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Sharpe Performance by Australian Property

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Aims of this Presentation

- To evaluate and analyse the Sharpe performance for leading Australian property markets
- To examine total return property data for 1) skewness 2) kurtosis 3) autocorrelation, and provide statistical solutions to address the issues
- To modify the Sharpe performance based on Value at Risk models and compare results to the standard Sharpe performance model

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Approach

- Define and examine the leading institutional grade Australian property markets
- Compare and contrast the leading property markets, examining turning points and descriptive statistics
- Consider the issue of autocorrelation with the property data and apply statistical model to desmooth the data
- Apply Value at Risk approaches to the property data and analysis results

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Sharpe Ratio

The Sharpe ratio also known as the "reward to variability ratio" measure calculates the risk premium per unit of total risk (standard deviation):

$$S_i = \frac{R_i - RFR}{\sigma_i}$$

The Sharpe ratio is used to compare how asset classes are able to add value and take risk over and above a so-called risk-less investment return.

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Sharpe Ratio

Issues:

1. Defining the risk free rate
2. Negative returns
3. Non - normal data (eg skewed or kurtosis data)
4. Autocorrelation

Of these four assumptions the issues of normality and autocorrelation present the greatest challengers when assessing the performance of direct property against the alternative financial assets

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Main Australian Commercial Property Markets

Source: Maps of Australia 2009

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Australian States: Investment Grade Property

	Office		Retail		Industrial	
State	Area sqm	Value $b	Area sqm	Value $b	Area sqm	Value $b
New South Wales	6,097,000	48	5,497,000	34	11,903,000	19
Victoria	4,044,000	19	3,377,000	20	9,794,000	10
Queensland	2,508,000	14	4,380,000	22	7,630,000	10
Western Australia	1,339,000	10	2,175,000	10	3,924,000	1
Sub Total	13,988,000	91	15,429,000	86	33,251,000	40
Australian Total	16,079,000	99	17,474,000	96	37,525,000	45

Source: Higgins et al 2008

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Australian Property Market Data

IPD/PCA Property investment series provided total annual returns 1985-2007 (23 years)

Data index construction

- Prime Brisbane - commenced Dec 90. Before Brisbane CBD office
- Prime Perth - commenced Dec 90. Before Perth CBD office
- Melbourne Industrial extend selected
- Brisbane Industrial Dec 1994. Before Brisbane CBD secondary office
- Perth Industry - Australian Industrial less provided State Capitals before 1998

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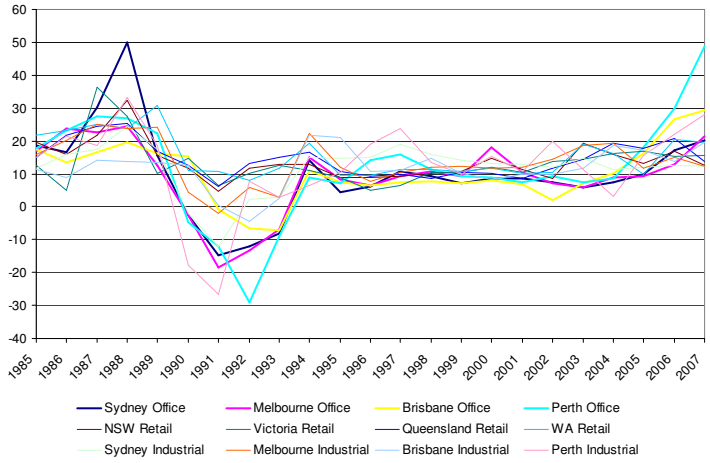
Australian Property Markets: Turning Points



Source: IPD/PCA Property Investor Digest 2008

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Return, Risk and Sharpe Ratio

	Asset Class	Mean	Rank	SD	Rank	SR	Rank
Prime Office	Sydney CBD	10.04	14	13.48	13	0.13	14
	Melbourne CBD	9.24	15	10.98	9	0.08	15
	Brisbane CBD	10.32	13	8.97	8	0.22	12
	Perth CBD	11.67	12	15.91	14	0.21	13
Retail	NSW	13.86	4	5.74	2	0.96	3
	Victoria	13.17	7	6.96	5	0.69	5
	Queensland	14.46	3	5.25	1	1.16	1
	WA	15.43	2	6.44	4	1.10	2
Industrial	Sydney	11.84	9	7.62	7	0.46	7
	Melbourne	13.54	5	7.06	6	0.73	4
	Brisbane	11.82	10	6.21	3	0.56	6
	Perth	12.28	8	13.25	12	0.30	10
All Ordinaries		15.57	1	17.56	15	0.41	9
A-REIT 300		13.46	6	12.05	11	0.42	8
10 year Bonds		11.69	11	11.40	10	0.29	11

Source: IPD/PCA Property Investor Digest 2008

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Skewness, Kurtosis and JB test of Normality

	Asset Class	Skew	Rank	Kurt	Rank	JB	Prob
Prime Office	Sydney CBD	0.82	10	2.86	1	6.19	0.05
	Melbourne CBD	-0.97	11	0.97	7	3.40	0.18
	Brisbane CBD	0.05	1	0.33	9	0.01	1.00
	Perth CBD	-0.33	5	1.70	5	1.53	0.47
Retail	NSW	1.55	13	4.03	4	16.34	0.00
	Victoria	2.01	15	5.33	8	28.69	0.00
	Queensland	0.60	7	-0.37	14	1.48	0.48
	WA	0.81	9	-0.43	15	2.55	0.28
Industrial	Sydney	-1.67	14	3.68	3	16.13	0.00
	Melbourne	-0.19	4	-0.27	12	0.32	0.85
	Brisbane	-0.77	8	1.19	6	2.45	0.29
	Perth	-1.50	12	3.15	2	12.35	0.00
All Ordinaries		0.11	2	-0.13	11	0.16	0.92
A-REIT 300		0.14	3	-0.29	13	0.29	0.87
10 year Bonds		-0.58	6	0.08	10	1.14	0.56

Source: IPD/PCA Property Investor Digest 2008

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Appraisal Based Property Data

Issues

- Unrealistically low standard deviation figures
- Skewed negative data
- Contrasting kurtosis readings

Appraisal data series based on historical transactional evidence and valuations may be less often than produced indices

Formula to De-smoothed data based on first order autocorrelation model

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Appraisal Based Property Data

First – order autocorrelation

	Asset Class	Raw data	Desmoothed data
Prime Office	Sydney CBD	0.62	0.22
	Melbourne CBD	0.70	0.30
	Brisbane CBD	0.71	0.28
	Perth CBD	0.75	0.43
Retail	NSW	0.46	0.02
	Victoria	0.25	0.02
	Queensland	0.68	0.19
	WA	0.51	-0.06
Industrial	Sydney	0.61	0.26
	Melbourne	0.46	0.06
	Brisbane	0.48	0.27
	Perth	0.49	0.19
All Ordinaries		-0.28	0.11
A-REIT 300		-0.53	-0.07
10 year Bonds		-0.15	0.04

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Return, Risk and Sharpe Ratio: de-smoothed data

	Asset Class	Mean	Rank	SD	Rank	SR	Rank
Prime Office	**Sydney CBD**	**10.16**	**14**	**27.64**	**2**	**0.07**	**14**
	Melbourne CBD	**9.71**	**15**	**25.97**	**3**	**0.05**	**15**
	Brisbane CBD	**11.59**	**13**	**21.71**	**5**	**0.15**	**13**
	Perth CBD	**15.68**	**2**	**42.21**	**1**	**0.17**	**12**
Retail	**NSW**	**13.61**	**6**	**9.26**	**13**	**0.57**	**3**
	Victoria	**13.21**	**8**	**8.98**	**14**	**0.54**	**5**
	Queensland	**14.33**	**4**	**12.09**	**8**	**0.49**	**6**
	WA	**15.34**	**3**	**11.14**	**10**	**0.63**	**2**
Industrial	**Sydney**	**11.88**	**11**	**15.51**	**6**	**0.23**	**10**
	Melbourne	**13.41**	**7**	**11.62**	**9**	**0.44**	**7**
	Brisbane	**12.14**	**10**	**10.46**	**11**	**0.36**	**8**
	Perth	**12.81**	**9**	**22.56**	**4**	**0.20**	**11**
All Ordinaries		**15.82**	**1**	**13.75**	**7**	**0.54**	**4**
A-REIT 300		**13.67**	**5**	**6.90**	**15**	**0.77**	**1**
10 year Bonds		**11.71**	**12**	**9.83**	**12**	**0.34**	**9**

Source: IPD/PCA Property Investor Digest 2008

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Skewness, Kurtosis and JB test of Normality: de-smoothed data

	Asset Class	Skew	Rank	Kurt	Rank	JB	Prob
Prime Office	Sydney CBD	0.51	9	1.42	6	1.61	0.45
	Melbourne CBD	-0.37	7	1.36	7	1.12	0.57
	Brisbane CBD	-0.10	3	1.07	9	0.38	0.83
	Perth CBD	-0.64	10	1.58	5	2.34	0.31
Retail	NSW	1.29	12	2.65	1	8.90	0.01
	Victoria	2.44	15	8.77	15	63.20	0.00
	Queensland	0.02	2	-0.96	14	0.98	0.61
	WA	0.00	1	0.03	11	0.05	0.98
Industrial	Sydney	-1.60	14	3.71	3	15.53	0.00
	Melbourne	-0.18	5	0.69	10	0.20	0.91
	Brisbane	0.11	4	1.93	4	1.62	0.44
	Perth	-1.32	13	2.50	2	8.74	0.01
All Ordinaries		0.74	11	1.22	8	2.32	0.31
A-REIT 300		0.33	6	-0.92	13	1.29	0.53
10 year Bonds		-0.42	8	-0.21	12	0.75	0.69

Source: IPD/PCA Property Investor Digest 2008

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Value at Risk and MVaR

$$\Im_{\text{normal}} = \mu + \mathbf{z}(\alpha)\sigma$$

$$\Im_{\mathbf{CF}}(\alpha) = \mu + \Omega(\alpha)\sigma$$

$$\Omega(\alpha) = \mathbf{z}(\alpha) + \frac{1}{6}(\mathbf{z}(\alpha)^2 - 1)\mathbf{S} + \frac{1}{24}(\mathbf{z}(\alpha)^3 - 3\mathbf{z}(\alpha))\mathbf{K}$$

$$-\frac{1}{36}(2\mathbf{z}(\alpha) - 5\mathbf{z}(\alpha))\mathbf{S}^2$$

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Value at Risk and MVaR

	Asset Class	VaR	Rank	MVaR	Rank
Prime Office	Sydney CBD	-35.31	14	-31.50	12
	Melbourne CBD	-33.00	13	-35.50	13
	Brisbane CBD	-24.12	11	-24.32	10
	Perth CBD	-53.76	15	-62.43	15
Retail	NSW	-1.62	3	0.16	2
	Victoria	-1.56	2	-1.06	3
	Queensland	-5.56	7	-5.72	7
	WA	-2.99	4	-2.99	4
Industrial	Sydney	-13.64	10	-24.95	11
	Melbourne	-5.70	8	-6.19	9
	Brisbane	-5.07	6	-4.35	5
	Perth	-24.30	12	-37.01	14
All Ordinaries		-6.79	9	-4.60	6
A-REIT 300		2.31	1	2.72	1
10 year Bonds		-4.47	5	-5.91	8

NB: Increases in MVaR due to negative skew

Decreases due to positive skew

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Sharpe, VaR Sharpe and Modified Sharpe Ratios

	Asset Class	Sharpe	Rank	VaRS	Rank	MSharpe	Rank
Prime Office	Sydney CBD	0.07	14	0.05	15	0.06	15
	Melbourne CBD	0.05	15	0.29	13	0.27	13
	Brisbane CBD	0.15	13	0.48	12	0.48	10
	Perth CBD	0.17	12	0.29	14	0.25	14
Retail	NSW	0.57	3	8.43	2	83.74	1
	Victoria	0.54	5	8.48	1	12.52	2
	Queensland	0.49	6	2.58	6	2.50	7
	WA	0.63	2	5.14	4	5.12	3
Industrial	Sydney	0.23	10	0.87	10	0.48	11
	Melbourne	0.44	7	2.35	8	2.17	8
	Brisbane	0.36	8	2.39	7	2.79	6
	Perth	0.20	11	0.53	11	0.35	12
All Ordinaries		0.54	4	2.33	9	3.44	5
A-REIT 300		0.77	1	5.92	3	5.02	4
10 year Bonds		0.34	9	2.62	5	1.98	9

Rank correlation Sharpe with VaR = 0.86

with MSharpe = 0.91

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Summary

- Australian property market performance can show relatively good returns and low risk compared to shares and bonds, which translate into good Sharpe performance readings
- Sharpe performance readings for property neglects two important features: non-normality and autocorrelation, both which underestimate the true risk of direct property
- Using a number of adjustments to the traditional Sharpe ratio, the non-normality and autocorrelation can be addressed, although the Sharpe performance ranking remain similar to the initial ranking