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THE SIGNIFICANCE OF PROPERTY SECTOR AND GEOGRAPHIC DIVERSIFICATION IN AUSTRALIAN INSTITUTIONAL PROPERTY PORTFOLIOS

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INTRODUCTION

In a property portfolio, the standard strategies for portfolio diversification and risk reduction are diversification by property type and geographic region, with economic diversification also offering potential diversification benefits (Lee and Byrne, 1998; Mueller, 1993; Mueller and Ziering, 1992). As evidenced in industry surveys, such property investment strategies, involving diversification by property type and geographic region, are typically employed by the major institutional investors (DeWitt, 1996; Louargard, 1992; Webb, 1984).

In Australia, the extent of these portfolio diversification strategies by LPTs in 2001 is shown in Table 1. Accounting for a property portfolio of $14.9 billion (PIR, 2002), these nine diversified LPTs represent 36% of the total LPT sector market capitalisation (UBS Warburg, 2002) and demonstrate significant portfolio diversification across the major property sectors and geographic regions. Overall, office (51%), retail (31%) and industrial (13%) are the major property sectors and NSW (49%), Victoria (15%) and Queensland (15%) are the major geographic regions.

The strategic issues of property type and geographic diversification have been substantial areas of property research in recent years (see Hamelink et al, 2000; Lee and Byrne, 1998; Seiler et al, 1998). A range of techniques have been used to assess these diversification benefits, including correlations, efficient frontiers and cluster analysis. Whilst differences in diversification benefits exist across different property markets (Eichholtz et al, 1995), the consensus view has been that property sector diversification is more effective than geographic diversification (Fisher and Liang, 2000; Lee, 2001) and hence, property sector diversification should form the first strategic level of property portfolio construction (Lee, 2001).

While the relative importance of property sector and geographic diversification has been assessed for the USA (Fisher and Liang, 2000) and the UK (Lee, 2001), the effectiveness of these property portfolio diversification strategies for Australian institutional investors also needs to be critically assessed; in particular, whether property type diversification is more effective than geographic diversification. This is particularly important, given the significant role of property in institutional portfolios in Australia.

The purpose of this paper is to use the Property Council of Australia (PCA) property indices over 1995-2002 to assess the relative importance of property sector and geographic diversification for Australian institutional property portfolios.

METHODOLOGY

Data sources

To assess Australian property sector and geographic diversification benefits, quarterly total returns over March 1995-June 2002 were obtained (Property Council of Australia, 2002) for each of the following nine (9) commercial property markets:

- Sydney: CBD office, retail, industrial
- Melbourne: CBD office, retail, industrial
- Brisbane: CBD office, retail, industrial.

Whilst the overall PCA performance indices are available from June 1985, the lesser availability of Melbourne industrial (since March 1995) and Brisbane industrial (since June 1994) limits the quarterly sector x region analysis to the 7½ - year period of March 1995-June 2002. Table 2 presents the number of properties and property portfolio value for each of these property markets over this period. At June 2002, these property markets represented 450 properties (68% of the 664 properties in the overall PCA index portfolio) and $39.6B (80% of the $49.4B value of the overall PCA index portfolio).

For tracking error benchmarking purposes, the PCA “Australian” composite property portfolio returns and PCA “Sydney/Melbourne/Brisbane x Office/Retail/Industrial” composite property portfolio returns were utilised.

Constructing “pure” property sector and geographic returns

To assess the relative benefits of property sector versus geographic diversification, it is necessary to establish “pure” property sector and “pure” regional returns. Typically, the property sector and regional returns (eg: PCA, NCREIF) are not “pure”, as regional returns

are influenced by sector returns, as well as sector returns complicated by regional returns (Fisher and Liang, 2000).

To construct the respective pure property returns and separate the sector and regional effects, the decomposition methodology of Heston and Rouwenhorst (1994) was used. For each quarter, this model is:

$$R_{ij} = \alpha + \beta_O * D_O + \beta_R * D_R + \beta_I * D_I + \delta_S * D_S + \delta_M * D_M + \delta_B * D_B$$

where:

R_{ij} = return for property type i in region j
α = market return
β_O, β_R, β_I = excess property sector returns
D_O, D_R, D_I = property sector dummy variables
δ_S, δ_M, δ_B = excess regional returns
D_S, D_M, D_B = regional dummy variables.

This methodology can be used to generate pure property returns on both an equal-weighted and value-weighted basis. To construct the equal-weighted returns, this model was subject to the two constraints:

$$\beta_O + \beta_R + \beta_I = 0 \qquad \text{and} \qquad \delta_S + \delta_M + \delta_B = 0$$

whilst for the value-weighted returns, the model was subject to the two constraints:

$$w_O \beta_O + w_R \beta_R + w_I \beta_I = 0 \quad \text{and} \quad w_S \delta_S + w_M \delta_M + w_B \delta_B = 0$$

where:

w_O, w_R, w_I = respective property sector market shares ($w_O + w_R + w_I = 1$)
w_S, w_M, w_B = respective regional market shares ($w_S + w_M + w_B = 1$).

For each quarter, the resulting pure sector returns were:

Office: $\alpha + \beta_O$
Retail: $\alpha + \beta_R$
Industrial: $\alpha + \beta_I$

and the resulting pure regional returns were:

Sydney: $\alpha + \delta_S$
Melbourne: $\alpha + \delta_M$
Brisbane: $\alpha + \delta_B$,

with this procedure done quarterly over March 1995-June 2002 to generate the pure property sector returns and pure regional returns on both an equally-weighted and value-weighted basis. These two "pure" series will be compared with the standard PCA value-weighted return series.

The major benefits of this methodology are that the resulting pure sector portfolios have the same regional distribution as the PCA property index; similarly, the resulting pure region portfolios have the same sector distribution as the PCA property index. This decomposition methodology has previously been used for the diversification analysis for USA property over 1978-99 (Fisher and Liang, 2000) and UK property over 1981-95 (Lee, 2001).

The assessment of the relative impact of diversification by property type and geographic region will be done using a range of statistical procedures, including correlations and tracking error.

RESULTS AND DISCUSSION

Development of pure PCA property series

The justification for the development of the pure PCA property series is shown in Table 3. The geographic distribution of the three property sectors is significantly different to the overall PCA index geographic distribution. For example, for retail, Brisbane is over-represented and for industrial, Brisbane is under-represented. Similarly, the property sector distribution of the three regions is significantly different to the overall PCA index property sector distribution. The resulting impact sees property sector returns having hidden regional components and the regional returns having hidden property sector components. This further reinforces the need for developing pure PCA property series to more effectively isolate the diversification contribution of the property type and regional effects.

Using the Heston and Rouwenhorst (1994) methodology, Figures 1 and 2 present the resulting quarterly property sector indices (office, retail, industrial) and regional indices (Sydney, Melbourne, Brisbane) over March 1995 to June 2002 for:

- pure PCA: equal-weighted returns
- pure PCA: value-weighted returns,

as well as for the actual PCA value-weighted returns.

Table 4 presents a comparison of the PCA actual and pure return series over March 1995-June 2002 in terms of average annual return, annual risk and correlations. Whilst the differences are not substantive, the pure PCA series are conceptually superior in assessing the relative importance of property type and regional diversification effects.

Correlation analysis

Table 5 presents the inter-sector and the inter-region correlations for the three portfolios (PCA actual and two PCA pure series) over 1995-2002, with average correlations used to assess the impact of the sector and region diversification. For the PCA actual series (see Panel A), an average sector correlation of 0.088 compared to an average regional correlation of 0.191 indicates marginally better diversification benefits are delivered by the property sectors than regions. Importantly, with these average correlations close to zero, both property sectors and regions deliver substantial diversification benefits. For both the PCA equal-weighted and value-weighted pure portfolios (see panels B and C respectively), the average region correlations were slightly less than the average sector correlations. The differences

were only marginal, with both sectors and regions delivering substantial diversification benefits.

The above correlation analysis indicates significant diversification benefits for both property sector and region, with only marginal differences in diversification benefits for these two components in the portfolio. The average correlations seen for Australia over 1995-2002 were – .047 to .087, compared to average correlations of .68 to .75 over 1978-99 in the USA, with sector being seen to be more important than region in the USA (Fisher and Liang, 2000). These differences highlight two issues:

- the stronger diversification benefits provided by both property sector and region in Australia

- the impact of shorter time period of analysis for Australia (8 years) than USA (22 years); potentially not capturing the fuller impact of the longer-term property cycle. This is further demonstrated in the larger inter-sector and inter-region correlations for the PCA actual series over 1985-2002 (see panel D) compared to 1995-2002, with average correlations of .519 and .582 respectively.

Tracking error analysis

Tracking error represents the standard deviation of excess sector or region returns relative to the overall PCA returns. As the PCA pure sector portfolio is diversified by region, a large tracking error of a pure property sector would indicate that regional diversification is less effective. Similarly, as the PCA pure regional portfolio is diversified by property sector, a large tracking error of a pure region would indicate that sector diversification is less effective (Fisher and Liang, 2000).

Table 6 represents the tracking error analysis for the three portfolios using both PCA benchmark portfolios over 1995-2002. For both the PCA pure equally-weighted portfolio (see panel B) and the PCA pure value-weighted portfolio (see panel C), the tracking error for the regions was larger than for the sectors. This confirms diversification by region is marginally more effective than diversification by sector. Again, the differences are only marginal, and the small tracking errors highlight the diversification benefits of both sector and region.

Decomposition analysis

Table 7 provides additional features of the decomposition analysis to assess the effectiveness of property sector and regional diversification. In particular:

- average R^2 values for sector were larger than for region, reflecting property sector factors are more important than regional factors in explaining property returns. Again, the differences are not large, particularly compared to the UK analyses (Lee, 2001)

- average absolute values of the property sector coefficients are larger than average absolute values of the regional coefficients

- average property type variance is less than average regional variance, reflecting regional effects accounting for marginally more of the property return variation; again, the differences are not large.

PROPERTY IMPLICATIONS

Previous property diversification studies in the USA (Fisher and Liang, 2000) and the UK (Lee, 2001) have shown that property sector diversification is more important than regional diversification.

This study has shown that the differences in property sector and regional diversification are not as substantive for Australian commercial property over 1995-2002, with regional diversification delivering slightly more diversification benefits than property sector diversification. Importantly, both property sector and region deliver significant portfolio diversification benefits.

The more significant regional contribution to property diversification in Australia, compared to USA and UK, reinforces the institutional investment strategy of introducing sector-specific LPTs in recent years and achieving portfolio diversification via regional diversification. This has seen the 25 current sector–specific LPTs account for over $29.2B or 64% of the LPT sector market capitalisation at June 2002 (UBS Warburg, 2002).

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Table 1: Diversified LPTs property diversification strategies: December 2001

PANEL A: PROPERTY SECTOR DIVERSIFICATION

LPT	Value of property portfolio	Portfolio composition (%)					
		Office	Retail	Industrial	Hotel	Residential	Other
General Property Trust	$ 5,655M	38%	52%	2%	8%	0%	0%
Stockland Trust Group	$ 2,540M	35%	31%	15%	2%	17%	0%
Mirvac Group	$ 1,552M	69%	22%	9%	0%	0%	0%
Colonial First State	$ 1,688M	45%	32%	23%	0%	0%	0%
AMP Diversified	$ 1,517M	48%	43%	9%	0%	0%	0%
Deutsche Diversified *	$ 1,290M	28%	33%	23%	0%	0%	16%
Tyndall Meridan	$ 423M	37%	40%	21%	2%	0%	0%
James Fielding	$ 106M	77%	23%	0%	0%	0%	0%
Flexi Property	$ 108M	84%	0%	16%	0%	0%	0%
Total	**$14,879M**	**51%**	**31%**	**13%**	**1%**	**2%**	**2%**

PANEL B: GEOGRAPHIC DIVERSIFICATION

LPT	Value of property portfolio	Portfolio composition (%)						
		NSW	VIC	QLD	SA	WA	ACT	Other
General Property Trust **	$ 5,655M	49%	23%	8%	0%	3%	7%	10%
Stockland Trust Group **	$ 2,540M	60%	11%	16%	4%	4%	4%	1%
Mirvac Group	$ 1,552M	66%	14%	7%	0%	0%	13%	0%
Colonial First State	$ 1,688M	45%	17%	19%	11%	7%	1%	0%
AMP Diversified	$ 1,517M	64%	11%	5%	8%	12%	0%	0%
Deutsche Diversified	$ 1,290M	34%	28%	6%	13%	19%	0%	0%
Tyndall Meridan	$ 423M	57%	3%	29%	0%	0%	11%	0%
James Fielding	$ 106M	0%	14%	42%	21%	23%	0%	0%
Flexi Property	$ 108M	65%	11%	0%	24%	0%	0%	0%
Total	**$14,879M**	**49%**	**15%**	**15%**	**9%**	**8%**	**4%**	**0%**

*: Other = carpark **: Other = Northern Territory

Source: Author's compilation from PIR (2002)

Table 2: PCA index portfolio: December 1994 - June 2002

Property portfolio component	December 1994		June 2002	
	# properties	Value	# properties	Value
Sydney CBD office	86	$7.3B	66	$12.3B
Sydney retail	62	$4.2B	64	$7.8B
Sydney industrial	90	$0.9B	98	$2.0B
Melbourne CBD office	54	$3.6B	21	$3.6B
Melbourne retail	24	$2.1B	49	$5.7B
Melbourne industrial	24	$0.3B	45	$0.6B
Brisbane CBD office	33	$1.8B	32	$2.0B
Brisbane retail	27	$2.1B	49	$5.3B
Brisbane industrial	11	$0.1B	26	$0.3B
Total portfolio	**411**	**$22.4B**	**450**	**$39.6B**
Total PCA portfolio	**640**	**$29.9B**	**664**	**$49.4B**
Percentage of total PCA portfolio	**64%**	**75%**	**68%**	**80%**

Table 3: Need for "pure" PCA returns

PCA PORTFOLIO: GEOGRAPHIC

- **Overall**
  - Sydney: 55.4%
  - Melbourne: 26.3%
  - Brisbane: 17.8%
- **Office**
  - Sydney: 57.5%; distribution quotient difference = +3.8%
  - Melbourne: 28.3%; distribution quotient difference = +5.6%
  - Brisbane: 14.2%; distribution quotient difference = -20.2%
- **Retail**
  - Sydney: 50.0%; distribution quotient difference = -9.7%
  - Melbourne: 25.0%; distribution quotient difference = -6.7%
  - Brisbane: 25.0%; distribution quotient difference = +40.4%
- **Industrial**
  - Sydney: 69.0%; distribution quotient difference = +24.5%
  - Melbourne: 23.0%; distribution quotient difference = -14.2%
  - Brisbane: 8.0%; distribution quotient difference = -55.1%

PCA PORTFOLIO: SECTOR

- **Overall**
  - Office: 56.7%
  - Retail: 37.5%
  - Industrial: 5.8%
- **Sydney**
  - Office: 58.9%; distribution quotient difference = +3.9%
  - Retail: 33.9%; distribution quotient difference = -9.6%
  - Industrial: 7.3%; distribution quotient difference = +25.9%
- **Melbourne**
  - Office: 60.0%; distribution quotient difference = +5.8%
  - Retail: 35.0%; distribution quotient difference = -6.7%
  - Industrial: 5.0%; distribution quotient difference = -13.8%
- **Brisbane**
  - Office: 45.0%; distribution quotient difference = -20.6%
  - Retail: 52.5%; distribution quotient difference = +40.0%
  - Industrial: 2.5%; distribution quotient difference = -56.9%

Table 4: Comparison of PCA actual and PCA "pure" return series

PANEL A: RISK AND RETURN

	Average annual return			Annual risk		
	PCA actual (value-weighted)	PCA pure (equal-weighted)	PCA pure (value-weighted)	PCA actual (value-weighted)	PCA pure (equal-weighted)	PCA pure (value-weighted)
Sector						
Office	8.49%	8.34%	8.60%	1.24%	1.13%	1.25%
Retail	10.08%	10.08%	10.45%	1.14%	0.95%	0.96%
Industrial	13.79%	12.66%	12.94%	1.22%	1.18%	1.11%
Geographic region						
Sydney	9.62%	11.09%	10.28%	0.99%	1.01%	1.28%
Melbourne	10.08%	10.33%	9.45%	1.76%	1.45%	1.56%
Brisbane	8.96%	9.63%	8.72%	1.22%	1.02%	0.90%

PANEL B: SECTOR CORRELATION MATRIX (1)

	AO	AR	AI	POE	PRE	PIE	POV	PRV	PIV
AO	1.00								
AR	0.22	1.00							
AI	0.11	-0.07	1.00						
POE	**0.90**	0.28	0.12	1.00					
PRE	0.18	**0.96**	0.00	0.21	1.00				
PIE	-0.25	0.08	**0.67**	-0.14	0.12	1.00			
POV	**0.95**	0.17	0.21	**0.96**	0.12	-0.23	1.00		
PRV	0.41	**0.80**	0.18	0.29	**0.87**	-0.07	0.35	1.00	
PIV	-0.17	-0.01	**0.84**	-0.09	0.04	**0.95**	-0.10	0.02	1.00

PANEL C: GEOGRAPHIC REGION CORRELATION MATRIX (2)

	AS	AM	AB	PSE	PME	PBE	PSV	PMV	PBV
AS	1.00								
AM	0.35	1.00							
AB	0.10	0.12	1.00						
PSE	**0.82**	-0.04	-0.02	1.00					
PME	0.28	**0.91**	0.31	-0.12	1.00				
PBE	-0.28	-0.10	**0.63**	-0.18	0.16	1.00			
PSV	**0.90**	0.43	0.01	**0.93**	-0.04	-0.39	1.00		
PMV	0.41	**0.93**	0.33	-0.04	**0.96**	-0.00	0.12	1.00	
PBV	-0.10	0.05	**0.80**	-0.14	0.27	**0.93**	-0.23	0.19	1.00

(1): AO, AR, AI = PCA actual office, retail, industrial: value-weighted portfolio
POE, PRE, PIE = PCA pure office, retail, industrial: equal-weighted portfolio
POV, PRV, PIV = PCA pure office, retail, industrial: value-weighted portfolio

(2): AS, AM, AB = PCA actual Sydney, Melbourne, Brisbane: value-weighted portfolio
PSE, PME, PBE = PCA pure Sydney, Melbourne, Brisbane: equal-weighted portfolio
PSV, PMV, PBV = PCA pure Sydney, Melbourne, Brisbane: value-weighted portfolio

Table 5: Sector and geographic diversification: correlation analysis

PANEL A: PCA ACTUAL PORTFOLIO: VALUE-WEIGHTED

	Office	Retail	Industrial		Sydney	Melbourne	Brisbane
Office	1.00			Sydney	1.00		
Retail	0.22	1.00		Melbourne	0.35	1.00	
Industrial	0.11	-0.07	1.00	Brisbane	0.10	0.12	1.00
Average correlation = 0.088				**Average correlation = 0.191**			

PANEL B: EQUAL-WEIGHTED PURE PORTFOLIO

	Office	Retail	Industrial		Sydney	Melbourne	Brisbane
Office	1.00			Sydney	1.00		
Retail	0.21	1.00		Melbourne	-0.12	1.00	
Industrial	-0.14	0.12	1.00	Brisbane	-0.18	0.16	1.00
Average correlation = 0.062				**Average correlation = -0.047**			

PANEL C: VALUE-WEIGHTED PURE PORTFOLIO

	Office	Retail	Industrial		Sydney	Melbourne	Brisbane
Office	1.00			Sydney	1.00		
Retail	0.35	1.00		Melbourne	0.12	1.00	
Industrial	-0.10	0.02	1.00	Brisbane	-0.23	0.19	1.00
Average correlation = 0.087				**Average correlation = 0.026**			

PANEL D: PCA ACTUAL PORTFOLIO: 1985-2002

	Office	Retail	Industrial		Sydney	Melbourne	Brisbane
Office	1.00			Sydney	1.00		
Retail	0.52	1.00		Melbourne	0.60	1.00	
Industrial	0.71	0.33	1.00	Brisbane	0.59	0.57	1.00
Average correlation = 0.519				**Average correlation = 0.582**			

Table 6: Sector and geographic diversification: tracking error analysis

PANEL A: PCA ACTUAL PORTFOLIO: VALUE-WEIGHTED

	Sector diversified by region				Region diversified by sector			
	Office	Retail	Industrial	Average	Sydney	Melbourne	Brisbane	Average
Benchmark (1):	.367	.409	.678	.485	.282	.635	.603	.507
Benchmark (2):	.358	.393	.705	.485	.281	.613	.602	.499

PANEL B: EQUAL-WEIGHTED PURE PORTFOLIO

	Sector diversified by region				Region diversified by sector			
	Office	Retail	Industrial	Average	Sydney	Melbourne	Brisbane	Average
Benchmark (1):	.351	.374	.726	.484	.469	.524	.666	.553
Benchmark (2):	.353	.370	.763	.495	.488	.512	.702	.567

PANEL C: VALUE-WEIGHTED PURE PORTFOLIO

	Sector diversified by region				Region diversified by sector			
	Office	Retail	Industrial	Average	Sydney	Melbourne	Brisbane	Average
Benchmark (1):	.406	.326	.675	.469	.505	.516	.549	.523
Benchmark (2):	.403	.314	.712	.476	.502	.488	.578	.523

* Benchmark (1) : PCA “Australian” composite portfolio
Benchmark (2) : PCA “Sydney/Melbourne/Brisbane” composite portfolio

Table 7: Sector and geographic diversification: additional decomposition analysis

Parameter	Sector	Geographic region
Average R^2 – values		
Equal-weighted pure portfolio	.358	.228
Value-weighted pure portfolio	.356	.227
Average absolute value of decomposition coefficients		
Equal-weighted pure portfolio	.355	.144
Value-weighted pure portfolio	.389	.145
Average variance of decomposition coefficients		
Equal-weighted pure portfolio	.432	.487
Value-weighted pure portfolio	.448	.527