2013: A comparison of the major REIT regimes around the world*. European Public Real Estate Association.

Hoesli, M., & Serrano, C. (2007). Securitised real estate and its link with financial assets and real estate: An international analysis. *Journal of Real Estate Literature, 15*, 59–84.

Ibbotson, R. G., & Seigel, L. B. (1984). Real estate returns: A comparison with other investments. *AREUEA Journal, 12*, 219–242.

Koenker, R. (2004). Quantile regression for longitudinal data. *Journal of Multivariate Analysis, 92*, 74–89.

Koenker, R., & Basset, G. Jr (1978). Regression quantiles. *Econometrica, 46*, 33–50.

Liow, K. H. (2006). Dynamic relationship between stock and property markets. *Applied Financial Economics, 16*, 371–376.

Newell, G., & Peng, H. W. (2009). The impact of the Global Financial Crisis on A-REITs. *Pacific Rim Property Research Journal, 15*, 453–470.

Newell, G., & Tan, Y. K. (2005). *The changing risk profile of listed property trusts*. 11th Annual Conference of Pacific Rim Real Estate Society, January 23–27, 2005, Melbourne.

Psaltis, E., & Chubb, S. (2007). *Global REIT report: REIT market review 2007*. Ernst and Young.

PwC. (2011). *Compare and contrast: Worldwide real estate investment trust (REIT) regimes*. PricewaterhouseCoopers.

Ratcliffe, C., & Dimovski, W. (2007). The responsiveness of LPT returns and their attributes. *Pacific Rim Property Research Journal, 13*, 280–297.

Sagalyn, L. B. (1996). Conflicts of interest in the structure of REITs. *Real Estate Finance, 13*, 34–51.

Stevenson, S., Wilson, P. J., & Zurbruegg, R. (2007). Assessing the time-varying interest rate sensitivity of real estate securities. *The European Journal of Finance, 13*, 705–715.

Swanson, Z., Theis, J., & Casey, M. K. (2002). REIT risk premium sensitivity and interest rates. *Journal of Real Estate Finance and Economics, 24*, 319–330.