13th Pacific-Rim Real Estate Society Conference
Fremantle, Western Australia, 21 to 24 January 2007

An Investigation into the Responsiveness of LPT Returns and their Attributes

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Acknowledgements

The authors would like to thank Robert Brooks and an anonymous reviewer for their helpful comments and suggestions on a previous version of this paper.

Abstract
The Australian listed property sector has experienced substantial growth over the past decade. Relative to international property markets, Australia has the highest percentage of listed real estate and the highest proportion that makes up the total equity market in the world, hence, making it an important component of domestic financial markets. This study employs the Stone (1974) two factor asset pricing model to investigate the sensitivity of Listed Property Trust (LPT) returns to market and interest rate returns from 2000 to 2005, and the characteristics (namely, management structure, specialisation and the degree of financial leverage) that may be driving these sensitivities. Our results indicate an increase in the market risk profile of LPTs, suggesting an erosion of the defensive benefits of LPTs against stockmarket volatilities. The study also finds that the degree of financial leverage has a positive and significant impact on the level of market and interest rate risk for LPTs. There is also some evidence that the level of diversification across different property types in fact reduces market risk.

1. Introduction

Over the past decade the Australian Listed Property Trust (LPT) sector has grown from a market capitalisation of approximately $10 billion to over $125 billion (ASX, 2006). Securitised property trusts serve a vital capital formation function for the real estate market (Allen, Madura and Springer, 2000). This function is particularly significant in Australia, where both the percentage of the total real estate market that is listed and the contribution the sector makes to the total equity market are the highest in the world. According to Hughes and Arissen (2005), 30% of Australia's total real estate market is listed (compared to 7.2% in the US), and the LPT sector comprises more than 10% of the total Australian stockmarket (2.3% in the US). The Australian LPT sector also now represents approximately 10% of the world's listed property market (ASX, 2004), whereas the total Australian equity market represents less than 2.5% of the global listed equities market (D'Aloisio, 2005).

Where has this growth and demand come from? Norris (2004) identifies that a large proportion of the growth in the LPT sector has arisen from an increase in investment from institutional funds, particularly superannuation funds. The Australian Prudential Regulation Authority estimates that the collective worth of Australia's superannuation funds is over $945 billion as at September 2006, of which 5.5% is invested in listed property (Crowe, 2005). Superannuation funds are looking for stable, lower volatility, higher yielding investments. The listed property sector suits their needs, with volatility approximately 40% lower than that of general equities (ASX, 2004).

LPTs are required to hold a minimum of 75% in property investments, and have tax transparency. This facilitates relatively high dividend yields - the LPT sector pays an average yield of 8% versus 3.6% for the total market (ASX, 2005). As a population's average age increases the level of risk aversion also rises, hence demand for low risk-yield driven investments is expected to assist in maintaining the growth of the LPT sector (Norris, 2004).[1]

International research on Real Estate Investment Trusts (REITs) has investigated whether trusts are systematically exposed to general stock market risk and interest rate risk. For example, Allen et al. (2000) found REITs are statistically sensitive to interest rate changes while the influence of the market factor returned no statistical significance. The results of studies by Liang and Webb (1995) and Swanson et al., (2002) have also supported the significance of interest rate responsiveness of securitised property returns.

The aim of this research is to firstly extend previous international research to the Australian LPT sector as an extension of the research conducted by Newell (2005) who found a significant decrease in the relationship between market returns and LPT returns, whilst interest rate returns have played a more important role in explaining LPT performance in recent years. The study begins by employing a two-factor model to estimate the sensitivity of LPT returns with stock market and interest rate returns. Secondly, we then propose to test whether different characteristics of LPTs are related to their responsiveness to interest rate and stockmarket returns, an area (to our knowledge) that has not received particular academic attention in the Australian market. Using the estimated interest rate and market betas from the first model, we test how the risk of LPTs is conditioned on particular characteristics that are under the control of the trust. The maturity of the LPT sector has seen extensive structural change; significant merger activity, increased levels of debt, a broader range of property asset classes and a rise in the number of internally managed entities. Hence, the LPT characteristics investigated are financial leverage, management structure and degree of specialisation.

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[1] International investment in Australian property has doubled over the last five years (Norris 2004).

Our results suggest both long-term interest rates and stockmarket returns have a significant influence on LPT returns. However, we also find evidence to suggest that the risk characteristics of LPTs have become more closely aligned with other listed companies. Further, we find evidence that the degree of financial leverage is positively related to responsiveness of LPTs to market returns. Interestingly and in contrast to the bulk of prior research, the degree of diversification across property types actually reduces stockmarket risk.

The remainder of this paper is structured as follows. In section 2 we briefly review some previous LPT research. Section 3 outlines the data and method. The results are presented and discussed in section 4. Section 5 contains some concluding comments.

2. Literature Review

2.1 Asset pricing

The capital asset pricing model (CAPM) was developed by Sharpe (1964) and Lintner (1965). The model theorised that a stock's excess return over the risk-free rate is conditional on the company's market responsiveness, volatility and systematic risk (it's 'beta'). There have been numerous scholarly literatures that have extended on the findings of Sharpe (1964) and Lintner (1965) to further develop the theory of stock pricing. Stone (1974) extended the Sharpe-Litner asset pricing model to develop a two-factor pricing model that takes into account an interest rate proxy to complement the market proxy. Stone (1974) argued a two-index model is a useful structure that captures the effect of systematic interest rate risk and improves the concept of equity risk. Stone (1974) also asserts many interest rate sensitive firms have low market betas, that is, high dividend yield stocks generally exhibit greater collinearity with bond markets than low-yield firms. This argument is supported by Black and Scholes (1974) who reported a significant inverse relationship between yield and beta.

Staikouras (2003) posits the use of the single factor market model as a risk surrogate can result in underestimation of portfolio and security risk. Thus, the need for a two-index model allows for the explicit simultaneous treatment of market and interest rate risk. Other notable studies that have employed a two-factor model include Lynge and Zumwalt (1980) who provided evidence to demonstrate that both short- and long-return debt indices have statistically significant inverse relationship on bank stock returns. Both Bae (1990) and Dinenis and Staikouras (1998) also found a significant inverse relationship between interest rates and stock returns, furthermore both studies showed the sensitivity of returns is an increasing function of the interest rate measure employed. Flannery and James (1984) found evidence that the sensitivity of stock price changes and interest rates is highly related to the duration of the firm's assets and liabilities[2].

There have been various international researches on the performance and risk of LPTs/REITs. Chen and Tzang (1988) investigated the sensitivity of REITs to interest rates and inflation from 1973-1985. The results showed the coefficient for the market factor was statistically significant across the entire study period; however, the study found the market beta was higher in sub-period one, suggesting a decline in market risk of REITs. The interest rate coefficients were negative and significant for sub-period two (1980-1985). Khoo et al., (1993) provide statistically significant evidence that the market betas of REITs have declined over the study period of 1976 to 1989 the authors posit that the decrease in the standard deviation of trust returns can be credited to the increased levels of information about property trusts (measured by the number of market analysts following the trusts and trading volume). Results showed a significant negative relationship between the degree of information and the standard deviations of REITs. Similarly, Liang and Webb (1995) showed a decline in market betas of REITs over the study period. Further, the interest rate coefficients were negative and significant across all sub-periods. The results from these studies suggest that there has been a structural change in the securitised property sector.

[2] This result was further supported by Bae (1990)

In contrast Glascock, Lu and So (2000) showed REITs exhibited no cointegration with the market over the entire sample period, indicating that property trusts and the overall market do not share a common stochastic trend. However, the study found significant cointegration existed in the second half of the study period. Glascock et al. (2000) concluded that REITs have become more integrated with the market in recent years. Moreover when the authors investigated cointegration between the bond market and REITs, they found that the REIT sector displayed cointegration with the bond market only in the first sub-period. The authors concluded that the REIT sector has become more stock-like and less bond-like.

Using a sample period of 1992 to 1996 Allen et al. (2000) provided evidence of a significant inverse relationship between interest rates and REIT returns. Interestingly, the study found the market coefficient to be insignificant across both short- and long-term interest rate models; supporting previous empirical evidence that the REIT market has experienced a structural change. Furthermore, the results of the interest rate coefficients showed that REITs are more sensitive to long-term interest rates than they are to short-term. Swanson et al. (2002) also provided similar results and suggested these results may indicate a weakening of REIT 'safety' possibly due to the increase in an active management strategy and the increased focus on property development. Likewise, Sing (2004) showed that unexpected inflation, yield spread and credit risk is significantly priced in the securitised property sector.

Newell (2005) investigated the Australian LPTs at both the sector and individual level and provided results consistent with US studies. The study employed a multi-factor asset pricing model to assess the proportion of LPT return variability that is attributed to stockmarket movements, interest rates and direct property factors. The sample period was further divided into two sub-periods and the results provided evidence of a decline in the market coefficient for the LPT sector and an increase in the interest rate coefficient in sub-period two. These results show LPT performance "reflects the 'bond-like' stability of the rental cash-flows from high-quality tenants…typically seen in LPT property portfolios" (Newell, 2005, p. 220). In a more recent study, Newell and Tan (2005) assessed the changing risk profile of Australian LPTs from 1993 to 2004. Results showed, consistent with Newell (2005), the correlation between the overall market and LPTs has declined. However, the study found that the risk profile for LPTs over 2003 and 2004 was higher than for sub-period two (1999-2004). The authors suggested this move in risk profile is a reflection of the growth in internally managed property trusts, increased levels of debt and growth in international property portfolios, and concluded that LPTs have taken on higher risk levels in recent years.

2.2 Management structure

The management structure of real estate securities can be divided into two categories; internal or externally managed. Previous empirical evidence has found significant differences in the riskiness of externally versus internally managed LPTs/REITs. Cannon and Vogt (1995), Capozza and Seguin (2000) and Allen et al. (2000) all provided statistically significant evidence that self-managed REITs exhibit lower market risk than externally managed structures. Allen et al. (2000) concluded, that "the interests of owners and management are aligned for self-managed REITs" (p. 150).

Tan (2004) tested for significant differences in performance of externally and internally managed trusts in Australia. Empirical results show internally managed LPTs outperformed their externally managed counterparts. In addition, the level of systematic risk for internally managed trusts was significantly lower than external, 0.69 verses 0.81, suggesting that externally managed LPTs are more sensitive to market returns. A survey of stapled LPTs by Tan (2004) identified the ability to develop property along with reduced agency costs, lower cost of capital, no fee leakage and management efficiency as motivations for LPTs to be self-managed.

2.3 Financial leverage

Previous research on securitised property trusts has found highly levered LPTs/REITs are more sensitive to macro-economic factors than trusts that have lower levels of financial leverage. Chan et al. (1990) found REITs who employ higher levels of leverage are more sensitive to interest rate risk than moderately levered REITs. Likewise, Allen et al. (2000) and Chaudhry et al. (2004) demonstrated that the degree of financial leverage and market risk are significantly positively related. Delcoure and Dickens (2004) also showed that long-term debt has a significant positive relationship with risk; however, the short-term debt ratio returned a significant negative coefficient. That is, a REITs' choice to finance operations through short-term debt reduces their market risk.

2.4 Specialisation

Empirical evidence on property focus within the LPT/REIT sector has found consistent results. Gyourko and Nelling (1996) concluded that there was "no evidence that diversification across property type…is related to a market-based measure of diversification" (p. 494). Capozza and Seguin (1999) empirical results showed that 0.1 increase in REIT specialisation, measured by the Herfindahl index[3], is associated with an increase in value of 1.6%. Their results suggest diversified property trusts have higher risk levels than specialised trusts. Ambrose and Linneman (2001) found diversified REITs had the lowest profit margin, the highest average general and administration expenses, the lowest rental income to total income and the highest market betas. Finally, Hedander (2005) investigated diversification and value for Australian LPTs evidence showed a statistically significant positive relationship between property type focus and value.

2.5 Conclusion

The primary conclusion to be drawn from the literature presented is that empirical results suggest, on average, that the responsiveness of LPT/REIT returns to stockmarket returns, although still an

[3] See Hirscham (1964)

important variable, has declined over recent years. However, Newell and Tan (2005) have identified a possible change in the risk profile of LPTs in recent years, an area that warrants further investigation. Interest rate returns have a significant inverse relationship with LPT/REIT returns. Research into the management structure of LPTs/REITs suggests that internally managed LPTs/REITs have lower market risk than their externally managed counterparts, possibly due to the interest of management and owners being more closely aligned. The degree of financial leverage has an important impact on the level of stockmarket risk for LPTs/REITs. Finally, research on the level of diversification across property types suggests diversification is a naïve strategy, resulting in higher sensitivity to market returns.

3. Data and method

The study sample comprises eighteen LPTs trading on the Australian Stock Exchange (ASX) from January 1 2000 to December 31 2005. This period has been characterised by a change in risk profile, due to factors such as greater exposure to international property, higher debt levels, and a greater reliance on non-passive income. Newell and Tan (2005) note that international properties account for over 29% of LPT total assets. Property rental income has fallen from an average of 96% in 2000 to 87% in 2004 (Oliver, 2004), suggesting a move away from a reliance on passive income streams. Finally debt levels have been steadily increasing over the last decade, these higher debt levels may further increase the responsiveness of LPT returns to interest rate returns (Newell and Tan, 2005). Given these changes Oliver (2004) suggest LPTs may become more volatile, more interest rate sensitive, be less indicative of property market conditions, more reliant on the performance of one or two LPTs.

Monthly total returns data for the sample LPTs, the S&P/ASX200 Accumulation Index, S&P/ASX 200 Property Accumulation Index, 90-Day Bank Accepted Bill (BAB) and 10-Year Commonwealth Government Bonds (CGB) were extracted from the *IRESS Database*. Accounting data (leverage, specialisation and management structure) was collected from the *Connect 4 Annual Reports* collection and ASX website (www.asx.com.au). *Connect 4* is a well regarded private company provider of Australian Stock Exchange (ASX) information to universities, government departments, banks, stockbrokers and other such finance researchers. The *IRESS* database is a highly respected and well used share market information system that derives their pricing data from the ASX. Table 1 provides a break up of the management structure for the selected LPTs, the property sector that they invest in and the total number of assets, all sourced from the individual LPTs annual reports as at December 2005. Finally table 1 provides the level of market capitalisation for each of the selected trusts. Table 1 shows that the four largest LPTs (as measured by market capitalisation) are internally managed and of these four, three are classified as a diversified trust.

(Insert Table 1 here)

Two measures of interest rates are considered in the two-factor model. The 90-Day BAB rate is employed as a short-term measure of interest rates and is used as a proxy for changes in the cost of funds for the property trusts. Luckham (2002) provided evidence that over the last two years short-term interest rates (measured by 90-Day BAB) have become a more important explanatory variable than bond yields in property trust price movements. The yield on 10-Year CGB is used as a proxy for long-term interest rates because it contains implied market expectations of future interest rates, which may also imply a level of anticipated inflation, a change in long-term interest rates may bring about the repricing of a company's value (Allen et. al., 2000). Leverage is defined as the degree of financial gearing of the LPT, measured as *Financial Debt / (Financial Debt + Equity).*[4] A diversified trust is defined by the trusts portfolio spread across different property types, such as retail, office, residential development and hotels. Measurement of diversification/specialisation is calculated using the Hirscham-Herfindahl index (Hirscham, 1964) and is defined as:

$$HHPROP = \sum_i w_i^2 \quad (1)$$

Where: w_i = the proportion of a LPTs portfolio invested in property type *i*. This measure shows how focused or diversified the LPT is, a score close to one means the trust is highly focused, whereas a score close to zero is a diversified trust.

[4] Financial debt includes both long- and short-term debt

The first step in our analysis is to estimate the responsiveness of LPT returns to market and interest rate returns. The following two-factor model developed by Stone (1974) is employed to estimate the coefficients for market and interest rate risk:

$$R_{LPT,t} = \beta_0 + \beta_1 R_{M,t} + \beta_2 i_t + \mu_t \qquad (2)$$

Where $R_{LPT,t}$ represents the average monthly returns for the weighted portfolio of LPTs, β_0 represents the intercept, $R_{M,t}$ represents the market return, i_t represents the interest rate index. β_1 is the estimated coefficient for market returns, and β_2 is the estimated coefficient for interest rates and μ_t is a stationary stochastic process with zero mean for the LPT portfolio. Equation (2) is estimated for both short and long-term interest rates.

It is hypothesised that the relationship between LPT returns and interest rate returns is inverse. Allen et al. (2000) identifies two factors for this inverse relationship. Firstly, an increase in interest rates may result in higher costs of financing and hence effects demand, because investing in real estate is reliant on borrowed funds. Second, finance theory suggests investors determine their required rate of return from a risk-free return plus a risk premium. An increase in interest rates may lead to a higher required rate of return translating into lower valuations. However, Allen et al. (2000) suggests that the negative relationship between interest rates and LPT returns may be debatable "because of the underlying forces that cause interest rate movements" (p. 143). Declining interest rates are a result of weaker economic conditions and low inflationary expectations. Weakening economic conditions may cause downward pressure on real estate prices and an increase in the number of vacancies, resulting in lower income streams for LPTs and vis versa. These effects may counteract the hypothesised negative relationship between LPT returns and interest rates.

Estimating equation (2) may provide a problem due to the potential collinearity between the two independent variables. Thus, to remove this collinearity between R_M and i an orthogonalising method is employed[5]. We rely on Ragunathan, Faff and Brooks (1999) which suggests when doing asset pricing testing such as integration or segmentation of markets then we should orthogonalise even when the correlation is low. The objective of this method is to construct an uncorrelated pair of independent variables such that $\text{cov}(R_{M,}i) = 0$ (Dinenis and Staikouras, 1998), this is achieved by regressing the interest rate variable against the return on the market, the residual from the regression is then used as the proxy for interest rate returns in the two-factor model.

The second step in our analysis is to model the individual LPT returns against both market and interest rate returns. The coefficients for the sensitivities to market and interest rate risk of the individual LPTs are estimated from equation (3).

$$R_{j,t} = b_0 + b_1 R_{M,t} + b_2 i_t + \omega_t \tag{3}$$

Where $R_{j,t}$ represents the returns for the individual LPT in month t, b_0 represents the intercept, $R_{M,t}$ represents the market return in month t, i_t is the interest rate index for both long- and short-term interest rates. b_1 is the estimated coefficient for the return on the market, and b_2 is the estimated coefficient for interest rate returns and μ_t is the error term. As in the previous model, we conduct the analysis after orthogonalising the data, and estimate the equation for both short- and long-term interest rates. Equation (3) provides the estimated sensitivities for the individual LPT returns to market movements and both interest rate measures, the estimated coefficients are then used in final step of the investigation.

[5] See: Fogler, John and Tipton (1981)

The final step in our analysis is to test the individual characteristics of LPTs to their responsiveness to interest rates and market return for the data set. The estimated coefficients from step two are employed in this step as the dependent variables. To test the impact of the LPT characteristics on the dependent variables we estimate the following equations:

$$b_{1j} = \gamma_0 + \gamma_1 Management + \gamma_2 Leverage + \gamma_3 HHPROP + \omega_t \qquad (4)$$

$$b_{2j} = \gamma_0 + \gamma_1 Management + \gamma_2 Leverage + \gamma_3 HHPROP + \omega_t \qquad (5)$$

Where b_{1j} is the sensitivity of the individual LPT to market returns and b_{2j} is the responsiveness to both short- and long-term interest rates, estimated from equation (3). The independent variables; *Management, Leverage* and *HHPROP* are as defined earlier. The *Management* variable is identified by a dummy variable of 1 for internally managed and 0 for externally managed LPTs. The coefficient γ_0 is the intercept and γ_x represents the coefficients for leverage, management structure and specialisation for each LPT and finally ω_t is the error term.

4. Results

Table 2 presents the results from the regression of the LPT portfolio return against interest rates and market returns estimated from equation (2). Panel A shows the estimated coefficients using long-term interest rates. The market coefficient is positive and a significant with a p-value of 0.006 suggesting, in contrast to Allen et al. (2000), that LPT returns are significantly sensitive to stockmarket returns. Consistent with previous research [e.g. Liang and Webb (1995), Allen et al., (2000) and Sing (2004)], the interest rate coefficient returned the hypothesised negative and significant result, more specifically, as interest rates rise (decline) LPT returns decline (rise). The R^2 results show that the two-factor model explains approximately 24 percent of the variation in LPT returns when long-term interest rates are employed. Panel B of table 2 shows the regression results using short-term interest rates. Only the market return coefficient returned a significant positive coefficient with a p-value of 0.011, consistent with the results from the long-term interest rate model. The low R^2 and adjusted R^2 suggest there are other factors influencing LPT returns when modelled against short-dated interest rate securities. This lack of significance from the short-term interest rate regression is, however, consistent with the findings of Chen and Tzang (1988) and Allen et al. (2000) who provided evidence that property trusts are more sensitive to long-term interest rate returns than they are to short-term.

(Insert Table 2 here)

To test if there is any structural difference in the market and interest rate responsiveness of LPTs we divided the sample into two sub-periods, 2000 to 2002 and 2003 to 2005. Previous research has shown that the LPT sector has become less correlated with the stockmarket and more sensitive to interest rates [e.g. Allen et al. (2000) and Newell (2005)]. Table 3 presents the market return and interest rate coefficients for the two sub-periods. Consistent with the results provided in table 2, the market coefficient and interest rate coefficients are significant for both sub-periods in the long-term interest rate model (panel A). Interestingly, the market coefficient in sub-period two is 0.323 compared to 0.143 in sub-period one. This result suggests the risk characteristics of LPTs have become more closely aligned with other listed companies. This increase in market return responsiveness is consistent with Newell and Tan (2005) who provided evidence that there has been an increase in LPT risk that is directly related to stockmarket risk in 2003 and 2004. This result is further supported by the correlations between the market returns and the LPT portfolio returns. The correlations increased from 0.236 in sub-period one to 0.428 for sub-period two. Panel B of table 3 reveals only the market coefficient is significant with a p-value of 0.001 in sub-period two for the short-term interest rate model; however the market coefficient again has increased from 0.124 in sub-period one to 0.347 in sub-period two, consistent with the long-term interest rate model.

(Insert Table 3 here)

The increase in the responsiveness of LPT returns to market returns from sub-period one to sub-period two suggests an erosion of the defensive characteristics of LPTs against market risk/volatility. This defensive characteristic of LPT has been a major driver in the popularity growth of investing in LPTs by institutional and retail investors as a means of obtaining diversification benefits that LPTs provide.[6]

Tables 4 and 5 display the results of the regression for equations (4) and (5) when outliers are excluded from the sample. Macquarie Leisure Trust (MLE) was removed from the sample for two reasons; firstly the market return coefficient in the long-term interest rate regression was more than three standard deviations away from the mean. Secondly, the core income for MLE is different to the other LPTs in the data sample[7].

The results show that leverage is positive and significant for the market coefficient in both short- and long-term interest rate models over the full sample period. This suggests, consistent with Chan et al. (1990), Swanson et al. (2002) and Chaudhry et al. (2004), increased debt levels result in higher market risk. The long-term interest rate regression also shows that leverage is positively related to interest rate risk in sub-period two. This outcome suggests that the degree of financial leverage of LPTs is an important variable for LPTs. This result may be credited to an increase in exposure to international property and a low interest rate environment (Newell and Tan, 2005). Of particular interest, specialisation returned a significant positive coefficient for the market return in both models for sub-period one and the full sample period. This result shows, in contrast to Capozza and Seguin (1999), Ambrose and Linneman (2001) and Hedander (2005), that LPTs that diversify across different property types are able to smooth the cyclicality of property sector returns. However, this result may also be due to the firm size of the diversified trusts in our sample. We identified that the three largest LPTs, by market capitalisation, are all diversified trusts. Thus, this result may in fact be due to the larger LPTs have an economies of scale advantage that gives them

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[6] See; Newell and Tan (2005)

[7] MLE relies principally on revenue from domestic entertainment markets, while these revenue streams are still based on rental there is also a turnover component which is subject to fluctuations in the tourism/entertainment market (Macquarie Leisure Trust Group Annual Report, 2005).

sufficient expertise to manage different property types. The management coefficient is positive and significant in sub-period two for the short-term interest rate model, this result suggests that internally managed LPTs exhibit higher short-term interest rate risk than externally managed LPTs. It may be argued that due to the cyclical nature of stapled LPTs income, these firms are more reliant on short-term funding than external LPTs.

(Insert Tables 4 and 5 here)

5. Conclusion

This paper firstly examined the responsiveness of LPT returns to market and interest rate returns between January 2000 and December 2005, utilising the Stone (1974) two-factor model. Our results indicate an increase in the sensitivity of LPT returns to market returns from sub-period one to sub-period two, suggesting LPTs are becoming more closely aligned with other listed companies, and a potential erosion of the defensive characteristics of LPTs against market risk. In addition we have found that long-term interest rate returns have a significant negative influence on LPT returns.

The final section of our analysis investigated what influence the various attributes that are under the LPT manager’s control have on their sensitivities to market and interest rate returns. Our results show that LPTs can reduce their market and interest rate risk by maintaining lower levels of debt in their capital structure. Interestingly, we also find the LPTs that diversify across different property types have the propensity to reduce their sensitivity to market returns.

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Table 1: Profile of LPTs - 2005

Trust Name	Management structure	Sector	Market Cap ($A million)	Total Assets[1] ($A million)
Australian Hotel Fund	External	Hotel	$36	$72
Bunnings Warehouse Prp Tr[2]	External	Retail	$458	$630
Carindale Property Trust	External	Retail	$248	$300
Commonwealth Prp Off Tr[2]	External	Office	$1,735	$2,550
CFS Gandel Retail Trust[2]	External	Retail	$2,579	$4,636
ING Industrial Trust[2]	External	Commercial	$1,681	$1,923
ING Office Trust[2]	External	Office	$1,359	$2,096
JF Meridian Trust	External	Diversified	$767	$924
Macquarie CountryWide Tr[2]	External	Retail	$2,080	$2,660
Macquarie Leisure Trust[2]	External	Entertainment	$390	$327
Macquarie Office Trust[2]	External	Office	$2,521	$3,262
Tourism and Leisure Trust	External	Tourism	$20	$24
Grand Hotel Group	Internal	Hotel	$97	$509
General Property Trust[2]	Internal	Diversified	$8,269	$9,317
Investa Proprty Group[2]	Internal	Commercial	$3,028	$4,839
Mirvac Group[2]	Internal	Diversified	$3,518	$5,524
Stockland Trust Group[2]	Internal	Diversified	$8,559	$8,400
Thakral Holdings Group	Internal	Diversified	$228	$1,055

This table shows the profile of the eighteen LPTs in the data sample, their sector of investment, market capitalisation and total assets as at 31 December 2005.
(1) Total assets obtained from the LPTs bi-annual reports for year end 2005.
(2) These LPTs are constitutes of the ASX/S&P 200 Property Accumulation Index
Source: Author's compilation from IRESS Database and Connect 4 Annual Reports collection

Table 2: LPT portfolio coefficients for market and interest rate returns – 2000-2005

Panel A:		**Long-term Interest Rates**					
	No. Obs.	**c**	**Market-Return Coefficient**	**Interest-Rate Coefficient**	**R^2 Adj. R^2**	**J Bera**	**White Test**
Coef.	72	0.009	0.197	-0.179	0.238	1.000	3.561
P-Value		0.000	0.006*	0.001*	0.216	0.607	0.469

Panel B:		**Short-term Interest Rates**					
	No. Obs.	**c**	**Market-Return Coefficient**	**Interest-Rate Coefficient**	**R^2 Adj. R^2**	**J Bera**	**White Test**
Coef.	72	0.009	0.197	0.014	0.091	1.338	4.643
P-Value		0.001	0.011*	0.854	0.065	0.512	0.326

This table shows the regression results from $R_{LPT,t} = \gamma_0 + \gamma_1 R_{M,t} + \gamma_2 \varepsilon_t + \mu_t$ for the study period of January 2000 to December 2005. Where $R_{LPT,t}$ is the return on the LPT portfolio for month t, $R_{M,t}$ is the return on the S&P/ASX200 Accumulation Index for month t and ε_t is the orthogonalised interest rate index. The coefficient and p-values of each variable is given as well as values of R^2 and adjusted R^2. A Jarque-Bera test is reported and tests whether the residuals are normally distributed. A White specification tests is also reported and advises whether heteroscedasticity is a problem. To manage heteroskedasticity problems, White (1980) heteroscedasticity adjusted co-efficient and p-values are reported. * indicates significance at the 1% level or higher.

Table 3: LPT portfolio coefficients for market and interest rate returns - sub periods

Panel A:		**Long-term Interest Rates**					
Period 2000-02	**No. Obs.**	**c**	**Market-Return Coefficient**	**Interest-Rate Coefficient**	**R^2 Adj. R^2**	**J Bera**	**White Test**
Coef.	36	0.011	0.143	-0.157	0.209	0.120	3.612
P-Value		0.000	0.098*	0.016*	0.161	0.942	0.461
2003-05							
Coef.	36	0.005	0.323	-0.186	0.300	0.464	4.607
P-Value		0.201	0.015*	0.025*	0.258	0.793	0.330

Panel B:		**Short-term Interest Rates**					
Period 2000-02	**No. Obs.**	**c**	**Market-Return Coefficient**	**Interest-Rate Coefficient**	**R^2 Adj. R^2**	**J Bera**	**White Test**
Coef.	36	0.012	0.124	0.085	0.084	0.625	2.250
P-Value		0.000	0.181	0.319	0.029	0.732	0.690
2003-05							
Coef.	36	0.004	0.347	-0.105	0.193	0.846	9.356
P-Value		0.280	0.001*	0.653	0.144	0.655	0.053

This table shows the regression results from $R_{LPT,t} = \gamma_0 + \gamma_1 R_{M,t} + \gamma_2 \varepsilon_t + \mu_t$ for sub-periods one (January 2000 to December 2002) and sub-period two (January 2003 to December 2005). Where $R_{LPT,t}$ is the return on the LPT portfolio for month t, $R_{M,t}$ is the return on the S&P/ASX200 Accumulation Index for month t and ε_t is the orthogonalised interest rate index. The coefficient and p-values of each variable is given as well as values of R^2 and adjusted R^2. A Jarque-Bera test is reported and tests whether the residuals are normally distributed. A White specification tests is also reported and advises whether heteroscedasticity is a problem. To manage heteroskedasticity problems, White (1980) heteroscedasticity adjusted co-efficient and p-values are reported. * indicates significance at the 1% level or higher.

Table 4: Multivariate OLS Regressions Excluding Outliers - Long-term Interest Rates

Sample Period	Market Coefficient	No. Obs.	c	Management	Leverage	HHPROP	R2 / Adj. R2	J Bera	White Test
2000-2005	**Coef.**	17	-0.250	0.109	0.619	0.302	0.544	0.581	8.561
	P-Value		0.064	0.181	0.086*	0.030*	0.438	0.748	0.128
2000-2002	**Coef.**	17	-0.275	0.082	0.636	0.323	0.448	1.228	8.842
	P-Value		0.112	0.453	0.131	0.091*	0.320	0.541	0.116
2003-2005	**Coef.**	17	0.107	0.200	-0.101	0.148	0.184	1.734	9.264
	P-Value		0.649	0.159	0.897	0.511	-0.004	0.420	0.099

Sample Period	Interest Rate Coefficient	No. Obs.	c	Management	Leverage	HHPROP	R^2 / Adj. R^2	J Bera	White Test
2000-2005	**Coef.**	17	-0.360	0.052	0.765	-0.019	0.247	0.524	10.168
	P-Value		0.185	0.735	0.244	0.932	0.073	0.769	0.071
2000-2002	**Coef.**	17	-0.292	0.143	0.349	0.057	0.140	0.246	9.079
	P-Value		0.217	0.352	0.537	0.821	-0.058	0.884	0.106
2003-2005	**Coef.**	17	0.365	-0.015	0.849	-0.069	0.368	2.029	11.979
	P-Value		0.100	0.904	0.091*	0.700	0.222	0.363	0.035

This table shows the regression results excluding outliers from $\delta_{1j} = \alpha + \gamma_1 Management + \gamma_2 Leverage + \gamma_3 HHPROP + \omega_t$ and $\delta_{2j} = \alpha + \gamma_1 Management + \gamma_2 Leverage + \gamma_3 HHPROP + \omega_t$ for the study period of 2000 to 2005 along with sub-periods. Where δ_{1j} and δ_{2j} are the estimated coefficients for the market return and long-term interest rates respectively. *Management* is defined as the management structure employed by the LPT. *Leverage* is defined as *Financial Debt / (Financial Debt + Equity)*. *HHPROP* is defined as the level of specialisation of the individual LPT. The coefficient and p-values of each variable is given as well as values of R^2 and adjusted R^2. A Jarque-Bera test is reported and tests whether the residuals are normally distributed. A White specification tests is also reported and advises whether heteroscedasticity is a problem. To manage heteroskedasticity problems, White (1980) heteroscedasticity adjusted co-efficient and p-values are reported. * indicates significance at the 1% level or higher.

Table 5:Multivariate OLS Regressions Excluding Outliers - Short-term Interest Rates

Sample Period	Market Coefficient	No. Obs.	c	Management	Leverage	HHPROP	R^2 / Adj. R^2	J Bera	White Test
2000-2005	**Coef.**	17	0.250	0.109	0.619	0.302	0.544	0.581	8.561
	P-Value		0.064	0.181	0.086*	0.029*	0.438	0.748	0.128
2000-2002	**Coef.**	17	-0.301	0.077	0.705	0.324	0.487	0.334	9.351
	P-Value		0.027	0.488	0.217	0.029*	0.368	0.846	0.096
2003-2005	**Coef.**	17	0.164	0.233	-0.307	0.158	0.206	1.659	7.358
	P-Value		0.501	0.109	0.631	0.450	0.023	0.436	0.195

Sample Period	Interest Rate Coefficient	No. Obs.	c	Management	Leverage	HHPROP	R^2 / Adj. R^2	J Bera	White Test
2000-2005	**Coef.**	17	-0.171	0.283	-0.020	0.005	0.170	56.202	2.714
	P-Value		0.662	0.259	0.985	0.990	-0.022	0.000	0.744
2000-2002	**Coef.**	17	-0.072	0.394	-0.682	0.113	0.180	45.748	3.968
	P-Value		0.871	0.191	0.531	0.817	-0.010	0.000	0.554
2003-2005	**Coef.**	17	-0.148	0.188	-0.123	-0.036	0.376	1.009	4.254
	P-Value		0.415	0.083*	0.794	0.815	0.231	0.604	0.513

This table shows the regression results excluding outliers from $\delta_{1j} = \alpha + \gamma_1 Management + \gamma_2 Leverage + \gamma_3 HHPROP + \omega_t$ and $\delta_{2j} = \alpha + \gamma_1 Management + \gamma_2 Leverage + \gamma_3 HHPROP + \omega_t$ for the study period of 2000 to 2005 along with sub-periods. Where δ_{1j} and δ_{2j} are the estimated coefficients for the market return and short-term interest rates respectively. *Management* is defined as the management structure employed by the LPT. *Leverage* is defined as *Financial Debt / (Financial Debt + Equity)*. *HHPROP* is defined as the level of specialisation of the individual LPT. The coefficient and p-values of each variable is given as well as values of R^2 and adjusted R^2. A Jarque-Bera test is reported and tests whether the residuals are normally distributed. A White specification tests is also reported and advises whether heteroscedasticity is a problem. To manage heteroskedasticity problems, White (1980) heteroscedasticity adjusted co-efficient and p-values are reported. * indicates significance at the 1% level or higher.