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The value-added role of sector-specific REITs in Australia

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ABSTRACT

Australian sector-specific REITs (A-REITs) have grown significantly in recent years. This raises the issue of whether sector-specific A-REITs play a value-added role compared with diversified A-REITs. Despite the rapid growth of sector-specific A-REITs, limited studies have been devoted to it. Hence, this study aims to compare sector-specific A-REITs with diversified A-REITs by assessing risk-return performance, portfolio diversification benefits and portfolio allocation strategies for sector-specific A-REITs over January 2000 – August 2018. The results suggest that sector-specific A-REITs play a value-added and strategic role in an Australian mixed-asset portfolio, with superior risk-adjusted returns, enhanced portfolio diversification benefits and increased portfolio returns compared with that for diversified A-REITs. This supports the notion of specialisation value in an A-REIT context. The practical listed property investment implications regarding the value-added and strategic role of sector-specific A-REITs are also identified.

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Sector-specific REITs; diversified REITs; risk-adjusted returns; portfolio diversification; mixed-asset portfolio; Australia

Introduction

Australian Real Estate Investment Trusts (A-REITs) are a mature and highly successful listed property investment vehicle in the Asia-Pacific and globally. Figure 1 depicts that A-REITs have grown from US$ 12.1 billion in January 2000 to US$ 131.1 billion in August 2018, an increase by 10.8 times since January 2000. With 46 REITs and the total assets of US$ 131.1 billion, A-REITs are ranked as #2 in the Asia-Pacific and #3 globally, only exceeded by the U.S. REITs (US-REITs) and Japan REITs (EPRA, 2018). A-REITs are also the largest owner of the commercial properties in Australia, ahead of unlisted wholesale property funds and unlisted retail property funds (ASX 200List, 2017). These have seen the significant stature of A-REITs in Australia and globally.

One of the prominent features of A-REITs is that sector-specific A-REITs (eg: Scentre Group (retail sector), Goodman Group (industrial sector), Dexus (office sector), Agricultural Land Trust (specialty sector)) play a major role in the A-REIT market compared with diversified A-REITs (eg: Stockland, GPT, Mirvac Group). Figure 2 shows that sector-specific A-REITs, on average, represented 90.9% of the size of A-REITs over the past 18 years, with an increase of 8.3 times since January 2000. This has seen sector-specific A-REITs as a dominant role in the A-REIT market compared with their diversified counterparts.

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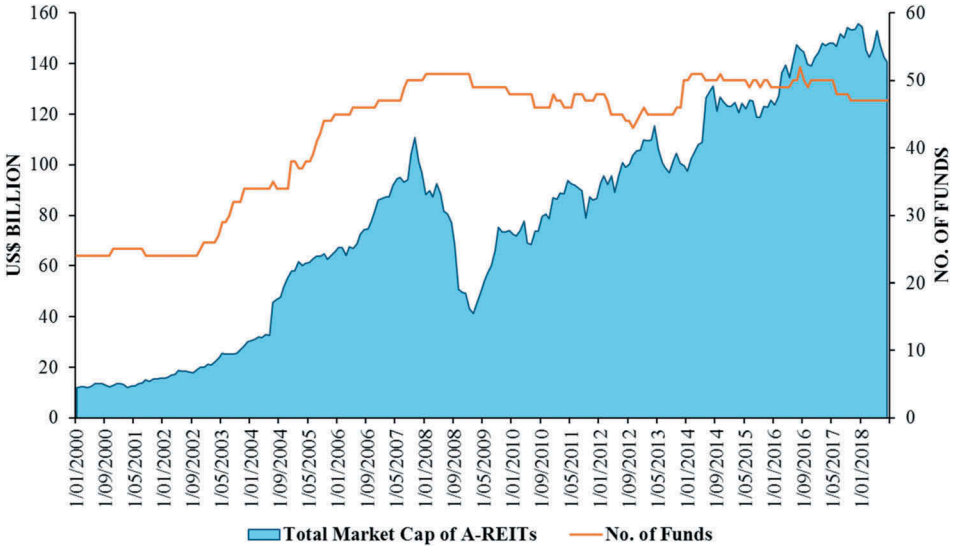

Figure 1. Growth in market capitalisation for A-REITs: July 2000 – August 2018.
Source: Authors' compilation from Thomson Reuters Eikon.

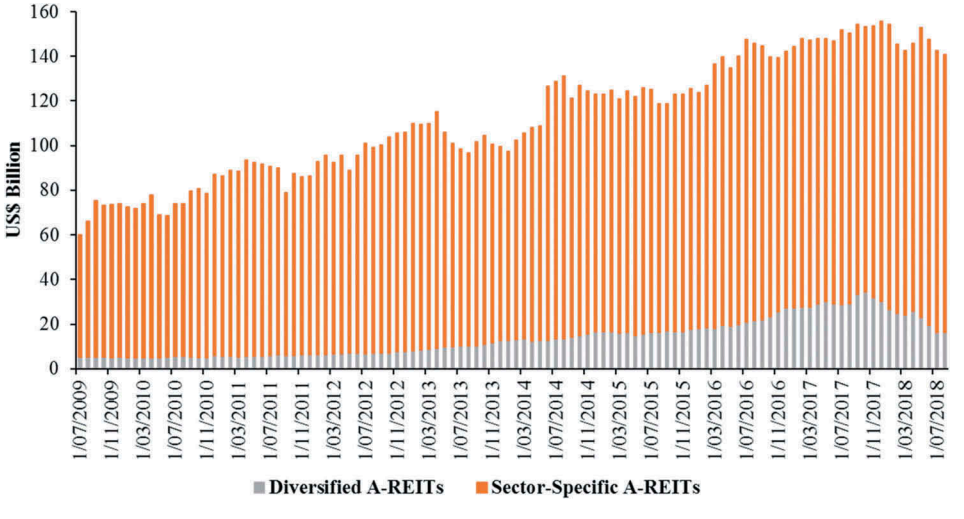

Figure 2. Growth in market capitalisation for sector-specific A-REITs: January 2000 – August 2018.
Source: Authors' compilation from Thomson Reuters Eikon.

The growth of sector-specific A-REITs is consistent with the increasing appetite of investors, particularly sophisticated institutional investors who intend to make sectoral diversification decisions by themselves (Capozza & Seguin, 1999). The management expertise could be more effective when a REIT is specialised by property types (Geltner, Miller, Clayton, & Eichholtz, 2014). This can be explained by the notion of specialisation value which has been documented in the mainstream finance literature. The notion of specialisation value posits that a single business segment trades at a premium than

diversified business segments (Graham, Lemmon, & Wolf, 2002; Lang & Stulz, 1994). This sees sector-specific A-REITs as an effective listed property investment vehicle for REIT investors who diversify on their own by investing in different sector-specific REIT stocks rather than diversified REITs.

Despite that specialisation offers a greater level of flexibility and emerges as the favourable REIT structure for investors in comparison to diversified REITs, it is not clear that sector-specific REITs offer enhanced risk-adjusted returns, increased portfolio diversification benefits and heightened portfolio returns. A number of US-REIT studies found some evidence countering the notion of specialisation value (Benefield, Anderson, & Zumpano, 2009; Ro & Ziobrowski, 2011). However, these studies mainly focus on REITs in the U.S. context and no international evidence is available to demonstrate the specialisation value on REITs. In addition, since the Global Financial Crisis (GFC) has had an adverse impact on the REIT market (Lee, Kuo, Lee, & Lee, 2016; Newell & Peng, 2009), it is essential to offer internationally empirical evidence on the specialisation value on REITs in a post-GFC context.

As A-REITs play a significant role in the global REIT context, numerous A-REIT studies have documented the risk-return profiles and investment strategies of a single A-REIT sector (Bohjalian, 2018; Lee, 2018; Newell & Lee, 2011; Newell & Peng, 2007a, 2007b; Peng & Newell, 2007). Nonetheless, no comparable study has examined the specialisation value of A-REITs. Therefore, this study will be the first analysis to demonstrate distinctions between all sector-specific A-REITs and diversified A-REITs, via gauging the investment performance of sector-specific A-REITs and diversified A-REITs over January 2000 – August 2018. It particularly highlights the risk-return performance, portfolio diversification benefits, and the role of sector-specific A-REITs in an Australian mixed-asset portfolio, benchmarked against diversified A-REITs and Australian major asset classes. This raises two research questions concerning sector-specific A-REITs:

RQ1: Do sector-specific A-REITs offer a superior risk-adjusted return compared with diversified A-REITs?

RQ2: What role do sector-specific A-REITs play in an Australian mixed-asset portfolio compared with diversified A-REITs?

By answering both research questions, this study contributes to the literature in several ways. Firstly, this is the first study to assess the value-added and strategic role of sector-specific A-REIT over January 2000 – August 2018, by using constructed sub-sector series[1]. Secondly, despite the significant role of sector-specific A-REITs in an Australian context, no study has been devoted to the specialisation value of A-REITs. This study is the first analysis to offer some international evidence on the notion of specialisation value. The findings are expected to assist international institutional investors, particularly Australian institutional investors, to make informed investment decision making regarding sector-specific A-REITs. Thirdly, unlike previous studies by taking sector-specific REITs as a whole that ignore the reality that different property sectors might have different property market cycles (Hoesli & Oikarinen, 2016; Hoesli, Oikarinen, & Serrano, 2015; Yavas & Yildirim, 2011), this study is the first to compare all sector-specific A-REITs with diversified A-REITs, and has particular value for property investors seeking REIT exposure in Australia. Lastly, previous studies did not consider the specialisation value in a REIT context in a post Global

Financial Crisis (GFC) context, this study contributes to the literature by offering more updated results of the specialisation value. These have significant implications for sector-specific A-REITs as the value-added and strategic property investment product, as well as the international evidence on the notion of specialisation value.

Significance of sector-specific A-REITs

The Australian property market has grown significantly in recent years in response to the increasing integration of the Australian property market and the Australian capital market. The size of the Australian property market was forecasted to grow from US$ 589 billion in 2016 to US$ 1.6 trillion in 2036 (PREI, 2017).

Australia is classified as a "highly transparent" property market. It is ranked as the most transparency property market in the Asia-Pacific and #2 globally; only exceeded by the U.K. globally (JLL, 2018). Hence, the Australian property market is seen as a highly accessible property channel for both Australian and international institutional investors, absorbing a substantial amount of capital flows. The Australian property transaction activities accounted for US$ 23.8 billion in 2017; being #3 in the Asia-Pacific and #7 globally. It contributed over 15.1% of property transaction volumes in the Asia-Pacific and 2.7% of the global property transactions respectively (RCA, 2017).

Specifically, over 45% of the size of the Australian Property Securities Fund (PSF) is managed by international property securities (e.g. Vanguard Investment Ltd., Franklin Templeton Investments, Renaissance Investment); accounting for US$ 9.4 billion. Amongst these international property securities, Vanguard Investment Ltd (#1, US$ 7.4 billion; 36% of the total assets of the Australian PSF) is the largest Property Security Fund Manager (PSM). It is followed by Franklin Templeton Investments (#5, US$ 1.3 billion; 6%) and Renaissance Investment (#6, US$ 0.7 billion; 3%) (PIR, 2017). These have seen the significance and stature of the Australian property market in the Asia-Pacific and globally.

The increasing alignment of the Australian property market and the Australian capital market has also seen the strong growth in market capitalisation for A-REITs. Currently, A-REITs have a market capitalisation of US$ 131.06 billion; comprising institutional-grade commercial properties in sector-specific portfolios (eg: Cromwell Property Group (office; US$ 2.2 billion), BWP Trust (retail; US$ 2.1 billion), Propertylink Group (industrial; US$ 0.6 billion), Asia Pacific Data Centre Group (specialty; US$ 0.2 billion)) and diversified portfolios (eg: Abacus Property Group (US$ 2.0 billion), Charter Hall Long Wale REIT (US$ 1.0 billion)) (ASX, 2018). It contributes over 32.1% of the Asia-Pacific REIT markets and 6.1% of the global REIT market; representing over 95.2% of the size of the Australian listed property market (EPRA, 2018). Additionally, it is the largest institutional owner of the commercial properties in Australia; ahead of unlisted wholesale property funds and unlisted retail property funds; being one of the major sectors on the Australian stock market (ASX 200List, 2017). As of December 2017, Scentre Group (#1, US$ 34.3 billion; 20% of the A-REIT market capitalisation) was the largest fund manager of A-REITs, followed by Westfield Corporation (#2, US$ 26.1 billion; 15%), Stockland (#3, US$ 17.4 billion; 10%), Vicinity Centres (#4, US$ 15.0 billion; 9%), Mirvac Group (#5, US$ 11.9 billion; 7%) (PIR, 2017). Furthermore, the Australian superannuation funds invest over 3% of its total assets in A-REITs (APRA, 2017). These have seen A-REITs

being the appetite for Australian and international institutional investors seeking high-quality commercial property exposure in Australia.

One of the main features of A-REITs is that sector-specific A-REITs play a prominent role in the A-REIT market. Table 1 presents that A-REITs invest in office (#4, US$ 18.4 billion; 14.1% of the size of A-REITs), retail (#1, US$ 48.2 billion; 36.8%), industrial (#3, US$ 21.0 billion; 16.1%), residential (#6, US$ 1.2 billion; 0.9%), specialty (#5, US$ 4.7 billion; 3.6%) and diversified sectors (#2, US$ 37.5 billion; 28.6%). Specifically, A-REITs comprise both sector-specific portfolios with 35 REITs (US$ 93.5 billion; 71.4% of the A-REIT market capitalisation) and diversified portfolios with 11 REITs (US$ 37.5 billion; 28.6%). This sees sector-specific A-REITs as a majority of the A-REIT market. The comparable evidence is also observed in the U.S. where sector-specific US-REITs represent over 81.2% of the size of US-REITs (US$ 837.9 billion) (NAREIT, 2018). This clearly reflects sector-specific REITs as the preferable REIT structure for investors in Australia and other leading global REIT markets (e.g. US-REITs).

To reinforce the major role of sector-specific A-REITs in the A-REIT market, Table 2 lists the leading A-REITs which own and manage over 882 commercial properties, with a market capitalisation of US$ 104.1 billion. Of the top 10 A-REITs, 6 are sector-specific A-REITs; including Scentre Group (office; #1, US$ 21.9 billion), Goodman Group (industrial; #2, US$ 19.3 billion), Dexus (office; #3, US$ 10.9 billion), Vicinity Group (retail; #4, US$ 10.7 billion), Unibail-Rodamco Westfield (retail; #8, US$ 6.4 billion) and Investa Office Fund (office; #10, US$ 3.2 billion). On the other hand, 4 are diversified A-REITs; including Stockland (#5, US$ 10.1 billion), GPT (#6, US$ 9.3 billion), Mirvac Group (#7, US$ 9.0 billion) and Charter Hall Group (#9, US$ 3.3 billion). This underpins the stronger institutional investor appetite for sector-specific A-REITs in comparison to diversified A-REITs.

Table 1. Profiles of sector-specific A-REITs: August 2018.

Sectors*	No. of funds	Market cap (US$ B)	% of A-REITs
Office	9	18.43	14.06%
Retail	11	48.19	36.77%
Industrial	4	21.03	16.05%
Residential	2	1.20	0.90%
Specialty	9	4.69	3.58%
Diversified	11	37.52	28.64%
Total	46	131.06	100.00%

Source: Authors' compilation/analysis from ASX (2018)
*Categorised by the GICS

Table 2. Profiles of leading A-REITs: August 2018.

Rank	A-REITs	Listed date	Property sector	No. of properties	Market cap (US$ B)
1	Scentre Group	Jun-2014	Retail	39	21.85
2	Goodman Group	Jun-1987	Industrial	161	19.27
3	Dexus	Oct-2004	Office	155	10.94
4	Vicinity Centres	Dec-2011	Retail	84	10.72
5	Stockland	Oct-1982	Diversified	197	10.05
6	GPT	Apr-971	Diversified	67	9.31
7	Mirvac Group	Jun-1999	Diversified	41	9.03
8	Unibail-Rodamco Westfield	Jan-1975	Retail	51	6.42
9	Charter Hall Group	Nov-1996	Diversified	207	3.32
10	Investa Office Fund	Feb-1992	Office	35	3.19
	Total			882	104.10

Source: Authors' compilation from ASX (2018), Thomson Reuters DataStream and various companies' websites

Overall, all of the abovementioned details concerning sector-specific A-REITs strengthen the significance of sector-specific A-REITs in an Australian context, and highlight the favorable structure of sector-specific A-REITs for A-REIT investors at an Australian and global level. The strong institutional investor appetite for sector-specific A-REITs is also consistent with the notion of specialisation value in the mainstream finance literature which will be discussed in the following section.

Literature review

The significance of A-REITs has attracted considerable attention into its investment strategies (Lee, 2018; Newell, 2010; Newell & Lee, 2012; Newell & Tan, 2005; Reddy, 2012; Reddy, Higgins, & Wakefield, 2014; Reddy, Higgins, Wist, & Garimort, 2013). A-REITs have been seen as a stable investment sector and a highly liquid listed property investment hub for Australian fund managers in a post-GFC context (Newell & Lee, 2012; Reddy, 2012). It also delivered an enhanced portfolio return in a multi-asset portfolio (Reddy et al., 2013). Besides, the magnitude of the capital raised by A-REITs significantly increased in a post-GFC context due to its strong recovery from the GFC (Dimovski & O'Neill, 2012). Moreover, some studies examined the risk of A-REITs. For instance, Lee, Robinson, and Reed (2008b) examined and identified the systematic risk of A-REITs. Also, Lee (2008) and Yong and Pham (2015) examined the linkages between A-REITs and direct property. Further, Lee (2009) and Lee et al. (2016) assessed the volatility transmission of A-REITs and Australian major asset classes. However, the aforementioned studies did not consider the sector-specific effect on these relevant A-REIT issues.

At a single-sector level, the risk-return profiles and investment strategies of office A-REITs (Bohjalian, 2018), retail A-REITs (Newell & Peng, 2007a), storage A-REITs (Bohjalian, 2018), lodging A-REITs (Newell & Peng, 2007b), infrastructure A-REITs (Newell & Lee, 2011; Peng & Newell, 2007) have been widely assessed in recent years. However, no comparable study has demonstrated distinctions between all sector-specific A-REITs and diversified A-REITs on a risk-return basis.

This issue has stemmed from the specialisation value in the mainstream finance literature where it asserts that a single business segment trades at a premium than diversified business segments (Graham et al., 2002; Lang & Stulz, 1994). Capozza and Seguin (1999) found some empirical evidence to support the specialised benefits from REITs. On the other hand, Benefield et al. (2009) and Ro and Ziobrowski (2011) examined the specialisation value by comparing specialized US-REITs, which is a hybrid component of all sector-specific US-REITs, with diversified US-REITs on a risk-return basis prior to the GFC. However, no comparable study has offered the international evidence on the specialisation value, and has updated the results of this issue in respect to the significant impact of the GFC on the global REIT markets (Lee et al., 2016; Newell & Peng, 2009). More importantly, this issue has not been devoted to the A-REIT market. Hence, this study is the first analysis to exhibit the empirical distinctions between all sector-specific A-REITs and diversified A-REITs, informing institutional investors of the value-added and strategic role of sector-specific REITs in an Australian mixed-asset portfolio.

In brief, this section issues the notion of specialisation value and its validation in US-REITs. As no comparable study has yet placed this issue on the A-REIT market, this

study is the first paper to establish the validation of distinctions between all sector-specific REITs and diversified REITs on a risk-return basis in an Australian context. The risk-adjusted investment performance of sector-specific A-REITs benchmarked against diversified A-REITs, stocks and bonds in Australia will be assessed in the following sections, in order to advocate institutional investors enhancing a level of sector-specific A-REITs in their portfolios.

Methodologies

Data sources

To assess the risk-return profiles of sector-specific A-REITs benchmarked against diversified A-REITs, stocks and bonds in Australia, this study includes sector-specific A-REITs and diversified A-REITs categorised by the Global Industry Classification Standard (GICS). The market value-weighted free float-adjusted sector-specific A-REIT and diversified A-REIT total return indices were constructed by this study (see Table 3). Monthly total returns were assessed over January 2000 – August 2018 for sector-specific A-REITs and diversified A-REITs (see Figure 3), as specialty A-REITs could only be traced back to January 2000. Direct property is not considered in this study since the monthly series data of direct property is not available for each property sector analyses and the aim of this study is to demonstrate the specialisation value of A-REITs. For a comparison with Australian major asset classes, the following performance series were employed:

- **Stocks**: S&P/ASX 300;
- **Bonds**: Australian commonwealth government bond yield 10-years;
- **Cash**: Australian 3-months interbank rate, as the risk-free rate.

Statistical analyses

Performance analysis

To examine the risk-return profiles of sub-sector A-REITs, annualised monthly returns, risk and risk-adjusted returns via the Sharpe ratio for sector-specific A-REITs, diversified A-REITs and Australian major asset classes (stocks and bonds) were evaluated over the full-time study period. The portfolio diversification benefits between one asset class and others were assessed by using correlation coefficient analysis.

Comparisons based on risk-adjusted performance

To shed more lights on the risk-adjusted performance comparison between sector-specific A-REITs and diversified A-REITs, the Jobson and Korkie (1981) pairwise test was employed to compare the risk-adjusted performance (the Sharpe ratio) for sector-specific A-REITs with that for diversified A-REITs. The pairwise test hypothesises that there is no difference between the ratios of sector-specific A-REITs and the ratio of diversified A-REITs. The test statistics are the sample differences $\left(\hat{S}h_s - \hat{S}h_d\right)$. Further, the transformed difference for the Sharpe measurement is:

Table 3. List of active and delisted A-REITs*: January 2000 – August 2018.

Active A-REITs		Delisted A-REITs	
1	Abacus Property Group	1	APN European Retail Property Group
2	Agricultural Land Trust	2	Astro Japan Property Group
3	Aims Property Securities Fund	3	Australian Industrial REIT
4	ALE Property Group	4	Australand Property Group
5	Ante Real Estate Trust	5	Brookfield Australian Opportunities Fund
6	Arena REIT	6	Brookfield Prime Property Fund
7	Asia Pacific Data Centre Group	7	Centro Retail Group
8	Aspen Group	8	Centuria Urban REIT
9	Aventus Retail Property Fund	9	Challenger Wine Trust
10	Australian Unity Office Fund	10	Charter Hall Office REIT
11	Blackwall Property Trust	11	Commonwealth Property Office Fund
12	BWP Trust	12	Compass Hotel Group
13	Carindale Property Trust	13	Coonawarra Australia Property Trust
14	Centuria Industrial REIT	14	EDT Retail Trust
15	Charter Hall Group	15	Esplanade Property Fund
16	Charter Hall Long Wale REIT	16	Galileo Japan Trust
17	Charter Hall Retail REIT	17	Generation Healthcare REIT
18	Centuria Metropolitan REIT	18	GPT Metro Office Fund
19	Convenience Retail REIT	19	ING Industrial Fund
20	Cromwell Property Group	20	Intoll Group
21	Dexus	21	Living And Leisure Australia Group
22	Elanor Retail Property Fund	22	Mirvac Industrial Trust
23	Folkestone Education Trust	23	Multiplex European Property Fund
24	Garda Diversified Property Fund	24	Novion Property Group
25	GDI Property Group	25	Prime Retirement and Age Care Property Trust
26	Goodman Group	26	Rabinov Property Trust
27	GPT Group	27	Record Realty
28	Growthpoint Properties Australia	28	Rubicon America Trust
29	Hotel Property Investments	29	Rubicon Europe Trust Group
30	Industria REIT	30	Tishman Speyer Office Fund
31	Ingenia Communities Group	31	Transurban Group
32	Investa Office Fund	32	Unity Pacific Group
33	Lantern Hotel Group	33	Westfield America Trust
34	Mirvac Group	34	Westfield Corporation
35	National Storage REIT	35	Westfield Trust
36	Propertylink Group	36	Westpac Office Trust
37	RNY Property Trust		
38	Rural Funds Group		
39	Scentre Group		
40	Shopping Centres Australasia Property Group		
41	Stockland		
42	Vicinity Centres		
43	Viva Energy REIT		
44	Unibail-Rodamco-Westfield		
45	US Masters Residential Property Fund		
46	360 Capital Group		

Source: Authors' compilation/analysis from Thomson Reuters Eikon
*Categorised by the GICS

$$\hat{S}h_{in} = \frac{\sigma_d \overline{R_s} - \sigma_s \overline{R_d}}{4T} \tag{1}$$

The Jobson and Korkie's Z-test is computed as follows:

$$Z_i = \frac{\hat{S}h_{in}}{\sqrt{\theta}} \tag{2}$$

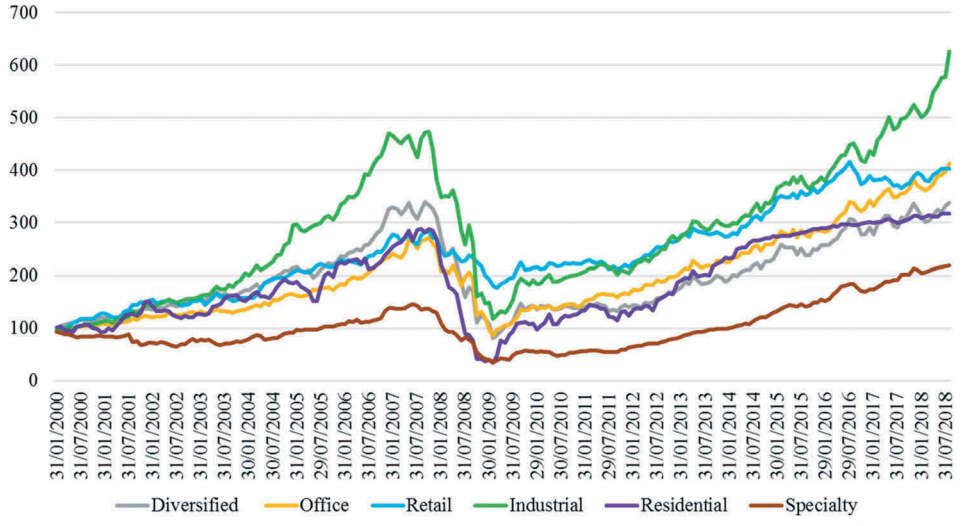

Figure 3. Sub-sector A-REIT series performance: January 2000 – August 2018 (100 = January 2000).
Source: Authors' compilation/analysis.

Where

$$\theta = \frac{1}{T}\left\{2{\sigma_i}^2{\sigma_m}^2 - 2\sigma_i\sigma_m\sigma_{i,m} + \frac{1}{2}\overline{R_i}^2{\sigma_m}^2 + \frac{1}{2}\overline{R_m}^2{\sigma_i}^2 - \frac{\overline{R_iR_m}}{2\sigma_i\sigma_m}\left({\sigma_{i,m}}^2 + {\sigma_i}^2{\sigma_m}^2\right)\right\} \quad (3)$$

Where $\overline{R_s}$ is the mean return premium (above the risk-free rate) for sector-specific A-REITs. $\overline{R_d}$ is the mean return premium (above the risk-free rate) for diversified A-REITs, as the benchmark. σ_s is the standard deviation of returns for sector-specific A-REITs. σ_d is the standard deviation of returns for diversified A-REITs. $\sigma_{s,d}$ is the covariance of returns between sector-specific A-REITs and diversified A-REITs. T is the total number of observations.

Portfolio analysis

The analysis was expanded by assessing the impact of adding sector-specific A-REITs in an Australian mixed-asset portfolio. Hence, the efficient frontiers and asset allocation diagram were employed to gauge the role of sector-specific A-REITs, diversified A-REITs and major asset classes (stocks and bonds) in an Australian mixed-asset portfolio. The portfolio analysis provided further evidence on the value-added role of sector-specific A-REITs in an Australian mixed-asset portfolio to listed property investors, particularly Australian and international institutional investors.

Results and discussion

Risk-adjusted returns

Table 4 compares annual returns, annual risk and risk-adjusted performance for sector-specific A-REITs with diversified A-REITs and Australian major asset classes (stocks and

Table 4. Sector-specific A-REIT risk-adjusted return analysis[a]: January 2000 – August 2018.

Asset class	Average annual return	Annual risk	Sharpe ratio	Rank*
Office	7.90%	15.62%	0.23	4
Retail	7.74%	10.20%	0.33	2
Industrial	10.33%	17.67%	0.34	1
Residential	6.40%	28.74%	0.07	6
Specialty	4.30%	16.34%	−0.01	8
Diversified	6.76%	18.21%	0.13	5
Stocks	8.30%	12.46%	0.32	3
Bonds	4.65%	4.63%	0.06	7

Source: Authors' compilation/analysis
[a]Local currency; *Measured by the Sharpe ratio

bonds) over January 2000 – August 2018. Industrial A-REITs (an average annual return = 10.33%) offered the highest average annual return, followed by office (7.90%), retail (7.74%), residential (6.40) and specialty A-REITs (4.30%), outperforming diversified A-REITs (6.76%), stocks (8.30%) and bonds (4.65%). Amongst sub-sector A-REITs, residential and specialty A-REITs were the only two sectors posting lower average annual returns than diversified A-REITs in the full-time study timeframe. The risk levels for retail (10.20%), office (15.62%) and industrial A-REITs (17.67%) were comparably lower than that for diversified A-REITs (18.21%). This resulted in industrial (the Sharpe ratio = 0.34), retail (0.33) and office (0.23) A-REITs outperforming diversified A-REITs (0.13) on a risk-return basis. In contrast, the inferior risk-adjusted performance of residential (0.07) and specialty A-REITs (−0.01) could be explained by their lesser average annual returns and comparably higher volatilities, at 28.74% and 16.34% respectively. Compared with Australian major asset classes, all sector-specific A-REITs offered superior risk-return performance than bonds (0.06), except for specialty A-REITs. In addition, industrial and retail A-REITs were the only two assets outperforming stocks (0.32) on a risk-return basis.

This provides strong evidence that sector-specific A-REITs generally delivered superior risk-adjusted performance than diversified A-REITs over the 18-year period. Precisely, the findings reveal that the traditional A-REIT sector (eg: office, retail, industrial A-REITs) significantly outperformed diversified A-REITs on a risk-return basis over the full-time study period, whilst the non-traditional A-REIT sector (eg: residential, specialty A-REITs) delivered inferior risk-return performance than their diversified counterparts. The results also support the notion of specialisation value of A-REITs, indicating that sector-specific A-REITs generally outperformed diversified A-REITs on a risk-return basis. Importantly, the findings can also be used to explain the rapid growth of sector-specific A-REITs in recent years, reflecting the favourable REIT structure of sector-specific A-REITs for A-REIT investors in Australia and globally.

Given that our results offer some empirical evidence to support the notion of specialisation value, it is contrary to the findings of Benefield et al. (2009) and Ro and Ziobrowski (2011) based on the US-REIT database. The difference can be attributed to the different sample being chosen, highlighting the significance of the international evidence on this issue. Additionally, the divergent empirical evidence between US-REITs and A-REITs can also be explained by different study periods, as our study offers updated results by using the more comprehensive dataset which covers the major economic events such as the GFC, whilst previous studies did not consider the GFC. Specifically, given a significant impact of the GFC on REITs (Lee et al., 2016; Newell &

Peng, 2009), it is not surprising to find distinct results in this study from that for the previous studies. Lastly, the divergence may also be attributed to the bias of seeing specialised REITs as a whole of each sector-specific REITs. By doing so, the findings could not reflect the distinct property market cycles for each property sectors (Hoesli & Oikarinen, 2016; Hoesli et al., 2015; Yavas & Yildirim, 2011).

Overall, sector-specific A-REITs, in general, delivered superior risk-return performance than diversified A-REITs. In addition, the results clearly support the presence of specialisation value of A-REITs. Importantly, the empirical evidence somewhat explains the growth of sector-specific A-REITs in recent years.

Diversification benefits

Table 5 presents the sub-sector A-REIT inter-asset correlation analysis over January 2000 – August 2018. Sector-specific A-REITs (average $r = 0.54$) and diversified A-REITs ($r = 0.58$) were significantly and positively correlated with stocks. Specifically, retail ($r = 0.44$), specialty ($r = 0.50$) and residential A-REITs ($r = 0.54$) offered superior portfolio diversification benefits with stocks than diversified A-REITs. The two exceptions are office ($r = 0.60$) and industrial A-REITs ($r = 0.60$). In addition, sector-specific A-REITs (average $r = -0.07$) and diversified A-REITs ($r = -0.06$) were negatively correlated with bonds, except for retail A-REITs ($r = 0.03$). In particular, specialty A-REITs ($r = -0.20$) were the only sub-sector A-REITs being significantly and negatively correlated with bonds. Precisely, specialty ($r = -0.20$), residential ($r = -0.08$) and industrial A-REITs ($r = -0.06$) delivered stronger portfolio diversification benefits with bonds than those provided by diversified A-REITs. However, office ($r = -0.04$) and retail A-REITs ($r = 0.03$) are the two exceptions.

In the context of an inter-property investment strategy, diversification within sector-specific A-REITs and diversified A-REITs (average $r = 0.64$) was not desirable. This can be explained by the fact that diversified REITs comprise a property portfolio with multiple property sectors[2]. However, the inter-asset correlations vary over time[3]. Diversification within sector-specific A-REITs and diversified A-REITs (average r = 0.42) was stronger during the pre-GFC period than that in a post-GFC context (average r = 0.63). On the contrary, diversification within various types of sector-specific A-REITs (average $r = 0.48$) was attractive for investors. Importantly, retail A-REITs provided lower correlation coefficient with the other sector-specific A-REITs. This highlights that a sector-specific A-REIT investment strategy could deliver more effective portfolio diversification benefits for Australian listed property investors.

Table 5. Sector-specific A-REIT correlations analysis: January 2000 – August 2018.

	Stocks	Bonds	Diversified	Office	Retail	Industrial	Residential	Specialty
Stocks	1.00							
Bonds	−0.05	1.00						
Diversified	0.58*	−0.06	1.00					
Office	0.60*	−0.04	0.77*	1.00				
Retail	0.44*	0.03	0.58*	0.53*	1.00			
Industrial	0.60*	−0.06	0.79*	0.73*	0.50*	1.00		
Residential	0.54*	−0.08	0.58*	0.47*	0.27*	0.58*	1.00	
Specialty	0.50*	−0.20*	0.47*	0.52*	0.24*	0.50*	0.48*	1.00

Source: Authors' compilation/analysis
*Significant correlation (p < 10%)

The results[4] are generally consistent with the findings of previous studies which found that a sectoral diversification strategy could offer enhanced portfolio diversification benefits for institutional investors (Fisher & Liang, 2000; Lee, 2001; Leone & Ravishankar, 2018; Newell & Tan, 2003). Furthermore, the results strengthen the notion of specialisation value of A-REITs. These are also in line with the finding of an early study in the U.S. (Capozza & Seguin, 1999) which indicated that sector-specific A-REITs generally outperformed their diversified counterparts on portfolio diversification benefits, and implied that institutional investors prefer to control their portfolio diversifications rather than leaving it to REITs which is diversified.

Overall, sector-specific A-REITs provided stronger portfolio diversification benefits with both stocks and bonds over the full-time study timeframe than that for diversified A-REITs. This indicates sector-specific A-REITs as a compelling Australian investment asset, with property investment performance and being complementary to both stocks and bonds in an Australian mixed-asset portfolio.

Different risk measures[5]

Acknowledging the availability of different risk measures, the robustness of different risk measures was assessed in this section. Specifically, this study considered our baseline results with beta and downside risk as alternative risk measures.

Beta has been employed as the measure of the systematic risk in order to capture the co-movement of an asset with the entire stock market (Sharpe, Robichek, & Cohn, 1974). Specifically, beta allows as to observe how A-REITs could co-move with returns of the market portfolio. Further, downside risk was also employed as it is a superior risk measure compared with the standard deviation. More specifically, it is consistent with investors' risk perception and does not require an assumption of the normal distribution (Lee, Reed, & Robinson, 2007; Lee, Robinson, & Reed, 2008a; Lee et al., 2008b).

Further, we also assessed the robustness of our baseline results with alternative risk-adjusted returns, including the Treynor ratio and Sortino ratio. For the Treynor ratio, it was used to estimate the risk-adjusted performance of an asset by comparing its expected excess return to its expected systematic market risk (beta). In addition, the Sortino ratio was also employed to capture downside deviation rather than standard deviation which comprises both downside and upside volatilities. All of these would allow investors to have a complete understanding of the risk-adjusted performance of an asset (Lee et al., 2008a, 2008b).

Panel A of Table 6 shows betas for sector-specific A-REITs and diversified A-REITs over the full study timeframe. Residential (*beta* = 0.39), retail (0.44) and specialty A-REITs (0.48) presented a lower beta than that for diversified A-REITs (0.54), whilst industrial (0.57) and office A-REITs (0.58) had a higher beta. These suggest that sector-specific A-REITs, in general, are not highly co-move with the broader stock market. Further, residential A-REITs have the highest diversification potential with the market portfolio. In short, the baseline results of sector-specific A-REITs are robust. This strengthens that sector-specific A-REITs generally offered stronger portfolio diversification benefits with stocks than that for diversified A-REITs over the full-time study period.

Furthermore, Panel B of Table 6 depicts the Treynor ratio and Sortino ratio for sector-specific A-REITs, diversified A-REITs and Australian major asset classes. Specifically,

Table 6. Alternative risk and risk-adjusted measures for sector-specific A-REITs: January 2000 – August 2018.

	Office	Retail	Industrial	Residential	Specialty	Diversified	Stocks	Bonds
Panel A: risk								
Beta	0.58	0.44	0.57	0.39	0.48	0.54	0.9	−0.02
Downside risk	12.86%	7.35%	14.31%	18.45%	12.59%	14.61%	9.51%	3.59%
Panel B: risk-adjusted performance								
Treynor ratio	0.06	0.08	0.10	0.05	−0.00	0.04	0.04	2.23
*Rank**	*4*	*3*	*2*	*5*	*8*	*6*	*7*	*1*
Sortino ratio	0.27	0.46	0.42	0.11	−0.01	0.16	0.41	−1.22
*Rank***	*4*	*1*	*2*	*6*	*7*	*5*	*3*	*8*

Source: Authors' compilation/analysis
*Measured by the Treynor ratio; **Measured by the Sortino ratio

industrial (the Treynor ratio = 0.10; the Sortino ratio = 0.42), retail (0.08; 0.46) and office A-REITs (0.06; 0.27) delivered superior risk-adjusted performance than that for diversified A-REITs (0.04; 0.16), except for residential (0.05; 0.11) and specialty A-REITs (−0.00; −0.01). The results of the Treynor ratio and Sortino ratio are fairly consistent with the baseline results, as well as the Sharpe ratio. This reinforces that sector-specific A-REITs generally offered superior risk-adjusted performance than diversified A-REITs over the full-time study period.

In brief, our results are robust to different risk measures. This strongly implies the stronger risk-adjusted investment performance of sector-specific A-REITs compared with their diversified counterparts.

Comparison results

While the preceding sections have shown that sector-specific A-REITs generally offered enhanced risk-adjusted returns compared with their diversified counterparts, this is still unclear that whether the differential risk-adjusted performance of sector-specific A-REITs and diversified A-REITs are statistically and significantly different. To provide a fuller understanding of the differential risk-adjusted performance between sector-specific A-REITs and diversified A-REITs, the Jobson and Korkie pairwise test was undertaken. The results are depicted in Table 7. As expected, the null hypothesis was rejected since all sector-specific A-REITs are statistically significant at least at the 1% level over the full-time study period. This indicates that there were significant differences in the Sharpe ratio between each sector-specific A-REITs and diversified A-REITs.

Table 7. Comparison[a] between sector-specific A-REITs and diversified A-REITs on risk-adjusted performance: January 2000 – August 2018.

Portfolio	Office and Diversified	Retail and Diversified
Z-test	34.10***	36.37***
Portfolio	Industrial and Diversified	Residential and Diversified
Z-test	51.53***	−20.26***
Portfolio	Specialty and Diversified	
Z-test	−45.55***	

Source: Authors' compilation/analysis
[a]Tests are based on a variance framework by the Jobson and Korkie (1981) pairwise test; *Significant at 10% level; **Significant at 5% level; ***Significant at 1% level

Specifically, office (Z value = 34.10), retail (36.37) and industrial A-REITs (51.53) markedly outperformed diversified A-REITs, as the Jobson and Korkie (1981) statistics of these three sectors are positively and statistically significant at the 1% level. On the other hand, residential (−20.26) and specialty A-REITs (−45.55) offered inferior risk-adjusted performance than diversified A-REITs. It was evident by the Jobson and Korkie (1981) statistics of these two sectors being negatively and statistically significant at the 1% level.

In short, this implies sector-specific A-REITs as a distinct investment asset from diversified A-REITs on a risk-return basis. Particularly, the results provide further insights into the existence of specialisation value of A-REITs to investors seeking listed property exposure in Australia.

Sector-specific A-REITs in an Australian mixed-asset portfolio

The stronger risk-adjusted performance and portfolio diversification benefits of sector-specific A-REITs compared with diversified A-REITs indicates the potential for sector-specific A-REITs playing a greater role in an Australian mixed-asset portfolio in comparison to their diversified counterparts. To gauge the value-added role of sector-specific A-REITs in an Australian mixed-asset portfolio, four portfolio allocation scenarios were utilised in this section. The first scenario is an optimal framework comprising sector-specific A-REITs, diversified A-REITs and Australian major asset classes (stocks and bonds), and assessing the role of sector-specific A-REITs in an Australian mixed-asset portfolio over January 2000 – August 2018. The second scenario aims to demonstrate the practical total property allocation in institutional investors' holdings, by constraining the total allocation of the property asset class (sector-specific A-REITs and diversified A-REITs) upper-bound capped at 20% over the 18-year timeframe. To reinforce the value-added role of sector-specific A-REITs in an Australian mixed-asset portfolio, two robustness checks were undertaken. Firstly, this study employed a constrained asset allocation analysis over the sub-period timeframes[6], including both the pre-GFC and post-GFC timeframes. Secondly, as previous studies adopted specialised REITs, a component of all sector-specific REITs, to examine the specialisation hypothesis (Benefield et al., 2009; Ro & Ziobrowski, 2011), this paper established the specialised composition comprising all sector-specific A-REITs, and compared this hybrid component with diversified A-REITs over the full-time study period.

First scenario: an optimal portfolio analysis over January 2000 – August 2018

Figure 4 presents the efficient frontiers and asset allocation diagram for an optimal mixed-asset portfolio for sector-specific A-REITs, diversified A-REITs, stocks and bonds over January 2000 – August 2018. Efficient frontiers with the inclusion of sector-specific A-REITs, particularly industrial and retail A-REITs, significantly outperformed the financial asset-only portfolio (stocks and bonds). However, the addition of diversified A-REITs provided no marked upward shift of the efficient frontier. This indicates that sector-specific A-REIT channels not only delivered substantial increment of the efficient frontiers, but also allowed for a wider risk-return spectrum, particularly for residential A-REITs. This implies sector-specific A-REITs as an important component for both risk-averse investors, as well as investors seeking greater portfolio returns over the past 18 years.

For an optimal asset allocation diagram, sector-specific A-REITs (an average allocation = 42.8%) configured over the entire risk-return spectrum, lessening bonds (18.4%) in

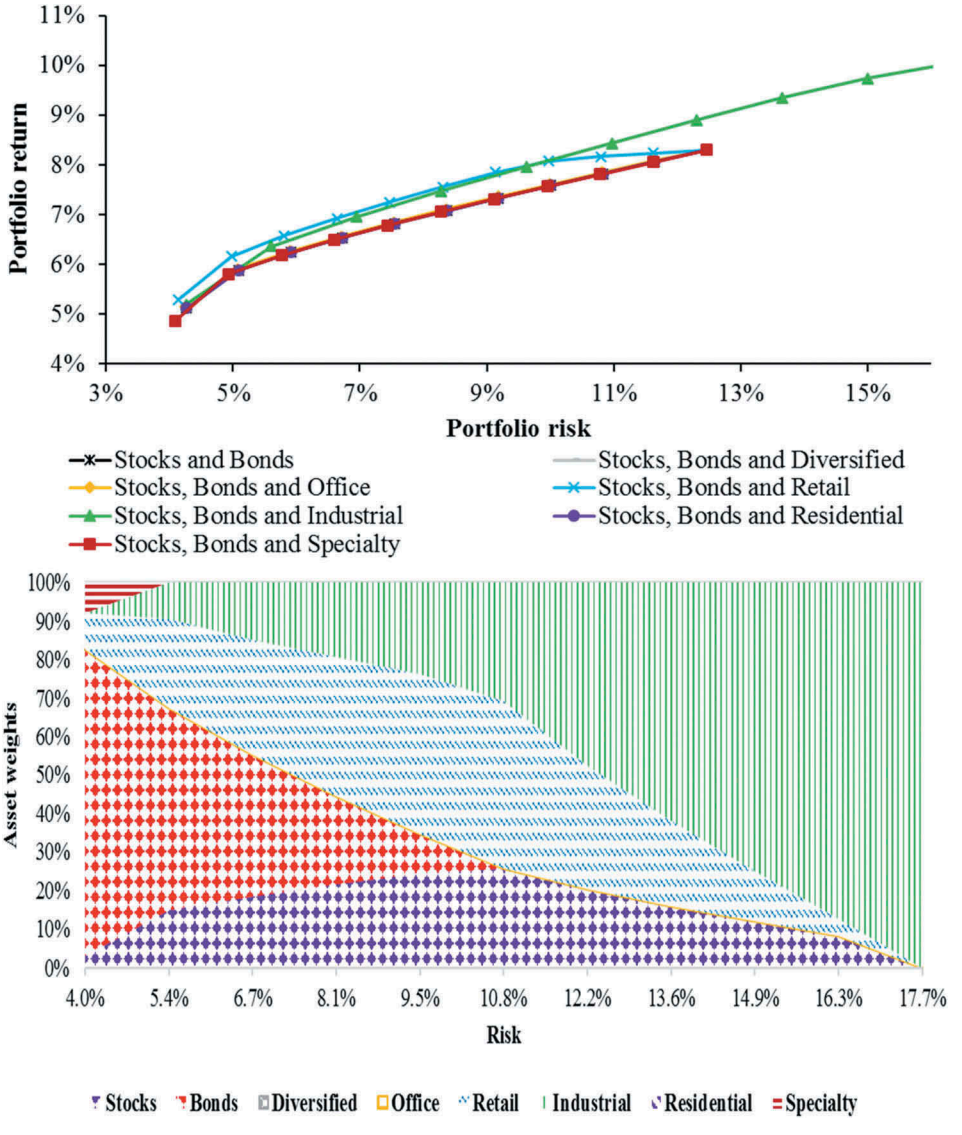

Figure 4. Optimal sector-specific A-REIT and diversified A-REIT asset allocation diagram: January 2000 – August 2018.

Source: Authors' compilation/analysis.

the lower half of the risk spectrum and stocks (14.9%) in the upper half of the risk-return spectrum respectively. Specifically, the greater risk-adjusted return of industrial A-REITs saw it co-existing with specialty A-REITs (0.7%), retail A-REITs (23.2%), stocks and bonds, gradually taking over specialty A-REITs, retail A-REITs, stocks and bonds as the risk level surged. However, diversified A-REITs played no role across the whole risk-return spectrum over the 18-year timeframe. This provides strong evidence that sector-specific A-REITs were a more significant component delivering higher portfolio returns in an optimal mixed-asset portfolio compared with their diversified counterparts over the full-time study period.

Second scenario: constrained portfolio analysis over January 2000 – August 2018

To avoid the over-exposure of the property asset class in a mixed-asset portfolio, a constrained asset allocation analysis was employed in this scenario. This scenario used an upper-bound constraint of 20% for the property asset class (sector-specific A-REITs and diversified A-REITs). It reflects the actual property allocation in institutional investors' holdings. Allocation in stocks and bonds were not constrained in this scenario, in order to match with the actual allocation of the major asset classes in institutional investor portfolio holdings

Figure 5 shows the constrained asset allocation of sector-specific A-REITs and diversified A-REITs over January 2000 – August 2018. Industrial (an average allocation = 12.9%) and retail A-REITs (6.2%) dominantly featured across the full risk-return spectrum within the ambit of the 20% capped allocation to the property asset class, while stocks (46.7%) and bonds (33.5%) have a more active role in shaping the capped allocation of a mixed-asset portfolio. Precisely, industrial A-REITs increased their role in the upper half of the risk-return spectrum, complementing retail A-REITs (6.2%) in the lower half of the risk-return spectrum. In addition, specialty A-REITs (0.7%) only played a negligible role at the beginning of the risk-return spectrum, whilst diversified A-REITs found no role in constrained portfolio compositions.

Based on the abovementioned portfolio results, these inform Australian and international A-REIT investors of several portfolio investment strategies for sector-specific A-REITs. Firstly, the ratio of industrial A-REITs increased in the upper half of an optimal and constrained portfolio composition respectively. This strongly indicates industrial A-REITs as a high-risk investment option for institutional investors. Secondly, given that investor's risk is a key determinant of the optimal mixed-asset allocation, particularly when the total REIT allocation is constrained to reflect the actual property allocation in institutional investors' holdings, sector-specific A-REITs could be the most appropriate form of

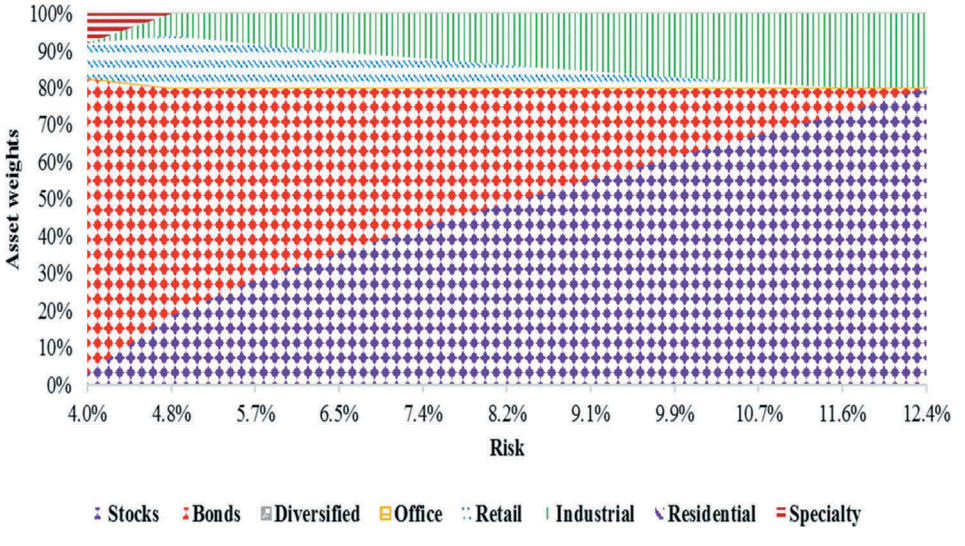

Figure 5. Constrained sector-specific A-REIT and diversified A-REIT asset allocation diagram: January 2000 – August 2018.

Source: Authors' compilation/analysis.

sub-sector A-REITs for investors with conservative to moderate risk-return requirements, as the large ratio of sector-specific A-REITs (eg: retail, industrial, specialty A-REITs) entered in the lower half of the risk-return spectrum. Lastly, as a major composition for sector-specific A-REITs was observed in an optimal and constrained portfolio respectively, accessibility to sector-specific listed property investment channels could alter the dynamics of listed property allocation in an Australian mixed-asset portfolio.

Overall, sector-specific A-REITs offered superior portfolio returns than diversified A-REITs. This strengthens the value-added role of sector-specific A-REITs in an Australian mixed-asset portfolio compared with diversified A-REITs. More importantly, this supports the notion of specialisation value in the A-REIT market.

Robustness checks

Sub-period constrained portfolio analysis. To reinforce the value-added role of sector-specific A-REITs in an Australian mixed-asset portfolio, this scenario assessed the efficient frontiers and constrained mixed-asset allocation over two sub-period time-frames; including the pre-GFC (January 2000 – August 2007) and the post-GFC timeframes (July 2009 – August 2018).

Figure 6 shows the efficient frontiers and constrained asset allocation for sector-specific A-REITs and diversified A-REITs prior to the GFC. The inclusion of sub-sector A-REITs provided a significant and substantial upward shift of the efficient frontier, except that for residential and specialty A-REITs. Specifically, the efficient frontier containing industrial A-REITs is the only sector-specific portfolio which offered greater returns than that for diversified A-REITs, whilst the other sector-specific A-REITs provided lesser returns than diversified A-REITs. Compared with the diversified A-REIT and financial asset-only portfolios, industrial A-REITs was a compelling Australian listed property investment product for investors seeking higher portfolio returns prior to the GFC, despite the lesser returns offered by the other sector-specific A-REITs.

For the constrained asset allocation, industrial A-REITs (an average allocation = 17.5%) dominantly featured the capped allocations in most of the portfolio risk-return spectrum, while stocks (39.5%) and bonds (42%) have a more active composition in shaping the capped allocation of the mixed-asset portfolio. In addition, diversified (0.6%), specialty (0.2%), retail (0.1%) and residential A-REITs (0.1%) only played a negligible role at low-risk levels. In short, sector-specific A-REITs featured a greater role in a mixed-asset portfolio prior to the GFC compared with diversified A-REITs.

Figure 7 depicts the efficient frontiers and constrained compositions for sector-specific A-REITs and diversified A-REITs in a post-GFC context. The addition of all sector-specific A-REITs significantly outperformed that for the diversified A-REIT and financial asset-only portfolios, except that for retail A-REITs. This indicates sector-specific A-REITs as an important investment component of asset mixes for investors seeking higher portfolio returns in Australia in a post-GFC context.

For the constrained asset allocation diagram, industrial A-REITs (17.2%) still dominated across the entire portfolio risk-return spectrum within the upper-bound at 20% of the total property allocation, while stocks (43.7%) and bonds (36.3%) had a more active role in constrained portfolio compositions. For other sector-specific A-REIT sectors, office (0.9%), specialty (0.9%) and retail A-REITs (0.9%) emerged at low-risk levels, whilst diversified A-REITs had no role across the full risk-return spectrum. A greater role of sector-specific

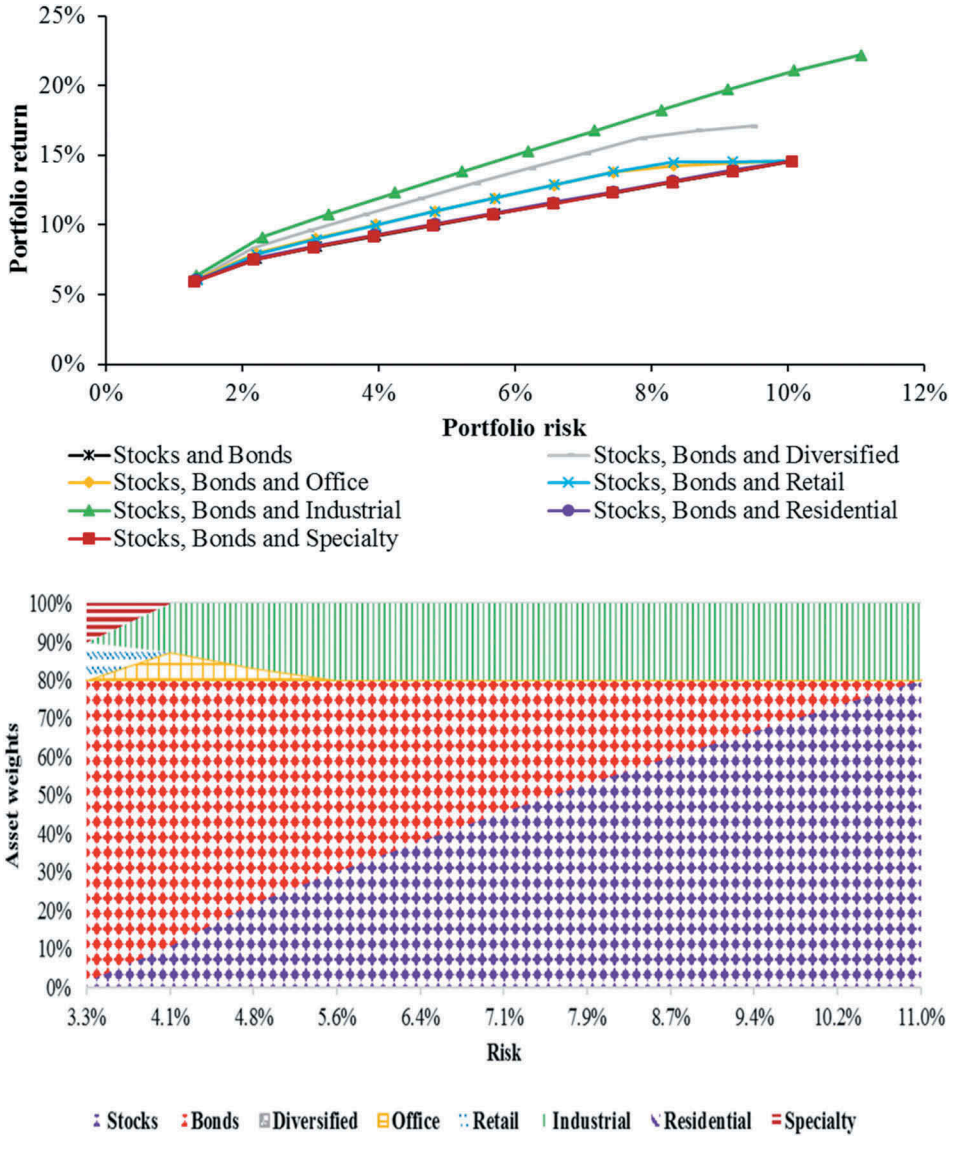

Figure 6. Constrained sector-specific A-REIT and diversified A-REIT asset allocation diagram: pre-GFC.
Source: Authors' compilation/analysis.

A-REITs in a constrained portfolio allocation over the post-GFC was observed in this section. This reinforces the value-added role of sector-specific A-REITs offering enhanced portfolio returns in an Australian mixed-asset portfolio in a post-GFC context.

Specialised A-REITs versus diversified A-REITs over January 2000 – August 2018

To provide a fuller understanding of the value-added role of sector-specific A-REITs, this scenario examined whether the specialised composition comprising all sector-specific A-REITs generates a higher portfolio return than diversified A-REITs in this scenario.

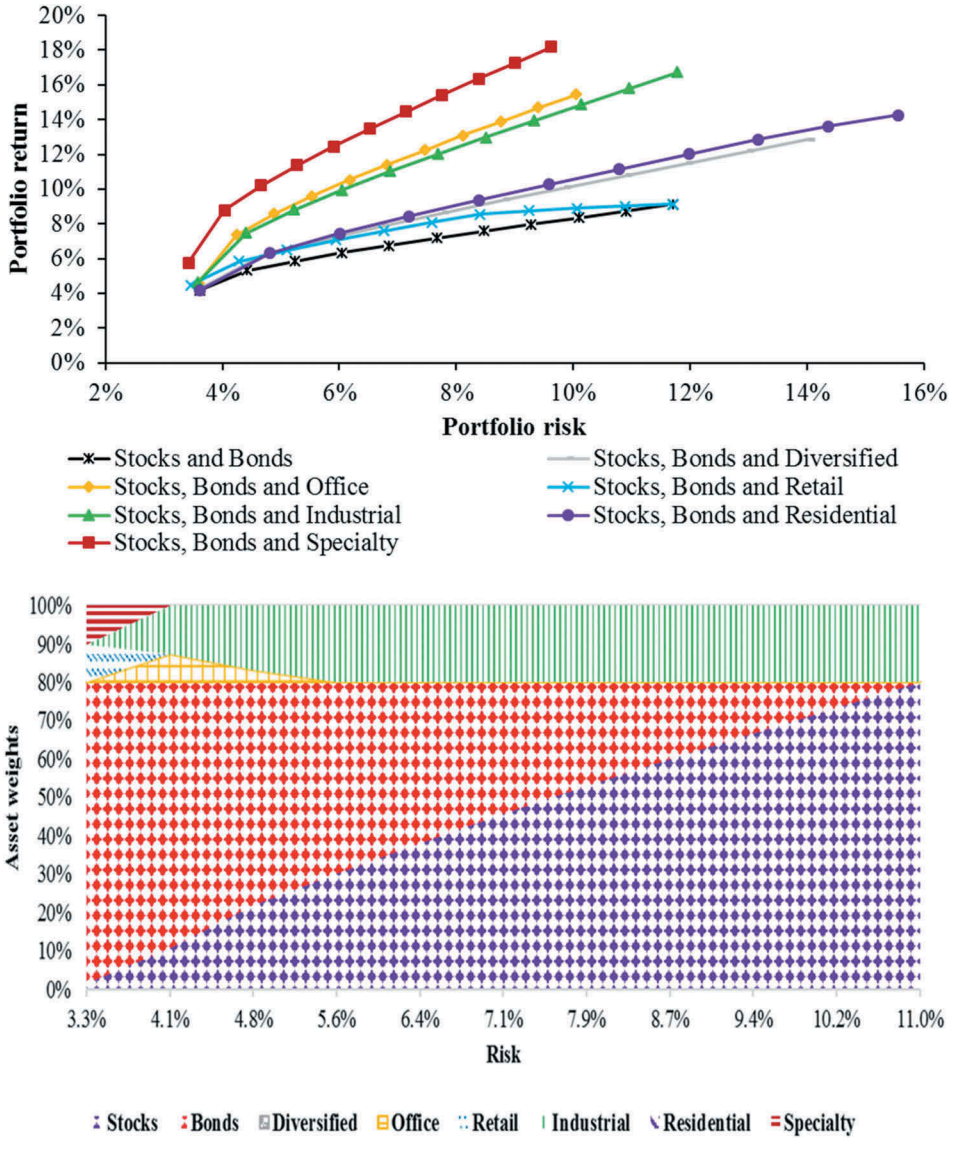

Figure 7. Constrained sector-specific A-REIT and diversified A-REIT asset allocation diagram: post-GFC.
Source: Authors' compilation/analysis.

Figure 8 shows the efficient frontiers and constrained asset allocation diagram for specialised A-REITs, diversified A-REITs, stocks and bonds over January 2000 – August 2018. For the efficient frontiers, the best performer is the inclusion of specialised A-REIT component. It was evident by a much steeper efficient frontier. In other words, it signifies a stronger portfolio return enhancement without a significant increase in portfolio risk for specialised A-REITs. In contrast, the addition of diversified A-REITs presented a comparatively slighter and shorter efficient frontier curve which delivered a weaker portfolio return enhancement with a significant increase in portfolio risk. For

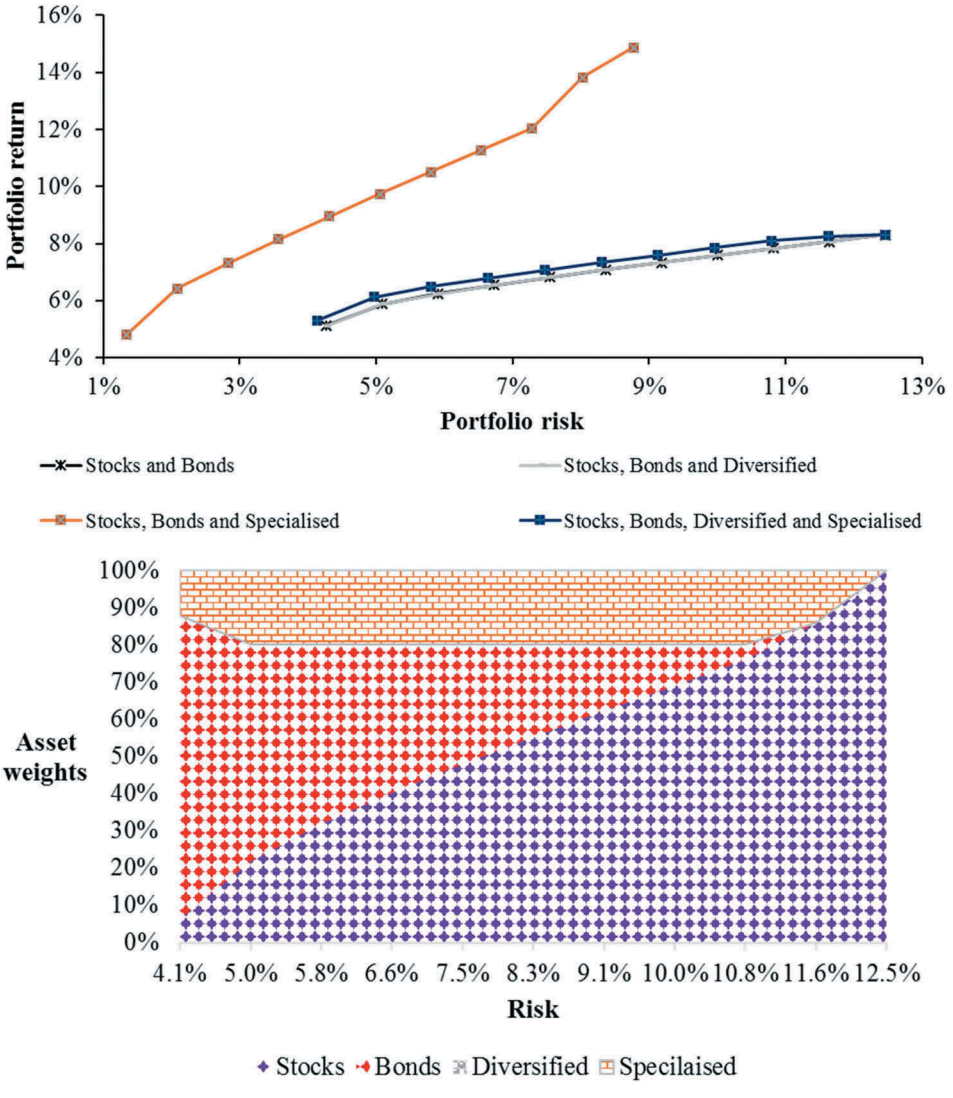

Figure 8. Constrained specilaised A-REIT and diversified A-REIT asset allocation diagram: January 2000 – August 2018.

Source: Authors' compilation/analysis.

the constrained asset allocation diagram, specialised A-REITs dominated across the entire risk-return spectrum over the full-time study period, whilst diversified A-REITs played no role in the mixed-asset compositions. This underpins the stronger investment performance of sector-specific A-REITs in an Australian mixed-asset portfolio in comparison to their diversified counterparts.

To sum up, the baseline results and robustness check offer strong evidence that sector-specific A-REITs generally deliver superior portfolio returns than diversified A-REITs in an Australian mixed-asset portfolio. Despite minor compositions of diversified A-REITs in the capped property allocation prior to the GFC, it was markedly

underperformed industrial A-REITs in the same period. These also confirm the notion of specialisation value in the A-REIT market.

Property investment implications of sector-specific A-REITs

Sector-specific A-REITs have grown increasingly significant in recent years. However, limited studies have been devoted to sector-specific A-REITs. This study aims to assess the value-added and strategic role of sector-specific A-REITs with a portfolio analysis over January 2000 – August 2018.

This paper empirically highlighted distinctions between sector-specific A-REITs and diversified A-REITs, particularly in the risk-return performance, portfolio diversification benefits, and the role of sector-specific A-REITs in an Australian mixed-asset portfolio compared with diversified A-REITs, stock and bonds in Australia over January 2000 – August 2018.

Several key findings are identified. Firstly, the value-added and strategic role of sector-specific A-REITs in an Australian mixed-asset portfolio across the full portfolio risk spectrum is evident. Specifically, superior average annual returns and risk-adjusted performance were observed when sector-specific A-REITs (eg: industrial, office, retail A-REITs) was compared with diversified A-REITs. In addition, sector-specific A-REITs delivered superior portfolio diversification benefits with both stocks and bonds than that for diversified A-REITs over the full-time study timeframe. Secondly, sector-specific A-REITs prominently featured in an Australian mixed-asset portfolio across the entire portfolio risk-return spectrum over the 18-year period, whilst diversified A-REITs found no role in the compositions. Lastly, this study confirms the notion of specialisation value in an A-REIT context over the last 18 years, including the pre-GFC and post-GFC timeframes. This not only offers the international evidence on the notion of specialisation value, but also demonstrates the specialised issue by comparing all sector-specific REITs and diversified REITs for the first time.

The findings have some profound implications. The existence of specialisation value in an A-REIT context indicates that the strong investment performance of sector-specific A-REITs is seen as a compelling Australian investment product co-existing alongside diversified A-REITs and Australian major asset classes in institutional investor portfolios in an Australian context, with desirable portfolio diversification benefits with both stocks and bonds for institutional investors seeking portfolio diversifying in Australia. This strongly suggests that institutional investors seeking listed property investment exposure in Australia should consider including sector-specific A-REITs in their mixed-asset portfolios rather than diversified A-REITs. Furthermore, this implies that institutional investors should control their portfolio diversifications by investing in sector-specific A-REITs, rather than leaving it to a diversified A-REIT portfolio. Given the stronger investment performance of sector-specific A-REITs compared with diversified A-REITs, REIT investment advisors should recommend sector-specific A-REITs to their clients who intend to develop a new REITs in Australia. This is clear that sector-specific A-REITs have been a favourable A-REIT structure to meet with the institutional investor appetite.

Notes

1. Since the S&P sub-sector A-REIT indices only started from July 2009, this study constructed the sub-sector series prior to July 2009, in order to assess the dynamic risk-return profiles of these assets.
2. We thank the referee for highlighting this point.
3. We thank the referee for highlighting this point. The results are not reported for brevity. But the results are available upon on required from the authors.
4. The results are not reported for brevity. But the results are available upon on required from the authors.
5. We thank the referee for this constructive suggestion.
6. As Newell and Peng (2009) found that the GFC stroke on the A-REIT market over September 2007 – June 2009, the pre-GFC timeframe of A-REITs started over January 2000 – August 2007 and the post-GFC timeframe began on July 2009 (over July 2009 – August 2018).

Disclosure statement

No potential conflict of interest was reported by the authors.

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