Keywords: portfolio management, real estate investment, diversification strategies.

MAURICE PEAT F Fin is a Senior Lecturer at the University of Sydney Business School, University of Sydney. Email: maurice.peat@sydney.edu.au

DANIKA WRIGHT is a Lecturer at the University of Sydney Business School, University of Sydney. Email: danika.wright@sydney.edu.au

THE IMPACT OF RESIDENTIAL PROPERTY INVESTMENT *on portfolio performance*

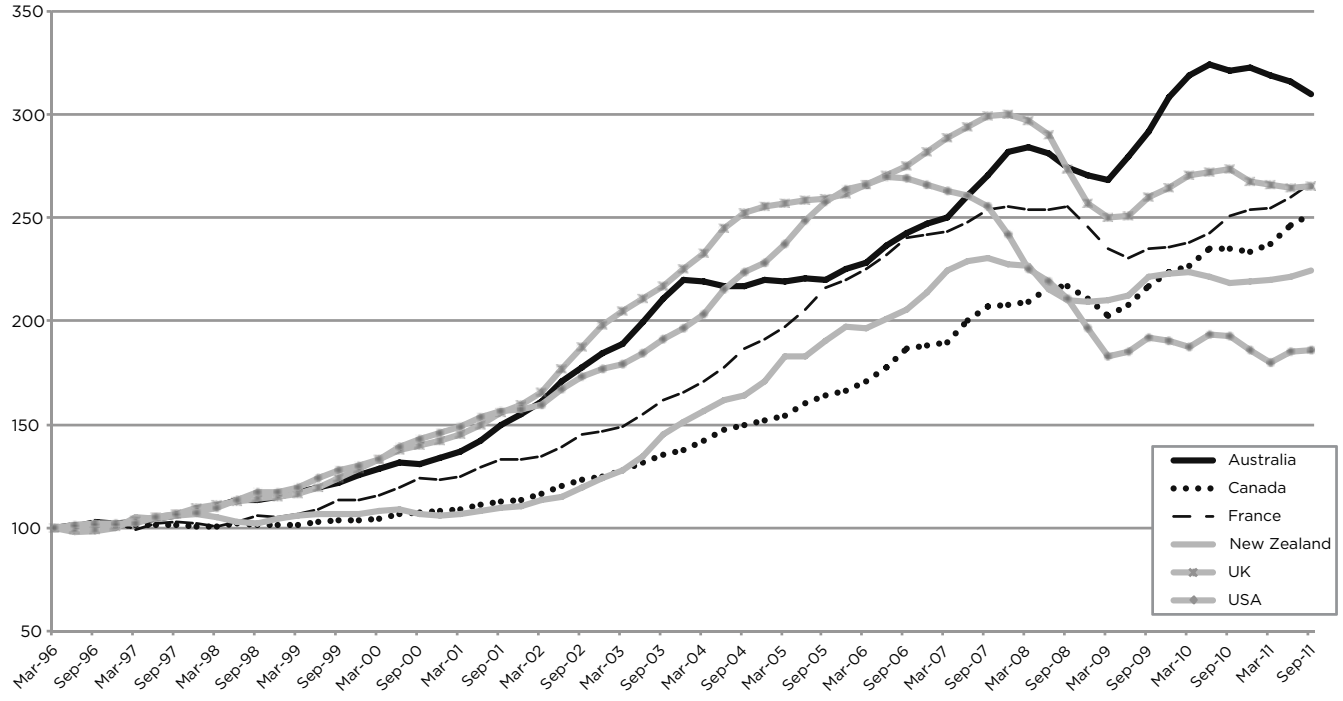
To identify the potential diversification benefits of residential property we extend a portfolio of traditional asset classes to include investment in residential property. We analyse the long-term price performances of domestic and international equities, government fixed income securities, listed property and Australian residential property, and construct return-maximising portfolios for given risk levels. Our results indicate that for every level of risk, a portfolio which includes residential real estate has a higher expected return than a portfolio without it. Given these findings, particularly the relative stability of returns on residential real estate and its demonstrated low correlation with other assets — especially equities — the current lack of investment vehicles in the residential real estate asset class is surprising.[1]

The unprecedented market volatility over the past five years has brought renewed focus to the risk–return profile of competing investment options and portfolio diversification. Residential real estate is one of the largest asset classes in the world, potentially offering significant diversification benefits in a multi-asset portfolio. Due to the global lack of accessible residential real estate investment vehicles, little research has considered the effect of an investment in this asset class on portfolio dynamics. This paper examines the effect on institutional multi-asset class portfolios of the inclusion of residential real estate. Specifically, it quantifies the additional diversification benefit of residential real estate investment at different investor risk profiles.

Residential real estate has many qualities — such as low correlation with equity and debt securities, and effective hedging against inflation — which should make it attractive to portfolio managers. However, direct investment in real estate involves taking a long capital position in the physical housing asset. While this is the most common method by which households invest in residential real estate, direct investment is typically illiquid and can be difficult to divest, involving high transaction and maintenance costs. It can also require taking a substantial exposure to the residential real estate asset class in order to achieve diversification effects. Portfolio managers are more likely to access residential real estate through securitised investment, available through real estate investment trusts (REITs) and mortgage-backed securities. While offering a less costly and more liquid method of accessing the broad real estate asset class, REITs in Australia are almost exclusively invested in retail, commercial, office and industrial real estate. Research has shown that the investment characteristics of residential real estate may be markedly different from other sub-categories of real estate (Webb et al. 1988; Lee 2008). Investment in REITs is conducted through organised exchanges, such as the Australian Securities Exchange (ASX). Oikarinen et al. (2009) show that REITs in the United States behave more like the broader equity market than other real estate assets.

Figure 1 charts the relative performance of residential real estate markets in several countries including Australia. Residential real estate prices in Australia and Canada, and to a lesser extent France and New Zealand, have risen relatively consistently over the past 15 years. In the decade to 2006, residential property prices in all countries grew strongly, nearly trebling in the United States and United Kingdom. These property markets were the hardest hit post-2006 through the global financial crisis (GFC).

FIGURE 1: International comparison of residential real estate returns



Source: Case-Shiller Index (CME), UK Land Registry, ABS, Teranet, INSEE, REINZ, author estimates.

TABLE 1: Investment assets

Asset	Proxy
Domestic equities	S&P/ASX All Ordinaries Accumulation Index
International equities	MSCI World (Ex-Aus) Equity Total Return Index
Government bonds	JP Morgan Australian Government Bond Total Return Index
Listed property	S&P/ASX 200 A-REIT Accumulation Index
Residential property	ABS Established House Price Index

One of the earliest examinations of residential real estate in a comparison with other investment classes was undertaken by Ibbotson and Siegel (1984). For the period 1947 to 1982, the authors observe a negative correlation between the returns on a capitalisation-weighted composite index of US residential, agricultural and commercial real estate, and the returns to the S&P 500 Index. They also observe a negative correlation between the returns to real estate and the returns to both long-term corporate and government bonds. Using the disaggregated agricultural, residential and commercial real estate indices from Ibbotson and Siegel's study, Webb et al. (1988) show that in portfolios constructed using the different asset classes, residential real estate is given a significant positive weight in the mean-variance optimal portfolio.

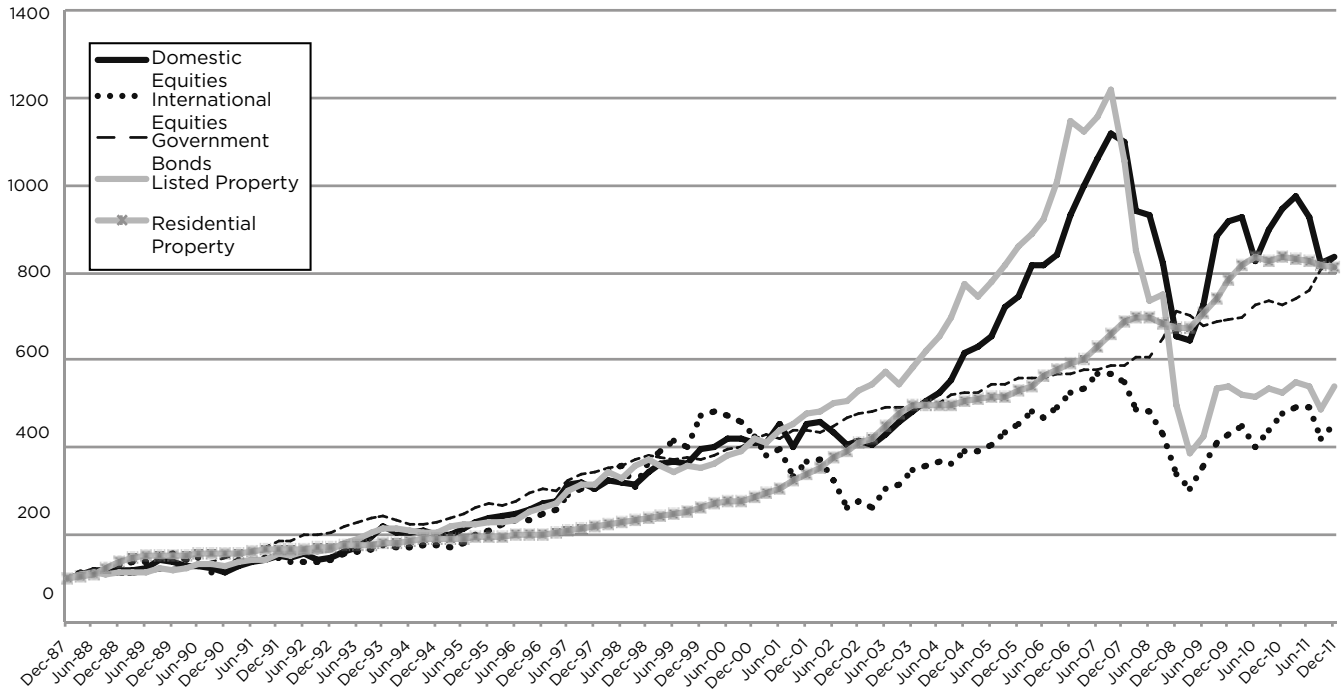
Interestingly, the results from Webb et al. (1988) also show a very low level of correlation between returns to residential and non-residential property. Similar results are reported in Goetzmann and Ibbotson (1990) who use individual US city house price indices, and Hutchison (1994) who examines the UK residential real estate market. Lee (2008) examines inter-asset correlation using Australian residential real estate data. Through correlation analysis using data for the period 1996 to 2007, Lee (2008) identifies the diversification potential of Australian residential real estate with equities, bonds and commercial property.

Until recently, methods for taking advantage of the diversification benefits offered by residential real estate have been limited to direct and securitised investments, neither of which is readily representative of the aggregate market. Housing derivatives may be one solution to this, with the launch in May 2006 of US housing derivatives written over the S&P/Case-Shiller Index and the ASX's March 2012 release of daily house price indices which are designed for trading.[2]

Asset classes

The asset classes modelled and used in the portfolio construction section of this paper cover equities (domestic and international), domestic government debt, listed property and residential property. The assets and their proxies are summarised in Table 1.

FIGURE 2: Relative investment performance



Source: Bloomberg, MSCI, ABS, author estimates.

These indices are compiled on a quarterly basis covering the period January 1988 to December 2011. Note that this study uses total returns data. That is, the index proxies for domestic and international equities, government bonds and listed property represent capital gains and income to the investment. We assume a constant 2 per cent net yield (representing net rental income or housing services consumption) in addition to capital gains on residential property for consistency. This value is in line with conservative long-run estimates from real estate data provider RP Data. The international equities data is not adjusted for currency.

Figure 2 indicates the relative performance of these asset-classes for the sample period and highlights three key trends:

- domestic equities, residential real estate and government bonds were the strongest performers over the total sample period, with relatively consistent positive growth;
- the strongest periods for positive growth across all assets were 1990 to 1999 and 2003 to 2007; and
- domestic and international equities and, more recently, listed property, appear to move together more than government bonds and residential property.

Table 2 reports the return, volatility and inter-asset correlations of the asset-classes considered in this study.[3] Domestic equities have the highest average annual return (9.95 per cent) of the asset classes considered, followed by government bonds (9.09 per cent), residential property (8.93 per cent), listed property (8.28 per cent) and international equities (7.77 per cent).[4]

The GFC had a significant impact on the returns estimates for equities and listed property. Once we exclude the period since September 2007 (Panel B), the average returns to these assets increase by around 3 per cent and the volatility decreases.

Residential property and government bonds have the lowest volatility estimates (4.71 per cent and 5.69 per cent, respectively), while domestic equities (14.15 per cent), international equities (16.72 per cent) and listed property (14.92 per cent) have the highest volatility estimates. International equities continue to underperform on a risk-adjusted basis even once the GFC period is removed from estimates (Panel B).

In portfolio construction it is necessary to take inter-asset correlation into account. The principles of diversification mean that more efficient portfolios may be created as an investment is spread across more assets. That is, it is possible to create a portfolio with a higher expected return for a given level of risk than would otherwise be possible. These diversification gains are greater the lower is the inter-asset correlation.

Domestic and international equities have the highest correlation (0.76) over the total sample period. This likely reflects the increased globalisation of markets and capital flows, and the importance of international macro-economic events in market movements. The A-REIT market is also highly correlated with domestic equities

TABLE 2: Asset-class risk and return

	Domestic Equities	International Equities	Government Bonds	Listed Property	Residential Property
Panel A: January 1988 to December 2011					
Return (% p.a.)	9.95	7.77	9.09	8.28	8.93
Volatility (% p.a.)	14.15	16.72	5.69	14.92	4.71
Correlations					
International equities	0.76				
Government bonds	-0.18	-0.22			
Listed property	0.61	0.44	0.05		
Residential property	0.13	0.19	-0.27	0.13	
Panel B: January 1988 to September 2007					
Return (% p.a.)	13.09	10.07	9.20	13.22	9.76
Volatility (% p.a.)	11.77	15.30	5.55	8.54	4.52
Correlations					
International equities	0.67				
Government bonds	0.04	-0.06			
Listed property	0.42	0.13	0.34		
Residential property	-0.09	0.06	-0.21	-0.12	

(0.61) supporting the observations of earlier research (Oikarinen et al. 2009).

Consistent with the findings of Ibbotson and Siegel (1984) and Lee (2008) among others, residential real estate is found to have a low or negative correlation with all other asset classes. It is worth noting that we observe domestic government bonds to have a low-to-negative correlation with all other asset classes considered in our sample period. Davis (2005) shows that this relationship was positive prior to 2000, and negative thereafter. The negative correlation between equities and government bonds is particularly strong through the GFC (2007–08) and, more recently, the European financial crisis (2009–12), during which monetary policy settings supported returns to bonds and funds were moved into safer assets (such as Australian government bonds) from riskier equity and listed property investments.

More than 50 per cent of value was wiped off equity and listed property markets through the GFC. Assuming that an event as extreme as the GFC occurs less than once in every 24 years (the length of our sample period), including it in the calculations may adversely bias the long-run estimates of risk and return. Removing all observations after September 2007 improves the observed average risk-adjusted annual return for all asset-classes. As presented in Panel B of Table 2, listed property has the highest average return (13.22 per cent) of all asset-classes in this truncated sample period, yet lower volatility (8.54 per cent) than domestic or international equities, which returned on average 13.09 per cent and 10.07 per cent, respectively. The pattern of inter-asset correlation is relatively consistent with the results when the GFC period is included. Residential real estate is remarkably resilient through the GFC, with little change to either the risk or return estimate.[5]

In Figure 3, the addition of residential real estate to optimal portfolio analysis (the dashed line) results in a shift of the efficient frontier to the left. This means that for every level of risk, measured by volatility (the horizontal axis), a portfolio which includes residential real estate has a higher expected return (the vertical axis) than a portfolio without it.

Optimal portfolios with residential real estate

Optimal portfolios are defined as those with the greatest possible level of expected return for a given amount of

FIGURE 3: Minimum variance frontier

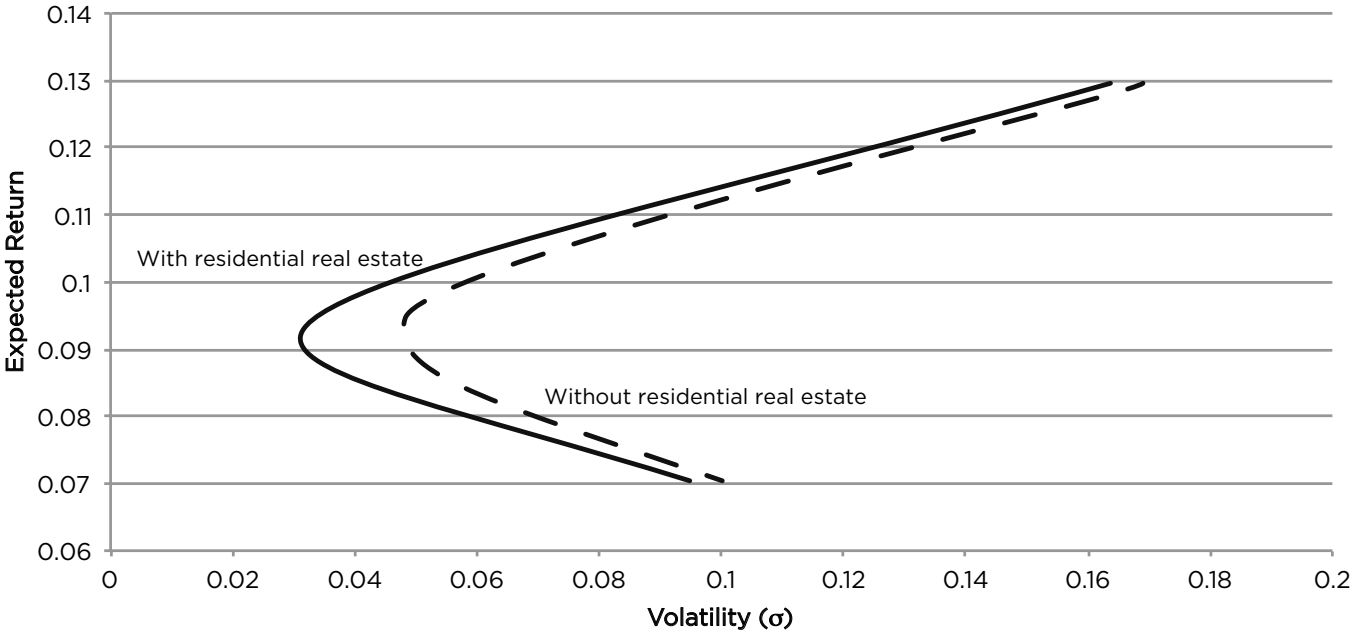


TABLE 3: Multi-asset portfolio characteristics

	Conservative	Balanced	Growth
Panel A: Portfolio without Residential Real Estate Investment			
Expected Return (% p.a.)	9.5	11.0	13.0
Volatility (% p.a.)	5.10	9.25	16.93
Likelihood of Loss (% p.a.)	3.12	11.72	22.13
Panel B: Portfolio with Residential Real Estate Investment			
Expected Return (% p.a.)	9.5	11.0	13.0
Volatility (% p.a.)	3.44	8.49	16.55
Likelihood of Loss (% p.a.)	0.29	9.75	21.61

volatility or, correspondingly, the smallest amount of volatility for a given expected return. A minimum variance frontier is derived by plotting the expected return of the optimal portfolio at each volatility level. The minimum variance frontier is constructed numerically following the process outlined by Markowitz (1952).[6]

Figure 3 shows the minimum variance frontier for multi-asset portfolios with and without residential real estate. The addition of residential real estate to optimal portfolio analysis (the dashed line) results in a shift of the efficient frontier to the left. This means that for every level of risk, measured by volatility (the horizontal axis), a portfolio which includes residential real estate has a higher expected return (the vertical axis) than a portfolio without it.

We follow the approach of Costello et al. (2008) to test the significance of adding residential real estate to the position of the minimum variance frontier. This method uses an F-test for equality of variances to test whether the minimum variance frontier has shifted significantly when a new asset is added. We find that the addition of residential real estate to the portfolio results in a significant reduction in volatility at the 95 per cent confidence level, with our test returning a p-value of 0.02362 for the test statistic.

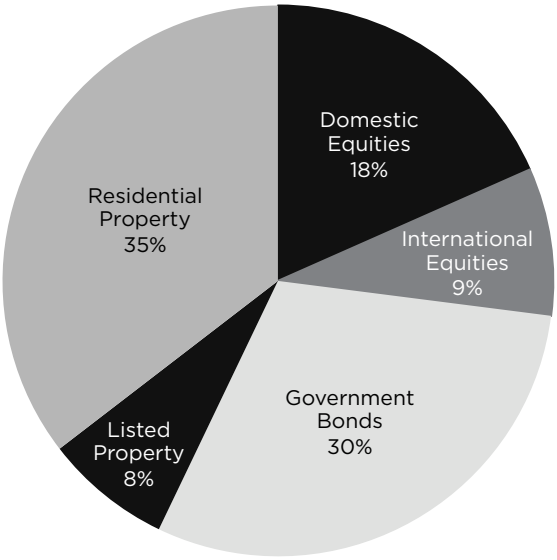
For further analysis, we select portfolios from this efficient frontier which match three commonly used investment strategies: conservative, balanced and growth. Investment strategies are typically matched to investor profiles, which provide a useful tool for advising on portfolio allocation, as each investor will have unique goals. We define our investor profiles by their risk tolerance.

A more conservative investor will accept a lower expected return on their portfolio if it means they can earn a more secure, less volatile, return. On the other hand, a growth-seeking investor with a much higher risk tolerance and longer-term investment objective may be prepared to invest in a portfolio with more volatility in exchange for a higher expected return. The balanced investor profile sits between the conservative and growth profiles.

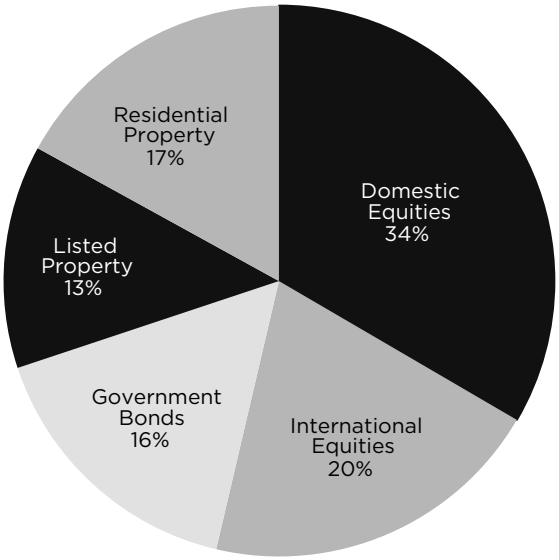
Table 3 presents the expected return and volatility of a conservative, balanced and growth portfolio. We follow

FIGURE 4: Absolute exposures for different risk profiles

A: Conservative Portfolio



B: Balanced Portfolio



ASIC's MoneySmart guide to these investment strategies: a portfolio with around 70 per cent invested in fixed interest is viewed as conservative, a portfolio with around 70 per cent in listed securities is balanced, and a portfolio with around 85 per cent in listed securities is growth. That is, we identify the expected return and volatility of these portfolios excluding residential real estate, and then compare the change in volatility from the inclusion of residential real estate, holding expected returns constant.

For all portfolios, including residential real estate reduces volatility. This is most pronounced in the conservative portfolio where, for an expected return of 9.5 per cent, a portfolio with residential real estate has significantly less volatility (3.44 per cent) than a portfolio without it (5.10 per cent).

Table 3 also shows the likelihood of loss in any given year for these portfolios.[7] For example, a conservative portfolio without residential real estate has a 3.12 per cent probability of loss in a year. This falls to 0.29 per cent with residential real estate investment. Without residential real estate, the probability of a negative return to each portfolio in any given year is higher. These results further demonstrate the benefit of residential real estate to portfolio diversification, particularly for a conservative strategy.

Figure 4 compares the absolute exposures to the different asset classes for the three optimal portfolios at different risk profiles that include residential real estate investment.

In the conservative profile portfolio, government bonds (30 per cent) and residential real estate (35 per cent) account for the largest absolute exposures. This is expected as these asset classes have the lowest return volatility. This profile has the greatest diversification benefit from the inclusion of residential real estate. The exposure to residential real estate falls to 17 per cent in the balanced portfolio and 10 per cent in the growth portfolio. The exposure to listed property and equities increases correspondingly in the higher-risk portfolios, albeit from a now relatively low base. Domestic and international equities account for 27 per cent of investment in the conservative portfolio rising to 64 per cent in the growth portfolio.

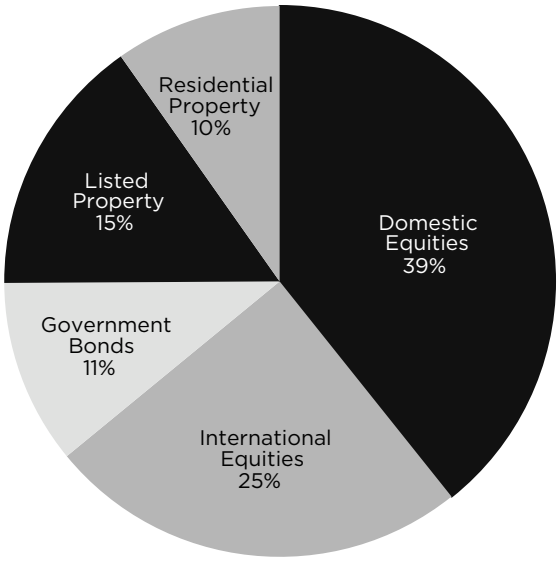
Residential real estate offers significant diversification benefits even after data from the recent GFC period is removed from estimates of expected return, volatility and correlation, making equities and listed property relatively more attractive. For all levels of volatility, the inclusion of residential real estate may create a portfolio with a higher expected return.

Table 4 reports the optimal portfolio expected risk–return dynamics at the three investor profiles excluding the GFC period from September 2007. Again, the greatest diversification gain is at the conservative investor profile. Without residential real estate, a portfolio with an expected return of 9.5 per cent has a volatility of 5.0 per cent. With residential real estate investment, the volatility of this conservative portfolio is 3.02 per cent.

The diversification gains to the balanced and growth portfolios are now reasonably large. A portfolio with a target expected return of 13 per cent has significantly lower volatility, when residential real estate is included (7.68 per cent), than a multi-asset portfolio restricted to equities, bonds and commercial real estate investment (6.68 per cent).

Given the low-to-negative correlation of its historical returns with the other asset classes considered in this analysis, these results support our expectation that the addition of residential real estate to a multi-asset portfolio would increase efficiency. That is, the inclusion of residential real estate enables the construction of

C: Growth Portfolio



Residential real estate offers significant diversification benefits even after data from the recent GFC period is removed from estimates of expected return, volatility and correlation, making equities and listed property relatively more attractive. For all levels of volatility, the inclusion of residential real estate may create a portfolio with a higher expected return.

TABLE 4: Multi-asset portfolio characteristics excluding GFC

	Conservative	Balanced	Growth
Panel A: Portfolio without Residential Real Estate Investment			
Expected Return (% p.a.)	9.5	11.0	13.0
Volatility (% p.a.)	5.00	5.33	7.68
Panel B: Portfolio with Residential Real Estate Investment			
Expected Return (% p.a.)	9.5	11.0	13.0
Volatility (% p.a.)	3.02	3.63	6.68

portfolios with lower volatility for a given expected return (or, conversely, portfolios with a higher expected return for a given level of volatility).

Conclusion

The results demonstrate that including residential real estate in a well-diversified portfolio generates significant diversification benefits. Compared with a portfolio limited to domestic and international equities, government bonds, and listed property, a portfolio with residential real estate offers a higher rate of return for any given level of risk. The greatest diversification gains are at the conservative end of the scale.

This finding holds when the analysis excludes the GFC and the subsequent market correction. Removing observations through this unprecedented period of market volatility, the risk–return dynamics of equities and listed property are significantly improved. However, including Australian residential real estate in a well-diversified portfolio still offers large diversification benefits.

This analysis considers the total returns to each investment, requiring assumptions to be made about the yield and costs of residential real estate investment. No currency adjustment is made to the international investment component. These extensions present an interesting path for future research. However, it is expected that the results of this analysis will hold given the low correlation of residential real estate returns to other asset classes and our conservative estimate for net rental yield.

An extra consideration may be the additional risk of holding an undiversified basket of housing. While this paper makes an argument for residential real estate as part of a diversified institutional portfolio, many Australian households already directly hold residential real estate which would need to be analysed separately. Future research may also consider how fund managers account for investor home ownership in determining optimal asset allocation.

Given the investment potential of residential real estate, particularly its relative stability and demonstrated low correlation with other assets, particularly equities, the current lack of diversified investment opportunities in the asset class is surprising. ■

Notes

1. The authors acknowledge the financial support of Genero Group and the Securities Institute Research Centre of Asia-Pacific (Sirca) in producing this research, as well as the recommendations from Kevin Davis and an anonymous referee.
2. See www.asx.com.au/asx/markets/propertyIndices.do.
3. For simplicity, we report the results from arithmetic average calculations. The results are consistent when geometric averages are used.
4. Note that we do not consider franking credits or other tax benefits from any particular investment in this study.
5. In this regard, Australian real estate has gone against the global trend. As Figure 1 shows, the US and UK residential real estate markets were significantly affected through the GFC.
6. Specifically, portfolios which minimise total portfolio variance are created for 5,000 equally spaced expected return levels using historical risk and return estimates for our chosen securities.
7. This analysis assumes a normal distribution of returns.

References

Costello, D., Gray, S. and McCrystal, A. 2008, 'The diversification benefits of Australian equities to international investor', *JASSA*, issue 4, pp. 31–35.

Davis, K. 2005, 'The systematic risk of debt: Australian evidence', *Australian Economic Papers*, vol. 44, pp. 30–46.

Goetzmann, W. and Ibbotson, R. 1990, 'The performance of real estate as an asset class', *Journal of Applied Corporate Finance*, vol. 3, pp. 65–76.

Hutchison, N. 1994, 'Housing as an investment? A comparison of returns from housing with other types of Investment', *Journal of Property Finance,* vol. 5, pp. 47–61.

Ibbotson, R. and Siegel, L. 1984, 'Real estate returns: a comparison with other investments', *Journal of the American Real Estate and Urban Economics Association,* vol. 12, pp. 219–42.

Lee, C. 2008, 'Housing in Australia as a portfolio investment', International *Journal of Housing Markets and Analysis*, vol. 1, pp. 352–61.

Markowitz, H. 1952, 'Portfolio selection', *Journal of Finance*, vol. 7, pp. 77–91.

Oikarinen, E., Hoesli, M. and Serrano, C. 2009, 'The long run dynamics between direct and securitized real estate', *Journal of Real Estate Research*, vol. 33, pp. 73–103.

Webb, J., Curcio, R. and Rubens, J. 1988, 'Diversification gains from including real estate in mixed-asset portfolios', *Decision Sciences*, vol. 19, pp. 434–52.