

REAL ASSET ALLOCATION: EVALUATING THE DIVERSIFICATION BENEFITS OF PROPERTY AND ALTERNATIVE ASSET CLASSES IN AUSTRALIAN SUPERANNUATION PORTFOLIOS

Wejendra Reddy

RMIT University

ABSTRACT

Problem/Purpose

The collapse of the credit markets in 2007 was more profound than previous recessions for all investment markets, including property. In the post-GFC era, institutional investors have reduced their exposure to mainstream asset classes such as equities and bonds; they are investing more in real assets such as property and infrastructure. In fact, recent market reports anticipate that in the next decade, institutional real assets allocation will increase from current average of 5%-10% to 25%. This research tests this notion by examining the diversification benefits of property and infrastructure (alternative) asset classes within A\$431 billion industry superannuation fund default balanced mixed-asset portfolio.

Design/methodology/approach

The research investigates the diversification benefits of property assets and alternative assets by constructing two asset and multi-asset portfolio models. The asset allocation is determined using the mean-variance portfolio optimisation technique utilising Australian 10-year bonds as the risk free rate. The analysis is based on ex-post data covering 20 years (1995 to 2015). The Sharpe ratio is used as the key risk-adjusted return performance measure.

Findings

The results illustrate that including alternative assets in the property portfolio provides the best risk-adjusted return performance (0.56), although portfolio weighting is dominated by direct property. Despite the higher asset allocation range assigned to alternative assets (0-25%) than to property assets (0-20%), the average allocation to alternatives was 12%, lower than the property allocation (22%). The strong allocation to property in both the two asset and multi-asset portfolios in this research further highlights that property will command significant allocation in institutional portfolios, despite the availability of similar real assets such as infrastructure.

Takeaway for practice

For an Australian superannuation balanced fund, the empirical results show that there is scope to increase the combined property and alternative asset allocation level from current 27% to 33%. This high allocation is backed by improved risk-adjusted return performance. This knowledge will be beneficial for funds currently reprofiling investment portfolios to achieve stable risk-adjusted returns.

Originality/value

The research contributes to both practical and academic fields as it offers a methodological approach on how allocation to property assets can be improved using a series of asset allocation strategies.

Keywords: Property, Infrastructure, Superannuation, Asset Allocation, Diversification options.

Paper Type: Research Paper

Theme: Investment and Finance

INTRODUCTION

Property as an asset class plays an important role in institutional investment portfolios in Australia. Property assets provide strong diversification potential when included in a mixed-asset portfolio. Combined with its comparatively good returns, property's low volatility (even after adjusting for the effects of valuation smoothing) emphasise its attractive risk and return characteristics to investors. Property assets generate regular income and long-term capital growth prospects. Apart from diversification benefits, inflation hedging has also been a good reason for investing in property (Bond et al. 2007a).

Despite the benefits, asset allocation studies by Brown and Schuck (1996), Craft (2001), Hoesli, Lekander and Witkiewicz (2003) and Worzala and Bajtelsmit (1997) have concluded invariably that property is significantly under-represented in the typical investment portfolio. Baum and Hartzell (2012, p. 11) stated that property's under-weighting in institutional portfolios can be attributed to several factors including:

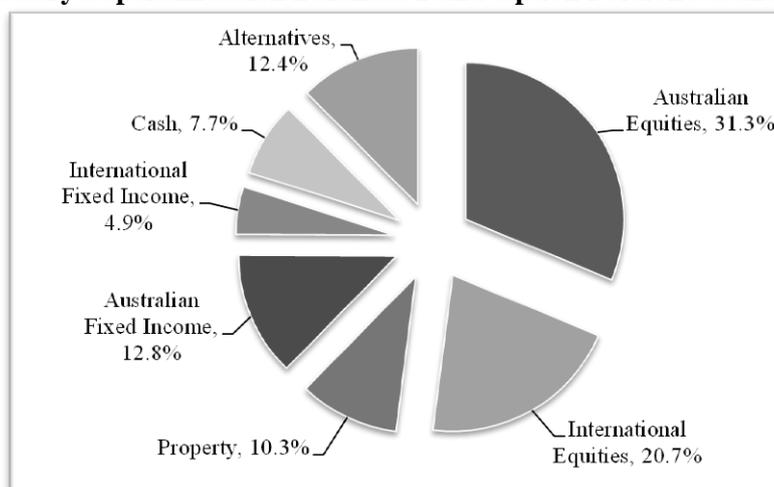
- i. The operational difficulties of holding properties, including illiquidity, lumpiness (specific risks) and the difficulty in aligning the investment management process for property and equities.
- ii. The introduction of new alternative asset classes, such as indexed-linked bonds, private equity, infrastructure and hedge funds. Some of these alternatives, such as infrastructure funds, offer income security and diversification benefits that are similar to those associated with real estate.

The research investigates the diversification benefits of property and alternative assets by constructing two asset and multi-asset portfolio models. To do this, the research examines the performance of industry superannuation balanced fund asset classes over a 20 year period (1995-2015); using quarterly benchmark data for each asset class.

Generally, Australians have three superannuation investment options: not-for-profit funds, retail funds, and self-managed super funds (SMSFs). The institutional sector, consisting of the not-for-profit funds (corporate funds, industry funds, public sector funds) and retail funds, make up 62% of the superannuation industry's A\$2 trillion of assets under management. The not-for-profit superannuation funds are popular options for superannuants, given that the trustee company operating the fund does not seek to make any profit out of running the fund, and therefore the funds often charge members quite low fees. With A\$431 billion under management, industry funds are the largest institutional superannuation investment options (APRA 2015).

Industry superannuation funds are designed for employees working in a common industry or group of associated industries operated by parties to industrial awards (usually employer associations and/or unions). Industry funds offer several investment options which aim to meet member investment objectives. The default balanced fund is the most popular, accounting for 67% of the industry funds' investments (APRA 2015). Balanced funds offer stable income returns and capital growth derived from a diversified range of asset classes. Australian superannuation managers' conventional strategic default balanced investment portfolio generally consists of five major components, namely: equities (Australian and international), fixed income (Australian and international), property, alternatives, and cash. Figure 1 illustrates the aggregated balanced industry superannuation fund default option asset allocation, as at June 2015.

Figure 1: Industry Superannuation Balanced Fund Option Portfolio: June 1995-2015



Source: APRA 2015;
Rainmaker Group 2012.

Figure 1 shows that over the study period (20 years), equities (Australian and international) was the dominant asset class, representing 52% of the industry superannuation balanced fund portfolio, followed by fixed income securities (Australian and international) 18%, alternatives (12%), property (10%) and cash (8%). Property component includes both allocation direct/unlisted property (5%) and listed REITs (5%). These asset allocation components do change over time as fund managers regularly rebalance investment portfolios to reflect prevailing market conditions. For example, allocation to property ranged from 9%-14% in the 20 year period to June 2015. In the same period allocation to alternatives assets ranged from 4%-21%.

Alternatives now represent the third largest asset class in Australian institutional balanced investment portfolios. Large institutional fund managers can offer investors both unlisted and listed alternatives products, such as infrastructure funds, venture capital, and other forms of private equity. The alternatives sector in Australia is dominated by the infrastructure funds which represent approximately 50% of the industry's assets under management (Austrade 2010). For the purpose of this research, alternative assets include hedge funds, commodities, infrastructure funds, private equity, and venture capital funds.

Australian industry superannuation funds generally have extensive property portfolios invested in both direct/unlisted and listed property. Typically, institutional superannuation funds favour unlisted property for diversification and stability reasons. Industry superannuation funds unlisted wholesale property funds are externally managed by several major fund managers in Australia, including AMP, Lend Lease, QIC, ISPT and GPT. At 30 June 2015, industry superannuation fund combined allocation to property and alternatives were 27%; being property 10% (direct property 8%; listed property 2%) and alternatives 17%. Table 1 lists the leading APRA regulated Australian industry superannuation funds and the fund allocation to property and alternatives, as at June 2015.

Table 1: Leading Industry Funds by Net Asset Value; Property, Alternatives Allocation: 30 June 2015

<i>Superannuation Funds</i>	<i>Net Assets (A\$ billion)</i>	<i>Property Allocation</i>		<i>Alternatives Allocation</i>	
		<i>(%)</i>	<i>\$ billion</i>	<i>(%)</i>	<i>\$ billion</i>
AustralianSuper	91.8	9.2%	8.5	13.8%	12.6
Unisuper	49.2	8.8%	4.3	8.4%	4.1
Retail Employees Superannuation Trust	37.4	7.0%	2.6	5.0%	1.9
Sunsuper Superannuation Fund	33.5	9.3%	3.1	19.3%	6.5
Health Employees Superannuation Trust	32.4	9.0%	2.9	9.0%	2.9
Construction & Building Unions Superannuation	30.7	11.0%	3.4	16.5%	5.1

Source: APRA 2015

AustralianSuper and Unisuper are the highest ranked industry funds with net assets of A\$92 billion and A\$49 billion respectively, as at June 2015. Several industry superannuation funds had in excess of A\$2 billion invested in both property and alternatives assets. The AustralianSuper fund holds the largest proportion of property assets (A\$8.5 billion) and alternatives assets (A\$12.6 billion). Other funds with significant investments in property assets include Unisuper (A\$4.3 billion), Construction & Building Unions Superannuation (A\$3.4 billion) and SunsUPER Superannuation Fund (A\$3.1 billion). SunsUPER Superannuation Fund (A\$6.5 billion) and Construction & Building Unions Superannuation (A\$5.1 billion) also had significant investments in alternatives assets.

The next section provides literature review on the challenges posed by alternative asset classes to property asset allocation in institutional portfolios.

LITERATURE REVIEW

The shortage of good quality commercial real estate, along with yield compression, has resulted in significant fund flow in the alternative sector, particularly in the infrastructure sector (Newell & Peng 2008a). The increasing level of institutional support means that alternatives are now the third largest asset group in most Australian institutional portfolios. There is ongoing debate about whether alternative assets such as infrastructure can be regarded as property assets, and whether alternative assets can replicate the performance of property assets in the mixed-asset portfolio.

Finkenzeller, Dechant and Schäfers (2010) identified that institutional investors faced this classification problem when allocating alternative assets in their portfolios. Some institutional investors tend to allocate alternative assets in existing real estate or fixed income securities portfolio, although the risk-adjusted return characteristics do not match. The analogy, particularly between direct property and infrastructure assets, could potentially explain why institutional investors group them together. Direct property and infrastructure have similar underlying asset characteristics, such as indivisibility, long lifecycles, site dependency, long-term investment horizons, restricted liquidity, valuation-based performance, inflation hedging, capital gains, high yield, and strong competition for quality assets. Both are real assets and offer relatively stable investment returns when compared to more volatile assets such as equities.

However, there are also significant differences between property and infrastructure assets. While property markets are described as relatively competitive, infrastructure markets often have oligopolistic or even monopolistic structures. In addition, there is a greater degree of transparency in the real estate markets compared to the infrastructure market. There is limited potential to obtain ownership of direct infrastructure assets due to regulatory constraints which often only allow user rights (RREEF 2005; Newell, Chau & Wong 2009; Newell & Peng 2008a). Finkenzeller, Dechant and Schäfers (2010) explained that although investments in direct property are inhibited by large investment scales, direct infrastructure investments are lumpier. Real estate as an asset class provides various uses, whereas infrastructure assets are limited to very specific and restricted uses. The acquisition and sale of direct infrastructure projects is time consuming, and thus reduces the potential for investors to react immediately to changing market conditions.

Bond et al. (2007b) investigated whether the performance of real estate could be replicated by alternative assets (hedge funds, private equity, commodities and infrastructure) in UK institutional portfolios, and found that alternative assets could not deliver the same level of portfolio hedging benefits as real estate. Their study found that adding real estate to a portfolio of bonds and equities would have led to a substantial reduction in portfolio risk. By contrast, in no case does adding one of the alternative assets to the core asset mix achieve a significant level of risk reduction. They further identified that in the absence of real estate, the greatest risk reduction occurs by adding private equity to the mixed-asset portfolio. Newell and Peng (2008b) in a similar study on the US market, found while utilities provided lower diversification options, infrastructure offer enhanced portfolio diversification benefits in real estate, real estate-related and mixed-asset portfolios.

Several recent studies have evaluated the performance and diversification benefits of property and alternative assets in Australia. Earlier studies by CFS (2009), Newell and Peng (2008a), and Peng and Newell (2007), found that the correlation between unlisted infrastructure and unlisted property in Australia is significantly low, explaining the potential diversification benefits of including both asset classes within the multi-asset portfolio. More recently, Newell and Lee (2011) found that while direct property is still seen to play a key role in the Australian multi-asset portfolio, direct property plays a less significant role in the portfolio when the alternative assets (such as private equity, infrastructure, hedge funds and commodities) are included. An evaluation of the correlation matrix showed that in most instances, the diversification benefits of alternative assets compared to assets such as shares and bonds were much greater than property, which could in general have a negative impact on the level of allocation to direct property in the multi-asset portfolio. Newell, Peng and De Francesco (2011) found that even with the impact of the GFC, the performance attributes of unlisted infrastructure was superior to direct property. Their study found that the diversification benefits of unlisted infrastructure were more significant than the diversification benefits of direct property. These results provide justification for the current institutional practice of including alternative assets, such as infrastructure, as a separate asset class in the mixed-asset portfolio.

The literature review shows that direct property, and alternative assets such as infrastructure, has similar underlying asset characteristics. Infrastructure is a very heterogeneous asset class offering different risk-return profiles across a range of subsectors, similar to property. Both are real assets and offer relatively stable investment returns when compared to more volatile assets such as equities. However, there are a number of qualitative differences between direct property and infrastructure, which further adds weight to including infrastructure alongside property in a portfolio. Although research (Newell 2008) has identified that increased allocation to alternatives had not directly impacted a superannuation fund's property allocation component, this needs to be further investigated in light of recent changes to institutional asset allocation strategies.

DATA AND METHODOLOGY

This research will evaluate the diversification benefits and asset allocation components of different property assets (direct property and listed property) and alternative assets within the setting of two asset and multi-asset portfolios, including the industry funds' conventional strategic investment approach. Asset data for this study covers a 20 year period, 1995-2015, and comprises 81 quarterly data points. Industry standards generally require a minimum of 20 quarterly period data points for investment analysis (Bacon 2008, p. 64).

The asset data and benchmark representations for the research are detailed below:

- Cash – RBA Interbank Rate
- Australian Fixed Income (Aust fixed) - CBA Bond: All Series, All Maturities
- International Fixed Income (Int fixed) - Citigroup World Government Bond Index (AU\$)
- Australian Equities (Aust eq) - ASX All Ordinaries Accumulation
- International Equities (Int eq) - MSCI WORLD ex AUSTRALIA Standard (Large+Mid Cap) (AU\$)
- Direct Property (Direct Prop) - PCA/IPD Composite Property Index
- Listed Property (Listed Prop) - S&P/ASX 200 A-REIT Index
- Alternatives Assets (Altern'ves) - UBS Wealth Management; Dow Jones Credit Suisse; AVCAL & Cambridge Associates; Reserve Bank of Australia.

The property data used to construct the different asset allocation models are raw and not de-smoothed property, which is in line with industry practice. Recent studies such as AXA Real Estate (2012) in UK, and Newell and Lee (2011) in Australia, show that substituting the raw property index data with the de-smoothed property returns did little to change the weighting of property in the optimal portfolio. The normal industry practice is to use property index data in the original format.

The sourced overseas data was converted to Australian dollars, based on the prevailing exchange rate. For the alternative asset class data series, the Australian managed fund industry appears to have a range of benchmark data series which seem incomplete compared to the assets included in the alternative asset class. It is appreciated that there was difficulty in sourcing and establishing the alternative asset class definition and related index composition. This is because in Australia there is no recognised alternatives index available to industry. The index in this research is constructed from the commencement of selected Australian data series for Infrastructure and Utilities, Hedge Funds (AU), Private Equity, and Commodity Prices (AU) based on an equal weighted formula, which follows the UK alternative asset class index structure (Bond et al. 2007a).

The benchmark allocation series data for the seven asset classes in industry superannuation balanced funds was sourced from the Rainmaker Group, a leading superannuation service provider in Australia. Each quarter, Rainmaker Group surveys and publishes asset allocation data for the Australian industry and retail superannuation funds. Average asset allocation for industry superannuation fund for the period 1995-2015 was displayed in Figure 1. The range of asset allocation is exhibited in Table 2.

Table 2: Industry Superannuation Balanced Fund Range of Asset Allocations, 1995-2015

	Aust eq	Int eq	Prop	Aust fixed	Int fixed	Cash	Altern'ves
Average	31.3%	20.7%	10.3%	12.8%	4.9%	7.7%	12.4%
Minimum	22.0%	12.0%	8.7%	5.3%	2.0%	3.3%	3.6%
Maximum	37.0%	27.6%	14.0%	24.0%	7.9%	13.0%	21.0%
Range	15.0%	15.6%	5.3%	18.7%	5.9%	9.7%	17.4%

Source: APRA 2015; Rainmaker Group 2012

Table 2 shows the varying benchmark asset allocation weighting for the industry superannuation balanced funds. The aggregated average over the study period (20 years) was: Australian equities 31.3%, international equities 20.7%, Australian fixed income 12.8%, international fixed income 4.9%, alternatives 12.4%, property 10.3%, and cash 7.7%. Property allocation includes both direct/unlisted property, and listed securitised property (REITs). Allocation to property ranged between 9-11%, having peaked at 14% in September 1998, which corresponded with the push by REITs to offshore property investment. The lowest allocation to property was recorded at 9% in March 2010. This was during the recent Global Financial Crisis (GFC) that led to major falls in REIT prices and property valuations. The allocation to the alternative asset class has grown steadily from 1998 to the peak level of 21% in 2009. It now represents the third largest asset group for industry superannuation funds.

The Markowitz (1952) classical mean-variance portfolio selection model serves as the starting point for constructing optimal asset allocation models in this research. In theory, the portfolio optimisation (or mean-variance setting) generates a maximum Sharpe ratio portfolio based on the expected return, volatility and pairwise correlation parameters for all assets to be included in the portfolio. For n number of assets in the portfolio, the asset allocation is optimised by minimising portfolio risk for a given level of expected return using Markowitz's (1952) quadratic programming problem (see Equation 1).

$$\begin{aligned} \text{Minimise } \sigma_p^2 &= \sum_{i=1}^n \sum_{j=1}^n x_i x_j \sigma_{ij} \\ \text{subject to } \mu_p &= \sum_{i=1}^n x_i \mu_i \\ \mu_p &\geq \mu_0 \end{aligned} \quad \text{Equation 1: Quadratic Mean-Variance Function}$$

where x_i = proportion of portfolio allocated to asset i .

μ_p = expected portfolio return.

μ_i = expected return on asset i .

μ_0 = given level of expected return.

σ_{ij} = covariance between asset i and asset j returns.

The covariance and correlation coefficient matrix tests the portfolio diversification benefits for the industry fund balanced investment option asset classes. Day (2001) detailed the technique of constructing optimum portfolios using the Microsoft Excel program. The Microsoft Excel spreadsheet 'Solver' function, a what-if analysis tool, is used to find the optimal weightings at a risk minimised and targeted expected portfolio return value. The key inputs include the historical total return and standard deviation data. The use of Solver allows application of constraints to restrict the values the program can use in the model.

The individual asset weights were constrained to being positive (greater than or equal to zero), and the total portfolio weight should sum to 100%. The model does not allow short selling. The optimal asset allocation

model is reviewed annually. The construction of the efficient frontier involved calculating the possible portfolio weighting at a 10% interval for return and standard deviation. The Australian government 10 year bonds are used as the risk-free rate.

In practice, the Markowitz mean-variance framework is altered with various types of constraints that follow the institution's investment guidelines and investment objectives. This is because the classical mean-variance portfolio optimisation can often result in extreme allocation in specific assets. Therefore, in addition to the Strategic asset allocation policies, industry superannuation funds also formulate a range of permissible investable asset weights as a primary risk management tool. Including holding constraints leads to a more industry practical application of the mean-variance optimisation problems. Table 3 illustrates the assumed predetermined weight constraints for industry superannuation fund balanced portfolios.

Table 3: Industry Superannuation Funds Asset Weight Parameters

Asset Class	Minimum Weight	Maximum Weight
Australian Equities	20%	40%
International Equities	10%	30%
Property	0%	20%
Australian Fixed	0%	20%
International Fixed	0%	15%
Cash	0%	15%
Alternatives	0%	25%

Source: Reddy et al. 2013

Industry superannuation fund asset allocation parameters appear to place high weighting on the equity markets. The property allocation range is set as 0-20%. Previous overseas studies (Lee & Byrne 1995; Stevenson 2000) have also examined the role of property within unconstrained and constrained mixed-asset portfolios, with the upper limit to property set at 20% for constrained strategies. This research follows the methodology to evaluate the optimal allocation to property and alternative asset classes within two-asset and multi-asset unconstrained (*Optimal – No Constraints model*) and weight constrained (*Optimal – Weight Constrained*) mean-variance models.

RESULTS AND DISCUSSION

Table 4 details the industry superannuation fund balanced investment option asset allocation trend, with property allocation split into direct property and listed property components. The total return data for all asset classes are displayed at different time intervals.

Table 4: Asset Total Return at Different Intervals – Quarterly Data, 1995 – 2015

<i>Time Period</i>	Cash	Aust fixed	Int fixed	Aust eq	Int eq	Direct Prop	Listed Prop	Altern' ves
1995 - 2000								
Mean Return	1.4%	2.5%	1.9%	3.1%	2.5%	2.4%	2.9%	3.8%
Standard Deviation	0.2%	2.5%	1.6%	4.9%	12.3%	0.3%	4.6%	3.9%
2001 - 2007								
Mean Return	1.3%	1.5%	1.1%	3.5%	1.4%	3.2%	4.3%	4.0%
Standard Deviation	0.1%	1.8%	1.5%	5.9%	13.4%	0.8%	4.2%	3.4%
2008 - 2015								
Mean Return	1.0%	1.7%	0.6%	0.7%	1.6%	2.0%	-0.4%	1.4%
Standard Deviation	0.4%	2.3%	3.8%	8.5%	15.6%	2.1%	11.5%	3.2%
Sharpe Ratio (1995 - 2015)								
	-0.37	0.21	-0.08	0.15	0.07	0.80	0.08	0.43

Table 4 results demonstrate that there is significant variance in quarterly total returns for most asset classes at different time intervals. The data display sharp fluctuations for the Australian equities, international equities, and A-REITs markets. The returns for cash, direct property, and fixed assets (Australian and international fixed), remained relatively stable. A-REITs recorded strong performance in 1995-2000, enjoying a 'golden era' with increased investments in offshore properties and increased debt during 2001-2007, recording the highest total return (4.3%). However, during 2007-2015 (the GFC/ post-GFC period), the sector declined to its lowest point, recording the only negative mean return (-0.4%). Although direct property performance lagged the A-REITs returns for most of the analysis period, it significantly outperformed the listed property sector during 2007-2015.

The performance of the alternative asset class can be explained by the increase in allocation in recent years to underlying alternatives sector assets – specifically infrastructure investments. On average, the allocation to alternative assets within the industry superannuation fund portfolio has risen from 8% (prior to 2005) to 17% in 2015, having peaked at 21% in March 2009. Over a period of 20 years (1995-2015), direct property has significantly outperformed all other asset classes with a Sharpe ratio of 0.80. Alternatives recorded the second highest Sharpe ratio (0.43) during this period.

The diversification benefits of direct property, listed property and alternative asset classes in the industry fund balanced investment option can be attained by examining the correlation matrix. Table 5 and Table 6 assess the correlation between direct and listed property and other assets over different time periods. This follows the Jones Lang LaSalle (2012) correlation reporting methodology for property assets. Each time period involved a different number of data points. For example, 1-year represents four quarterly data points in 2015, 2-year represents eight quarterly data points from 2010-2015, and 20-year represents 81 quarterly data points from 1995-2015. To better evaluate the correlation of different property assets to the specific

alternative asset classes, alternative index assets are separated as infrastructure (Infr), hedge funds, private equity, and commodity (C'dity).

Table 5: Correlation Matrix: Direct Property and Other Asset Classes at Different Intervals

Time Period	Direct Property correlation to:									
	<i>Cash</i>	<i>Aust fixed</i>	<i>Int fixed</i>	<i>Aust eq</i>	<i>Int eq</i>	<i>Listed Prop</i>	<i>Infr</i>	<i>Hedge Funds</i>	<i>Private Equity*</i>	<i>C'dity</i>
1-year	-0.45	-0.34	0.80	-0.65	0.74	-0.33	-0.18	0.73	-0.85	0.33
2-year	0.13	-0.44	-0.64	-0.37	-0.47	-0.19	0.34	-0.59	0.45	0.51
3-year	-0.29	-0.07	-0.22	-0.44	-0.41	-0.21	0.01	-0.45	0.45	-0.09
5-year	0.15	0.10	-0.06	-0.10	0.18	-0.01	0.11	0.14	0.08	-0.29
10-year	0.25	-0.05	-0.12	0.17	0.11	0.27	0.26	0.04	0.53	0.08
15-year	0.27	-0.03	-0.03	0.19	0.10	0.28	0.26	0.04	0.35	0.07
20-year	0.18	-0.04	-0.11	0.16	0.09	0.27	0.17	0.03	0.35	0.08

*Private Equity data are available from June 2000.

Table 6: Correlation Matrix – Listed Property and Other Asset Classes at Different Intervals

Time Period	Listed Property correlation to:									
	<i>Cash</i>	<i>Aust fixed</i>	<i>Int fixed</i>	<i>Aust eq</i>	<i>Int eq</i>	<i>Direct Prop</i>	<i>Infr.</i>	<i>Hedge Funds</i>	<i>Private Equity*</i>	<i>C'dity</i>
1-year	0.59	1.00	0.30	0.86	-0.09	-0.33	-0.69	-0.13	0.72	0.58
2-year	0.17	0.85	-0.06	0.32	-0.22	-0.19	-0.61	-0.16	0.16	-0.38
3-year	0.40	0.75	0.05	0.23	-0.24	-0.21	-0.44	-0.18	-0.14	-0.28
5-year	-0.23	0.20	-0.23	0.48	0.29	-0.01	0.27	0.27	0.18	-0.32
10-year	-0.23	-0.20	-0.46	0.71	0.42	0.27	0.55	0.16	0.51	-0.22
15-year	-0.16	-0.13	-0.40	0.64	0.39	0.28	0.50	0.21	0.34	-0.23
20-year	-0.10	0.01	-0.30	0.59	0.36	0.27	0.49	0.18	0.29	-0.21

*Private Equity data are available from June 2000.

Table 5 demonstrates that over the short-term (1-2 years), the correlation between direct property and listed property is low (-0.33 and -0.19). This indicates strong diversification potential between the assets. In the medium term (3-5 years) the correlation between direct and listed property ranges from -0.01 to -0.21, and increases to 0.27 over the 20-year sample period. Direct property displays strong diversification potential with most asset classes, including alternative assets such as infrastructure, hedge funds and commodities, in both short-term and long-term horizons. Table 6 shows that listed property displayed strong diversification

benefits with cash, fixed income (Australian and international), and to some extent with commodities and hedge funds, in the short and long-term horizon. The correlation between A-REITs and Australian equities was high (> 0.60) in both the short-term and long-term, displaying potential lack of diversification benefit.

The research investigates the diversification benefits of property assets with Australian equities and alternative assets by constructing two asset optimal portfolio models. The asset allocation is determined using the mean-variance portfolio optimisation technique. Figure 2 displays the efficient frontier and optimal allocation results for the two asset models, being Portfolio A (Direct Prop & Listed Prop), Portfolio B (Direct Prop & Altern'ves), and Portfolio C (Listed Prop & Aust eq).

Figure 2: Efficient Frontier – Property and Alternative in Two Asset Portfolios

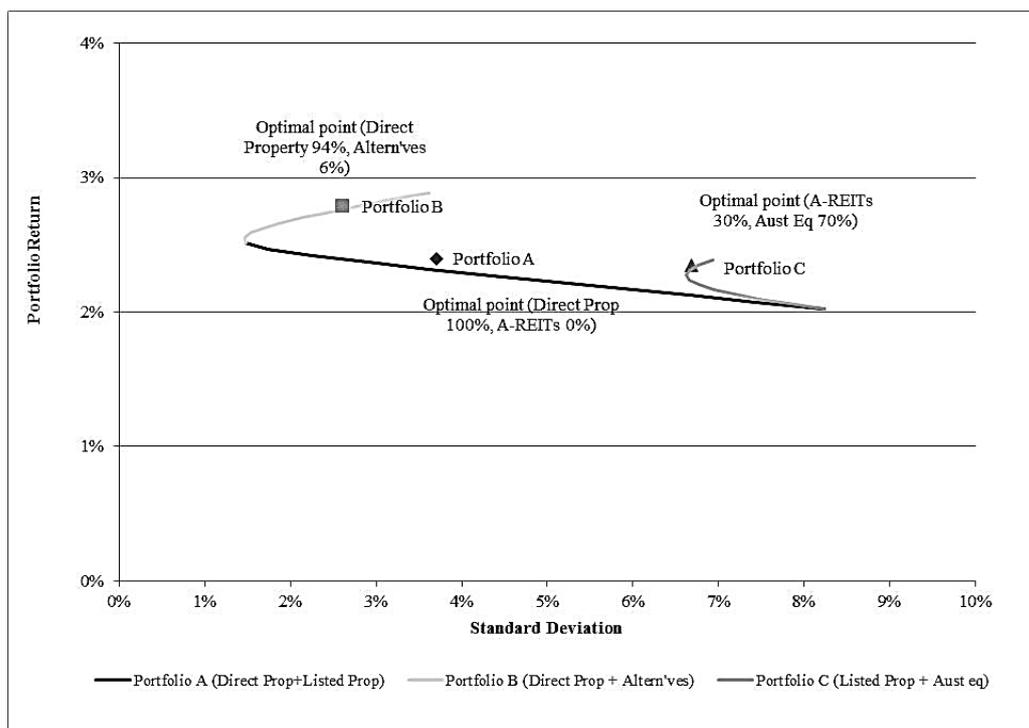


Table 7 details the performance statistics of the different two asset optimal portfolios. Table 6 illustrate that including listed property in the direct property portfolio is insignificant, evident from the low risk-adjusted return performance (0.29) in Portfolio A when compared to the direct property only portfolio (0.80). However, including listed property in the direct property portfolio provides a much better performance profile than including A-REITs in the Australian equities portfolio (0.15). Including alternative assets in the direct property portfolio (Portfolio B) provides the best risk-adjusted return performance (0.56), although portfolio weighting is dominated by direct property.

Table 7: Performance Statistics – Two Asset Portfolios

Portfolio	Assets	Mean Return	Standard Deviation	Sharpe Ratio
Portfolio A	Direct Prop & Listed Prop	2.40%	3.70%	0.29
Portfolio B	Direct Prop & Altern'ves	2.79%	2.60%	0.56
Portfolio C	Listed Prop & Aust eq	2.35%	6.68%	0.15

Overall, the results provide evidence that placing listed property in the equities portfolio is not a viable investment option. However, including alternatives assets in the real estate portfolio seems beneficial. The

performance of different property assets needs to be tested further within the parameters of multi-asset allocation models. Table 8 illustrates the quarterly performance of the multi-asset allocation strategies.

Table 8: Industry Fund Asset Allocation Strategies – Descriptive Statistics, Quarterly Performance Data, 1995-2015

Asset Allocation Strategy	Mean Return	Standard Deviation	Risk-Adjusted Return	Annualised Return	Annualised Standard Deviation
Strategic (original portfolio)	2.15%	4.97%	0.17	8.90%	9.93%
Optimal – No Constraints	1.94%	2.98%	0.20	7.98%	5.96%
Optimal – Weight Constrained	2.15%	3.60%	0.23	8.88%	7.21%

Mean total returns for all asset allocation strategies were similar (around the low 2% mark). Both Optimal – No Constraints and Optimal – Weight Constrained models recorded high risk-adjusted return profiles of 0.20 and 0.23 respectively. The alternative asset allocation strategies have outperformed the industry superannuation fund Strategic investment option, which recorded a Sharpe ratio of 0.17. It is appreciated that rebalancing the portfolio is not without costs. To increase the Sharpe ratio from 0.17 to 0.23 could provide minimal gains due to added management and transactions costs.

Table 9 details the weightings for the selected asset classes within the different asset allocation models.

Table 9: Asset Allocation Components for Different Investment Strategies

Asset Allocation Strategies	Aust eq	Int eq	Direct Prop	Listed Prop	Aust fixed	Int fixed	Cash	Altern 'ves
Strategic (Original Portfolio)	31%	21%	5%	5%	13%	5%	8%	12%
Optimal – No Constraints	3%	7%	46%	2%	2%	3%	18%	19%
Optimal – Weight Constrained	24%	13%	16%	6%	13%	8%	10%	11%

Note: All other asset allocation models were updated on a quarterly basis.

The minimum and maximum allocation for different asset classes varies within each asset allocation strategy. The highest level of allocation was to cash at 94% in the Optimal – No Constraints asset allocation strategy. The other assets to attain more than 50% allocation at some point during the 20 year sample period were alternatives (85%), property (75%), international equities (62%), international fixed (61%) and Australian equities (52%). All asset classes recorded a minimum asset allocation of 0% at some point during the analysis period, mainly in Optimal – No Constraints asset allocation strategy. The Optimal – No Constraints strategy works on the premise of allocating most weighting to assets that display the lowest volatility in performance.

The Optimal – Weight Constrained investment strategy demonstrates a 22% allocation to property (direct property 16%; listed property 6%). Despite the higher asset allocation range assigned to alternative assets (0-25%) than to property assets (0-20%), the allocation to alternatives was 11%, lower than the combined property allocation (22%). The combined allocation to property and alternatives within the constrained model was 33%. This can be compared to recent industry fund allocation to property and alternative assets in APRA report (2015, p.21) of 27% (10% property, and 17% alternatives).

Recent studies (Finkenzeller, Dechant & Schäfers 2010; Newell & Lee 2011; Newell, Peng & De Francesco 2011) have concluded that property may play a less significant role in multi-asset portfolios when the alternative assets, such as infrastructure, are included. However, the consensus was that both are distinct

assets and offer different diversification benefits. The strong allocation to direct property in both the two assets and multi-asset portfolio in this research further highlights property's significance in institutional portfolios. Higher allocation to direct property has limitations, such as illiquidity, higher transaction costs, availability of stocks and management fees. Lack of liquidity could act as a deterrent for higher allocation to direct property. However, the continued evolution of unlisted property fund vehicles (such as wholesale property funds and property syndicates) could provide the medium for increasing allocations to direct property. These vehicles would allow fund managers to meet specific member investment and liquidity requirements, alongside retaining some input into property allocation decisions

CONCLUSION

This research examined the role of property and alternative assets in the Australian industry superannuation fund balanced investment option by constructing and critically evaluating two-asset and multi-asset investment strategies. The analysis was undertaken for a 20 year timeframe (1995-2015) using ex-post quarterly total return asset benchmark data, and the industry superannuation fund asset allocation data.

The performance analysis of the two-asset portfolio analysis provides evidence that including alternative assets in the direct property portfolio provides better risk-adjusted return performance (0.56) than a portfolio that combines direct property and listed property (0.29). Interestingly, none of these two portfolio models could replicate the direct property only portfolio risk-adjusted return (0.80).

The key parameters from past market data (risk/return performance and correlation measures) provided the platform for the analysis of the historical benchmark data for industry superannuation funds' conventional Strategic balanced portfolio. The alternative multi-asset investment strategies evaluated included Optimal – No Constraints and Optimal – Weight Constrained models. The Optimal strategies seek the highest risk-adjusted returns: a technique known in the field of MPT as Markowitz mean-variance portfolio optimisation. The alternative asset allocation models outperformed the industry superannuation funds' conventional Strategic portfolio. The Optimal – Weight Constrained strategy recorded the highest Sharpe ratio (0.23), followed by Optimal– No Constraints (0.20). Strategic portfolio had a high standard deviation (4.97%), reflected in the relatively low risk-adjusted return profile rating (0.17).

The combined allocation to property and alternatives within the Optimal – No Constraints model was 67% (48% property, and 19% alternatives). It is appreciated allocations of 50% to property within unconstrained optimisation models may not be practicably justifiable for superannuation funds due to issues surrounding property such as liquidity. However, including weight constraints, leads to a more industry practical application of the mean-variance optimisation problem. The Optimal – Weight Constrained strategy recommended allocation to property for industry funds is 22% (16% direct, and 6% listed). This compares to the current industry fund property allocation of 10% (8% direct, and 2% listed). Interestingly, despite the higher asset allocation range assigned to alternative assets (0-25%) than to property assets (0-20%), the allocation to alternatives within the constrained strategy was 11%, lower than property (22%). This provides concrete evidence that property will command a significant allocation in institutional portfolios despite the availability of similar real assets such as infrastructure.

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Email contact: wejendra.reddy@rmit.edu.au