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Robert Mead, PIMCO

Mr. Mead is a Managing Director in the Sydney office and co-head of Asia-Pacific Portfolio Management. He co-oversees the portfolio management teams in the region.

Fabian Dienemann, PIMCO

Mr. Dienemann is a Senior Account Associate in the investment due diligence group, servicing research-related clients and consultants. He previously held a role in the institutional account management team in Germany.

UNDERSTANDING RISK IN AUSTRALIAN RETIREMENT PORTFOLIOS

Robert Mead and Fabian Dienemann

While housing has definitely helped support the Australian economy over the past four to five years, any further increases in house prices that are in excess of wage growth will represent potential systemic risks for the Australian economy. Bank hybrid securities, domestic equities, residential mortgage-backed securities and residential investment properties all essentially contain big bets on housing, and it follows that Australian income portfolios may now carry much higher risk than many would expect. In this current environment of a fully-priced Australian residential property market, increasing exposure to deeply subordinated Australian hybrid bank capital instruments or stocks as a source of income further concentrates this portfolio risk.

The high investment risk is of particular concern for investors approaching or in retirement. To understand and quantify it, we modelled the total wealth of a typical (hypothetical) Australian retiree using proprietary asset allocation tools developed by PIMCO's Client Analytics team. We found that over 95% of the volatility in an average retiree's total portfolio is currently driven by the equity risk factor – which is basically sensitivity to changes in the equity markets. This high exposure to equity risk is mainly the result of three factors.

- Australian shares tend to pay fully franked dividends making them, on the surface, attractive income providers and therefore a large component of retail portfolios.
- Equity risk contributes disproportionately more to total portfolio volatility when compared to other risk factors.
- Australian property is highly exposed to the equity risk factor.

The objectives of a typical retirement portfolio should be to produce an attractive total return, preserve capital and provide income. The major concern for retirees is the risk of capital loss stemming from market downturns, as retirees have a shorter time horizon to recover losses. Unfortunately, a further consequence of having high exposure to equity risk is an increase in tail risk – the likelihood of extreme events – and drawdowns (large losses).

Modelling a Retiree's Total Wealth

To uncover the inherent risk factors in Australian retirement accounts, we modelled four investment portfolios:

- SMSF (Self-Managed Superannuation Fund) model excluding primary property
- SMSF model including primary property
- Retail superannuation fund model excluding primary property
- Retail superannuation fund model including primary property

To model the asset allocations, we used data from the Australian Tax Office (ATO) for SMSFs and an income model portfolio of a representative retail superannuation fund. Details of the assumed asset allocation are shown in Figure 1.

From an asset allocation perspective we argue primary housing should be considered part of a retiree's total wealth, even if it has yet to generate income. In Australia, the family home is not usually seen as an asset with investment risk and is typically excluded when modelling the risks in a retirement portfolio. However, while saving for retirement, many homeowners choose to pay off their mortgages instead of, say, investing in other assets or making further contribu-

tions to their superannuation fund. This means that a large part of the average retiree's total wealth lies in the family home. This home is an asset and is exposed to market risk: When the house is sold at a later point, the current market price will be realised.

Figure 1: Australian Retirees' Asset Allocation

Asset Class	Proxy	SMSF Model	SMSF Model (incl. Property)	Retail Super Model	Retail Super Model (incl. Property)
Australian Equity	S&P/ASX 200 Accumulation Index	33.7%	21.4%	21.4%	10.0%
International Equity	MSCI World Index	5.0%	3.2%	5.0%	2.3%
Cash / Term Deposits	Bloomberg AusBond Bank Bill Index	32.1%	20.4%	12.1%	5.6%
Australian Bonds	Bloomberg AusBond Composite 0+ Yr	4.9%	3.1%	33.3%	15.5%
International Bonds	Bloomberg Barclays Global Aggregate Index	0.0%	0.0%	15.9%	7.4%
Australian Property direct	PIMCO Australia Private Property Model	6.2%	40.4%	3.5%	55.1%
Australian Property listed	PIMCO Australian Listed Property Model	18.0%	11.4%	2.8%	1.3%
Global Infrastructure	S&P Global Infrastructure Index	0.1%	0.1%	1.9%	0.9%
Managed Futures	DJCS Managed Futures Index	0.0%	0.0%	4.0%	1.9%
Sum		**100%**	**100%**	**100%**	**100%**

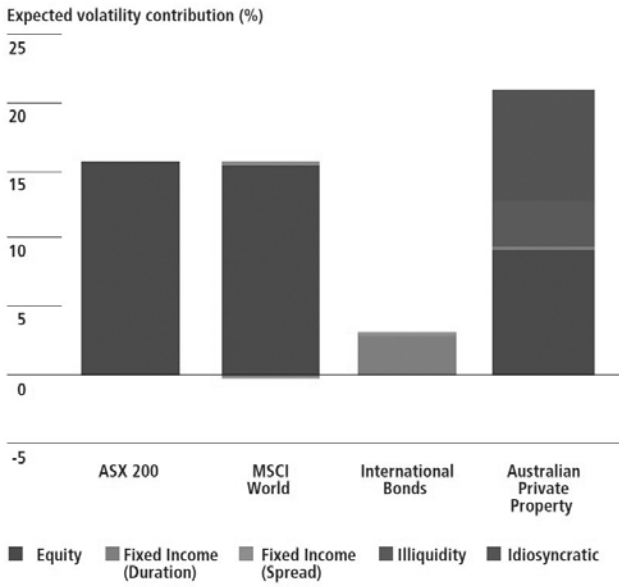
Note that all asset class exposures have been represented by an appropriate index. Please refer to Appendix for additional index information.
Source: PIMCO calculation based on ATO data and industry experience

How PIMCO identifies the risks in income portfolios

Before we examine the risks in the four model portfolios, we need to explain PIMCO's risk factor approach to portfolio construction.

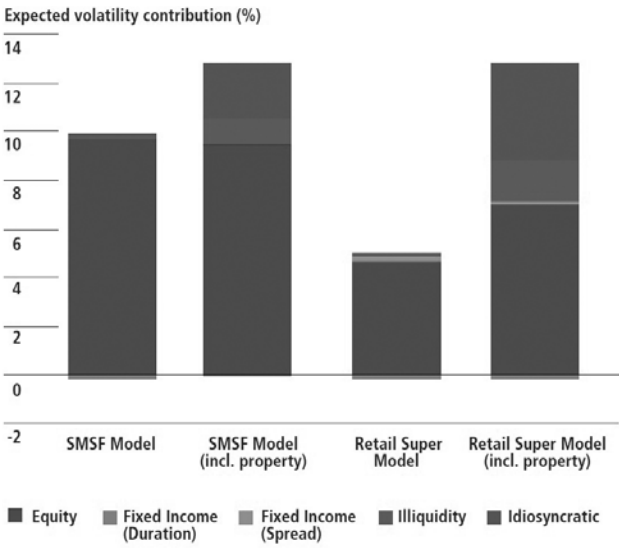
Superannuation funds typically attempt to reduce or minimize volatility in their portfolios by diversifying – investing in a range of assets which are negatively or lowly correlated to one another. For example, the average SMSF in Australia holds around 39% of funds under management in equities. To mitigate volatility, other asset classes such as property, bonds or infrastructure investments are also included in the portfolio based on the expectation that when equities are down these other asset classes will be up (or at least will outperform equities). Unfortunately, correlations between asset classes are not constant and tend to increase when markets are the most volatile.

Figure 2: Risk factor exposures of select asset classes



Source: PIMCO as of 31 January 2017

Figure 3: Risk exposures of income portfolios



Source: PIMCO as of 31 January 2017

But there is an alternative to diversifying across asset classes to reduce risk. The approach is based on the concept of "risk factors". (In a research paper, Page (2013) compared the effectiveness of risk factor diversification vs. asset class diversification and found that correlations between risk factors were significantly lower than across asset classes. Hence, to diversify across risk factors should be more efficient than to diversify across asset classes.) A risk factor represents exposure to a particular risk and helps explain the variation

in the returns of a security. For example, the "duration" risk factor measures a security's price sensitivity to a change in the bond yield curve, or more broadly, in interest rates, while the "equity" risk factor measures the sensitivity of a security's price to changes in equity markets (holding all other factors constant). The return exhibited by any asset class can be explained by its aggregate risk factor exposures and the correlation among the factors. Figure 2 shows the contribution to volatility by risk factor for several asset classes.

The chart highlights not only the disproportionate contribution to volatility of the equity risk factor but also the equity risk exposure of property. So adding property to an already equity-heavy portfolio can actually be adding risk instead of adding diversification benefits.

The results

To analyze the risk in typical retirement portfolios, we modelled the risk factor exposures for our four model portfolios (see Figure 3).

We found that Australian retirement portfolios are heavily exposed to one common risk factor: equity risk. This tells us that asset class diversification does not equate to risk factor diversification. For example, while equity investments make up 39% and 25% in the SMSF model and the SMSF + primary property model, the equity risk factor contributes 99% and 74% to volatility, respectively.

In the retail superannuation fund model, equities contribute around 4.7 percentage points to volatility. The situation worsens when primary housing is added. Because property is highly correlated to stocks, equity-driven risk increases to 7 percentage points.

Figure 4 shows that the expected return for retail superannuation funds (4%) is only slightly below the expected return for SMSF models (4.4%). However, the two models show vastly different risk characteristics: Based on our analysis, SMSF models excluding property exhibit around double the volatility of equivalent retail superannuation fund models. Moreover, the volatility during turbulent markets and the Conditional Value at Risk (CVaR) are more than twice as high for these SMSFs. Another observation is the increase in risk once the primary property is included. For retail superannuation fund models, the expected loss in a bad year (one in 20 years probability) as measured by the CVaR is about three times as high when including property investment.

The typical retail superannuation fund models have a higher allocation to fixed interest and lower allocation to equities than typical SMSF models (Figure 1). It is little surprise then that SMSF models experience more absolute volatility. With the equity risk factor contributing 99% of the total risk to the SMSF model excluding property, there is little room for other risk factors to act as meaningful diversifiers in stock market downturns. As a result, the average loss SMSF investors are expected to experience in a bad year as measured by the CVaR is a fifth of their wealth excluding property and a quarter of their wealth including property.

Cash is considered a safe-haven investment by many retirees. However, Figure 4 painfully highlights the inefficiency of this investment strategy in a portfolio context. SMSF model portfolios typically hold high cash allocations of 32% (Figure 1), and their Sharpe Ratios, which measure risk-adjusted returns, are lower than those of the retail superannuation fund models, which hold significantly less cash. Cash seems to offer almost no diversification benefits due to its low and static performance – essentially almost zero volatility (and risk premium). By comparison, bonds have historically not only provided more income with only marginally higher volatility, but also offered investors better downside protection due to their negative-to-low correlation with equities.

Figure 4: Risk and return expectation of income portfolios

	SMSF Model		SMSF Model (incl. Property)		Retail Super Model		Retail Super Model (incl. Property)	
	Full sample	Turbulent	Full sample	Turbulent	Full sample	Turbulent	Full sample	Turbulent
Return p.a.	4.4%	4.4%	5.7%	5.7%	4.0%	4.0%	6.1%	6.1%
Volatility	9.8%	17.1%	12.8%	20.8%	4.9%	7.3%	12.8%	19.1%
CVaR	19.4%	32.8%	25.3%	41.2%	7.2%	12.4%	23.7%	37.1%
Max Drawdown	10.6%	19.7%	13.9%	23.9%	4.8%	7.7%	13.7%	21.6%
Sharpe Ratio	21.2%	12.1%	26.1%	16.0%	32.3%	21.8%	28.9%	19.4%

Source: PIMCO as of 31 January 2017

Conclusions

After analyzing the risks in typical Australian retirement portfolios, we can draw several broad conclusions for investors.

- Many Australians may be overly focused on income, which results in a concentrated exposure to high dividend stocks and property.
- For equity and property heavy portfolios, additionally relying upon income from deeply subordinated hybrid capital securities further intensifies this risk concentration. It may be advantageous to target income from sources that are lowly correlated with the prospects for Australian house prices.
- A properly constructed retirement portfolio is diversified across several risk factors rather than simply across asset classes. Low to negative correlations, such as between fixed interest and equities, should be harvested.
- Property cannot be relied on as a diversifier. Although the real estate boom has skewed many investors' asset allocations to property, the risks in property and equity are positively correlated.
- It is important to keep an eye on cash allocations. With a cash rate of 1.5% currently and term deposits not offering significantly higher rates, the opportunity cost of sitting in cash has increased in recent years, penalizing investors.
- Portfolios should be stress-tested for different market environments to understand the potential for volatility and losses, which is crucial for investors nearing or in retirement.
- Quality financial advice can help. An experienced financial planner can assess future spending and liquidity requirements and construct portfolios that aim to bring return, risk and income expectations in line with individual objectives.

Appendix

CVaR

Conditional Value at Risk (CVaR) estimates the risk of loss of an investment or portfolio over a given time period (one year in our analysis) under normal market conditions in terms of an average of loss after a specific percentile threshold of loss (95% in our analysis). Under the specific modeling assumptions used, the portfolio will incur an average loss in excess of the CVaR five percent of the time. Different CVaR calculation methodologies may be used. CVaR models can help understand what future return or loss profiles might be. However, the effectiveness of a CVaR calculation is in fact constrained by its limited assumptions (for example, assumptions may involve, among other things, probability distributions, historical return modeling, factor selection, risk factor correlation, simulation methodologies). It is important that investors understand the nature of these limitations when relying upon CVaR analyses.

Maximum Drawdown

Maximum drawdown is measured as the average of the distribution of maximum drawdowns across 15,000 simulated annual paths under normal market conditions. This number represents an expected peak to trough drawdown within a one year time horizon.

Return (estimated)

For indices and asset class models, return estimates are based on the product of risk factor exposures and projected risk factor premia which rely on historical data, valuation metrics and qualitative inputs from senior PIMCO investment professionals.

Sharpe Ratio

The Sharpe Ratio measures the risk-adjusted performance. The risk-free rate is subtracted from the rate of return for a portfolio and the result is divided by the standard deviation of the portfolio returns.

Tail Risk

A tail event is a portfolio outcome that is unpredictable and highly unlikely under the assumption that returns follow a normal distribution.

Volatility (estimated)

We employed a block bootstrap methodology to calculate volatilities. We start by computing historical factor returns that underlie each asset class proxy from January 1997 through the present date. We then draw a set of 12 monthly returns within the dataset to come up with an annual return number. This process is repeated 25,000 times to have a return series with 25,000 annualized returns. The standard deviation of these annual returns is used to model the volatility for each factor. We then use the same return series for each factor to compute covariance between factors. Finally, volatility of each asset class proxy is calculated as the sum of variances and covariance of factors that underlie that particular proxy. For each asset class, index, or strategy proxy, we will look at either a point in time estimate or historical average of factor exposures in order to determine the total volatility. Please contact your PIMCO representative for more details on how specific proxy factor exposures are estimated. FS