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Vanguard's approach to constructing Australian Diversified Funds

Vanguard Research

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- When constructing a portfolio, there are a number of elements to consider including the investment objective, time horizon, risk tolerance, tax, cost, and investor behaviour. We categorise all of these considerations into four key investing principles, Goals, Balance, Cost, and Discipline.¹
- Vanguard's Diversified Funds are designed to address these elements while incorporating these four principles to construct professionally managed, low cost, and diversified portfolios.
- This paper explores Vanguard's framework for designing its Diversified Funds in Australia. We explain the rationale for the asset allocation of the funds and discuss the importance of some key implementation considerations, such as the use of index versus active strategies and the importance of rebalancing.

Acknowledgement: The authors thank Vanguard's Global Single Fund Solutions Working Group, and in particular Francis M. Kinniry Jr and Scott J. Donaldson, for their contributions to this whitepaper.

¹ See Vanguard's *Principles for Investing Success*.

Key portfolio construction considerations

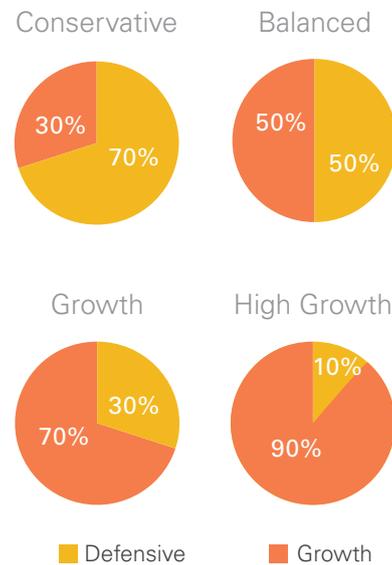
When it comes to portfolio construction, many investors lack the time, interest, or skills, and can become overwhelmed by the choice of investment options, asset classes, and other implementation hurdles such as choosing between index vs. active management. Investors also face behavioural risks in adhering to their investment plan over time due to the temptation of performance chasing or overreacting to market events. Vanguard's Diversified Funds provide professionally-managed portfolio solutions designed to help medium to long-term investors achieve their goals and overcome these challenges. At the core of Vanguard's approach to portfolio construction are four key principles: *Goals*, *Balance*, *Cost*, and *Discipline*.²

- 1. Goals** — Investors should have a clearly stated and appropriate goal for their investments.
- 2. Balance** — The asset allocation should be balanced in its exposures to various asset classes and be appropriate for the goal.
- 3. Cost** — Minimising investment costs improves the chance of better long-term outcomes.
- 4. Discipline** — Investors and investment strategies that stay with their approach across different environments have the best chance at investment success.

By adhering to these key principles the portfolios are consistent with Vanguard's investment principles of asset allocation, diversification and transparency, and maintaining the balance among risk, return, and cost.

In determining the asset allocation of the Diversified Funds, the focus is to design well balanced, disciplined funds, and deliver a professionally managed, diversified

Figure 1: Asset allocations of Vanguard's Diversified Funds



Source: Vanguard.

portfolio. As shown in **Figure 1** the funds cover different growth/defensive asset mixes catering to a variety of goals, risk tolerances and time horizons. Ultimately the key objective of these single-fund solutions is to maximise the chances of investment success by providing solutions that are low-cost and meet the primary portfolio construction needs of most investors.

² See *Vanguard's Principles for Investing Success*.

Notes on risk and performance data: All investments, including a portfolio's current and future holdings, are subject to risk, including the possible loss of the money you invest. Past performance is no guarantee of future returns. The performance of an index is not an exact representation of any particular investment, as you cannot invest directly in an index. Diversification does not ensure a profit or protect against a loss in a declining market. There is no guarantee that any particular asset allocation or mix of funds will meet your investment objectives or provide you with a given level of income. Be aware that fluctuations in the financial markets and other factors may cause declines in the value of your account. Bond funds are subject to the risk that an issuer will fail to make payments on time, and that bond prices will decline because of rising interest rates or negative perceptions of an issuer's ability to make payments.

The Diversified Funds are designed to provide return outcomes over the long-term that are commensurate with the level of risk assumed. For example, the Conservative asset allocation is expected to have a lower return than the Growth asset allocation, albeit at lower risk. That said, all of the Diversified Funds are designed with a medium to long-term investor in mind (a time horizon of at least 5 years). Some investors with shorter-term financial goals or extremely low risk tolerances may find cash or other low-volatility vehicles to be a suitable investment. But the reality is that the majority of Australian investors need to accept some market risk in order to reach intermediate to long-term investment goals.

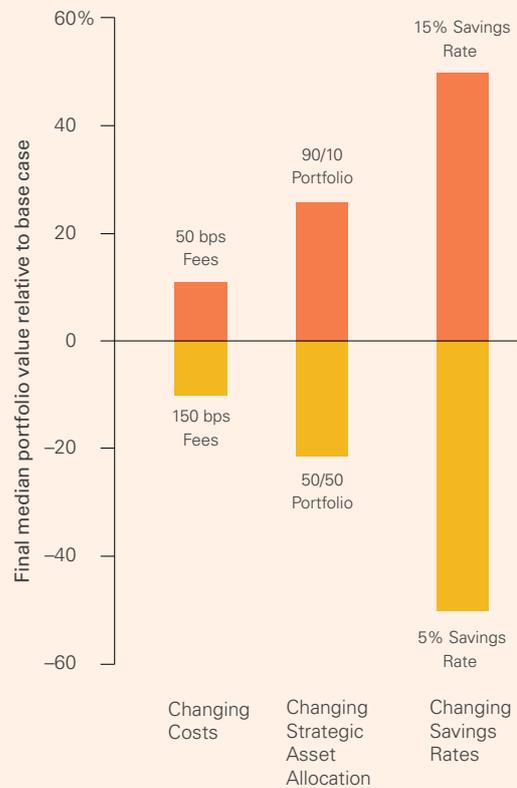
This paper approaches the construction and maintenance of diversified portfolios by exploring the following components:

1. Broad asset-class allocations.
2. Sub-asset allocations within the growth and defensive splits, including assessments of home bias.
3. Currency hedging decisions for global equities and bonds.
4. The role of property.
5. Consideration of other asset classes or alternative investment strategies.
6. The decision to implement using active or passive management.
7. Regular rebalancing to maintain the risk-return profile of the funds.

Focus on what you can control:

There are only a few key factors that can be readily controlled by investors: costs, asset allocation and savings rates are some of the biggest. As shown in **Figure 2**, these aspects of investing can be extremely influential in determining the final outcome of a portfolio. While the focus of this paper is on asset allocation, investors can improve outcomes by saving more and/or spending less on fees.

Figure 2: Quantifying the value-add of best practices in wealth management



The base case is 100 bps (1%) fees, 70/30 portfolio and 10% savings rate.

Notes: Simulation assumes a 25 year-old investor investing to retirement at age 65, earning \$80,000 per annum growing at a real rate of 2%. Percentage values shown indicate the difference in median final values of the adjusted portfolios relative to the base case.

Sources: Vanguard, from VCMM forecasts (see appendix).

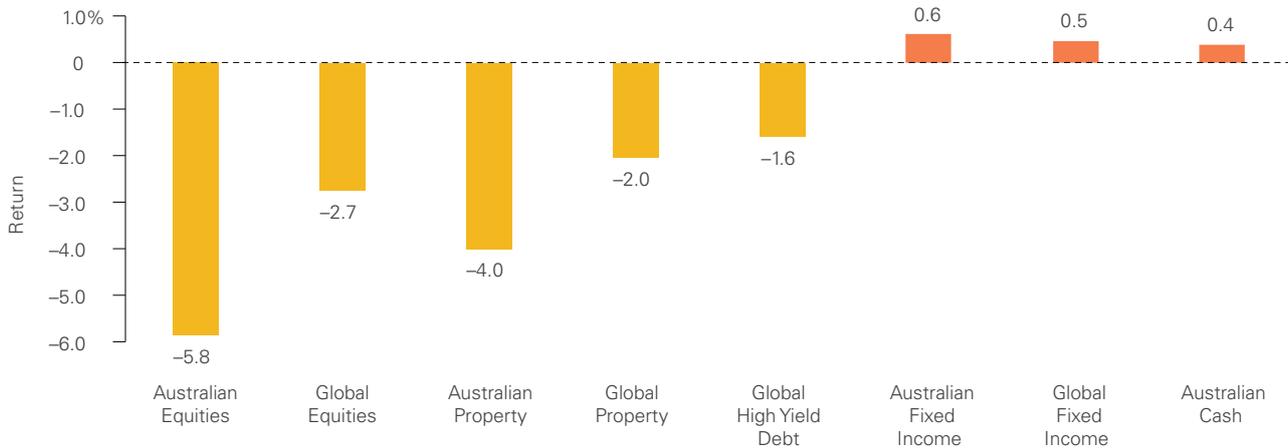
Figure 3a: Low and negatively correlated assets provide diversification and reduce risk in a portfolio

Rolling Five Year Correlation between Equity and Fixed Income



Figure 3b: Diversification is particularly critical during periods of market stress

Median Asset Returns during the Worst Decile of Australian Equity Months February 1992 to December 2016



Notes: Figure 3a: The chart shows the rolling five year correlation for various asset classes. The dataset runs from 30 April 1990 to 31 December 2016. The bond index is constructed from a 30% weighting to Bloomberg Ausbond Composite Index and 70% to Bloomberg Barclays Global Aggregate Index hedged into AUD. The equity index is constructed from a 40% weighting to S&P/ASX 300 Accumulation Index and 60% to MSCI World ex Australia Index.

Figure 3b: Median asset returns during the worst decile of Australian equity monthly returns for the period 31 February 1992 to 31 December 2016. Australian Equities – S&P/ASX 300 Accumulation Index, Global Equities – MSCI World ex Australia Index, Australian Property – S&P/ASX 300 A-REIT Index, Global Property – FTSE/NAREIT Developed Index in AUD, Global High Yield Debt – 1992 to 1998 US Corporate High Yield Index Local Currency and 1999 to 2016 Global High Yield USD Hedged, Australian Fixed Income – Bloomberg Ausbond Composite Index, Global Fixed Income – Bloomberg Barclays Global Aggregate Index hedged into AUD, Australian Cash – Bloomberg AusBond Bankbill Index.

Sources: Bloomberg, Barclays Live, FactSet, Thomson Reuters Datastream.

Broad asset-class allocation

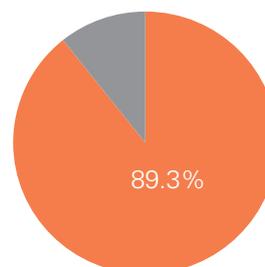
The portfolio construction process of the Diversified Funds follows a top-down hierarchy that starts by defining broad asset class allocations (equities, fixed income and cash),³ and then the weightings of the various specific assets (such as domestic versus international equities or bonds). As noted in **Figure 3a**, the low and often negative correlation between equities and fixed income makes these asset classes excellent complements.

The use of fixed income provides a strong ballast to equity risk during periods of market stress (**Figure 3b**), dampening portfolio losses and volatility. Additionally, the use of fixed income rather than cash to diversify equity risk captures the duration benefits and the term premium associated with holding longer dated bonds.

Vanguard research covering Australia as well as the US, Canada, UK, Japan, and Hong Kong markets shows that the Strategic Asset Allocation (SAA) decision drives the vast majority of portfolio return movement, rather than market-timing or security selection pursuits (**Figure 4**).⁴ As such, the broad allocations to defensive (fixed income) and growth (equities) are the main determinants of the risk-return profiles of the Diversified Funds' portfolios.

Figure 4: The strategic asset allocation drives the investment experience

Percentage of return variation explained by policy return



Notes: For each fund in our sample, a calculated adjusted R^2 represents the percentage of actual-return variation explained by policy-return variation. The percentage shown in the figure represents the median observation from the distribution of percentage of return variation explained by asset allocation for balanced funds. The Australian market sample covered 600 balanced funds from January 1, 1990, through June 30, 2016. Calculations were based on monthly net returns, and policy allocations were derived from a fund's actual performance compared with a benchmark using returns-based style analysis (as developed by William F. Sharpe) on a 36-month rolling basis. Funds were selected from Morningstar's Multi-Sector Balanced category. Only funds with at least 48 months of return history were considered in the analysis. The policy portfolio was assumed to have an expense ratio of 2.0 bps per month (24 bps annually, or 0.24%).

Sources: Vanguard calculations, using data from Morningstar, Inc.

Understanding Vanguard's SAA Process

For multi-asset funds, such as Vanguard Australia's Diversified Funds, Vanguard's Investment Strategy Group (ISG) conducts an annual review of the strategic asset allocation (SAA) of the funds. The team considers new asset classes, currency exposure, home bias, regulatory and tax impact, investment costs, investor behaviours, and implementation factors amongst others. The ISG team presents a recommendation to maintain or change the SAA to Vanguard's global Strategic Asset Allocation Committee (SAAC), which oversees all of Vanguard's multi-asset funds. The SAAC is comprised of senior leaders from the Investment Management Group and Vanguard's advice businesses and is co-chaired by Vanguard's global Chief Investment Officer and global chief economist. Upon approval of a change to the SAA, Vanguard assesses the feasibility, tax impact, and costs of the recommended changes and presents to the Board of Vanguard Australia for approval prior to implementing the changes.

³ Cash is a component of the Conservative option asset allocation only.

⁴ See *The global case for strategic asset allocation and an examination of home bias* (Scott et al., 2016).

Figure 5 shows the distribution of forecasted annualised returns and the volatility over a 10-year horizon for the four Diversified Fund portfolios based on Vanguard’s Capital Markets Model (VCMM) (see appendix). Higher volatility portfolios are expected to produce higher returns as a compensation for bearing the extra risk. Riskier portfolios are also shown to increase the dispersion of potential returns over the 10-year period to both the upside and downside. In selecting the most appropriate portfolio, an investor and advisor must understand this trade-off to ensure that the chosen SAA best aligns with the investor’s risk tolerance, return needs, and time horizon.

Sub-asset allocation

We build diversified sub-asset class exposures to achieve the objective of gaining broad market capitalisation exposure to equities and bonds. This is a critical step in order to reduce risks associated with a particular company, sector, or market segment.

Diversification takes place as different market segments or individual securities behave differently over time. The allocation between Australian markets and non-Australian securities (both for bonds and equities) adds another diversification benefit. A global asset allocation can reduce risks associated with issuer concentration, sector concentration, and country specific risk, to name a few.

Asset composition within the growth allocation

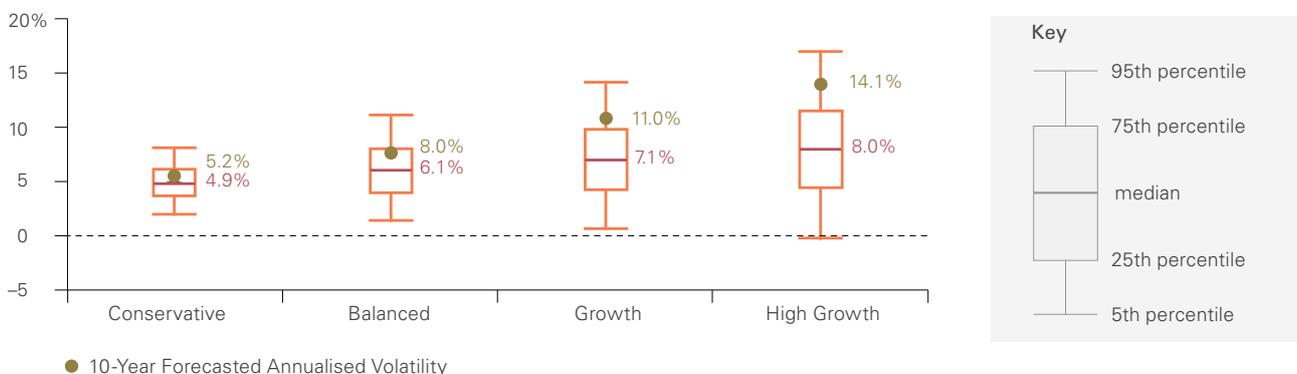
The growth allocation provides exposure to assets with higher expected returns, which serves to protect and grow real spending power over the long term, and is achieved primarily through exposure to equities. To support the objectives of the Diversified Funds, we believe that the best way to incorporate the benefits of diversification is via a market-cap weighted exposure to all the segments of the market.⁵

Figure 6 shows the relative performance of various Australian and global equity market sectors. The annual performance follows no discernible pattern, and strategies that tilt or time the portfolio in an effort to outperform also run the risk of substantial underperformance relative to the broad market. Thus, given the long term investment philosophy behind the Diversified Funds, tactical tilts are avoided, reducing active management risk for the end investor.

Home bias is the tendency for investors to hold a significant portfolio weight in domestic equities, despite the observed benefits of global diversification. The Australian market capitalisation is 2.7% of the global developed equity markets,⁶ but Australian investors allocate about half of their equity allocation to domestic shares.⁷ Reduction in home country equity bias has been taking place both globally and in Australia, due to a number of trends, such as increased access to global investment vehicles, awareness of the value of global

Figure 5: Understanding the risk/return trade-off is essential to selecting the portfolio that meets an investor’s needs

Annualised Return Distribution and Median Volatility over a 10-year Horizon



Notes: The chart shows the 5th, 25th, 50th, 75th and 95th percentiles of forecasted returns for the four Diversified Funds over a ten year period.

Source: Vanguard, from VCMM forecasts (see appendix).

5 See Vanguard’s framework for constructing diversified portfolios (Donaldson et al., 2017)

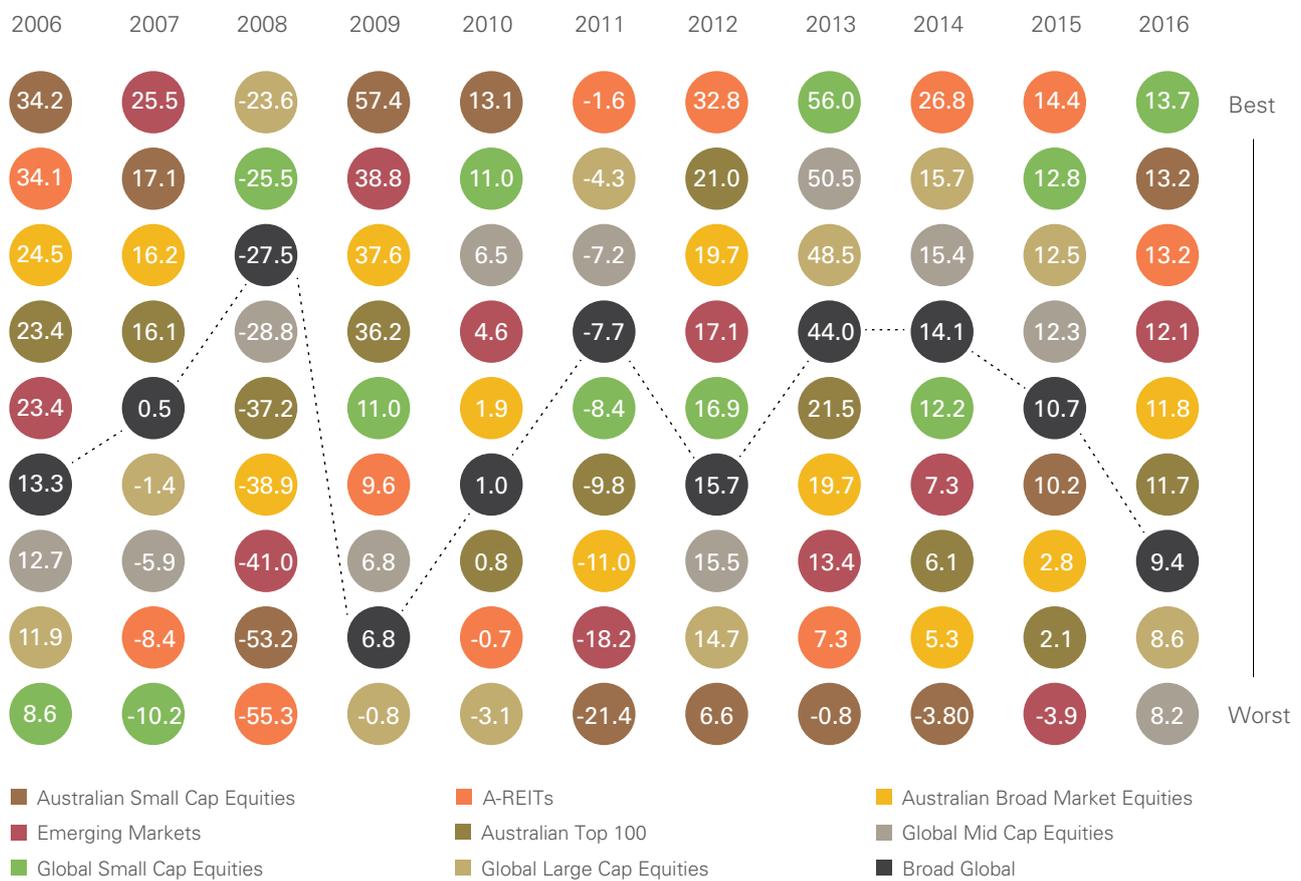
6 MSCI World Index, source: Factset.

7 Source: Rainmaker.

diversification, product availability, and lower costs.⁸ In Australian superannuation however, the reduction in domestic equities has not been matched by a corresponding increase in global equity — instead, the higher allocations have gone to Alternatives and Cash, which introduce different risks in the portfolio that we explore later (Figure 7). Self-Managed Super Funds (SMSFs) demonstrate even higher levels of home equity bias — of their assets, 30% are in direct domestic shares, 15% in domestic property, and 25% in cash and

term deposits. SMSFs preference for franking credits and direct domestic share ownership exposes them to a concentrated selection of Australian large caps.⁹

Figure 6: Out and underperforming sector returns (%) follow a seemingly random pattern



Notes: These returns (%) are for calendar years and are total return, inclusive of dividends reinvested. Indices used: Global Large Cap Equities – MSCI World ex-Au Large Cap; Global Mid Cap Equities – MSCI World ex-Au Mid Cap; Global Small Cap Equities – MSCI World ex-Au Small Cap; Emerging Markets – MSCI Emerging Markets; Broad Global – S&P Global Broad Market; Australian Broad Market Equities – S&P/ASX 300 Accumulation Index; Australian top 100 – S&P/ASX 100 ; Australian Small Cap Equities – S&P/ASX Small Ordinaries; A-REITS – S&P/ASX 300 A-REIT;

Sources: Vanguard’s Investment Strategy Group using data sourced from Factset.

8 For a more detailed discussion on home bias in the equity allocation see Scott et.al (2016).

9 Australian Taxation Office, Self-managed super fund statistical report June 2016. Australian Government.

Factors contributing to home bias

There are a number of reasons why investors prefer home country equities, some of which are behavioural and some of which have sound investment rationale. While behavioural drivers can have a strong influence on the degree of home country bias in an investor's portfolio, understanding the risks associated with concentrating your portfolio to a single market, will lead to better investment outcomes.

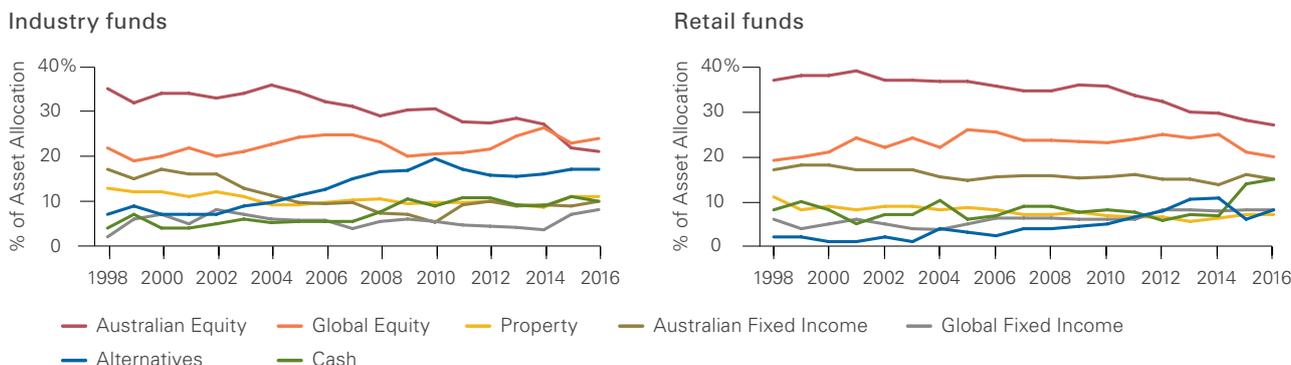
In determining the preferred level of home bias, key factors to consider include the diversification benefit of adding foreign securities, local market sector and security concentration, domestic tax treatment, and other domestic market risk factors.

The above listed factors are globally observed, however, a significant factor which dominates in its influence on the home bias decision for Australian investors is the tax treatment of dividend income, under Australia's dividend imputation tax system.

Dividend Imputation Tax System

Introduced in 1987 with the objective to prevent double taxation of dividend income, franking credits apply to the tax paid on earnings generated from the domestic activities of Australian companies. The distribution of franking credits reduces the applicable tax rate on dividend income to that of the end investor. For investors with a lower tax rate than the corporate rate, a cash refund is received. The claims supporting the merits of a dividend imputation system include: a reduction in the cost of equity capital; and placing equity and debt capital on an equal footing which leads to lower leverage in the corporate sector. However, counter claims include: misallocation of capital toward domestic projects and away from foreign expansion; and higher investor allocations to domestic equities, compromising diversification. The influence of the dividend imputation system has also raised questions about the sustainability of dividend yields with Australian companies paying out 86% of their earnings,¹⁰ the highest rate among developed economies. Lending some weight to the arguments against dividend imputation, the Financial System Inquiry Final Report,¹¹ commented that dividend imputation may be less beneficial than in the past, as it potentially distorts the allocation of funding.

Figure 7: Home bias in equities has declined but has been replaced with alternatives and cash in Superannuation funds



Sources: Vanguard's Investment Strategy Group using data sourced from Rainmaker.

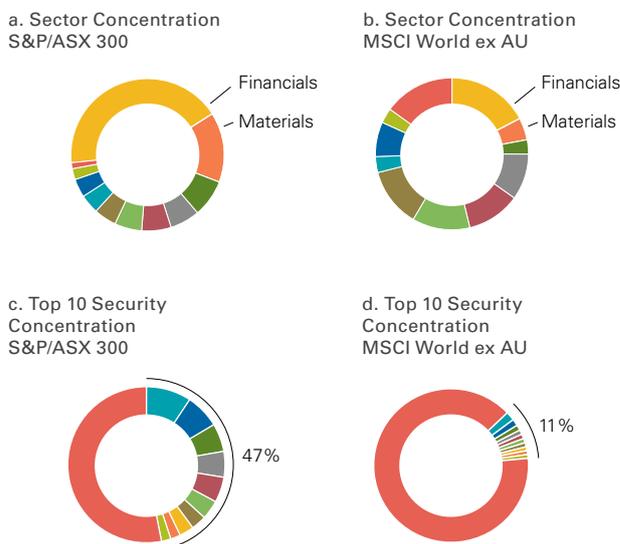
10 Vanguard calculations using data sourced from Factset.

11 Financial System Inquiry Final Report, 2014. Commonwealth of Australia.

Regardless of the perceived benefits of franking credits, which are debatable and vary by investor, concentration is a key risk, so reducing home bias provides substantial benefits in creating a diversified portfolio. At the sector level, the Australian share market is concentrated in Financials and Materials — which make up 62% of the market (Figure 8a), versus 22% globally (Figure 8b). At the issuer level, the top 10 stocks make up 47% of the market (Figure 8c), vs. 11% (Figure 8d) globally. These risks can be significantly reduced by an increased global equity allocation.

Our VCMM analysis on home country equity bias suggests that without sacrificing returns, volatility is indeed reduced when increasing the exposure to global equity. Based on history, however, Figure 9 shows that there is no consistently optimal, volatility-reducing home bias allocation. Figure 10 provides an assessment of home bias factors and how they relate to the Australian equity market.

Figure 8(a-d): The Australian equity market is concentrated at the sector and issuer level

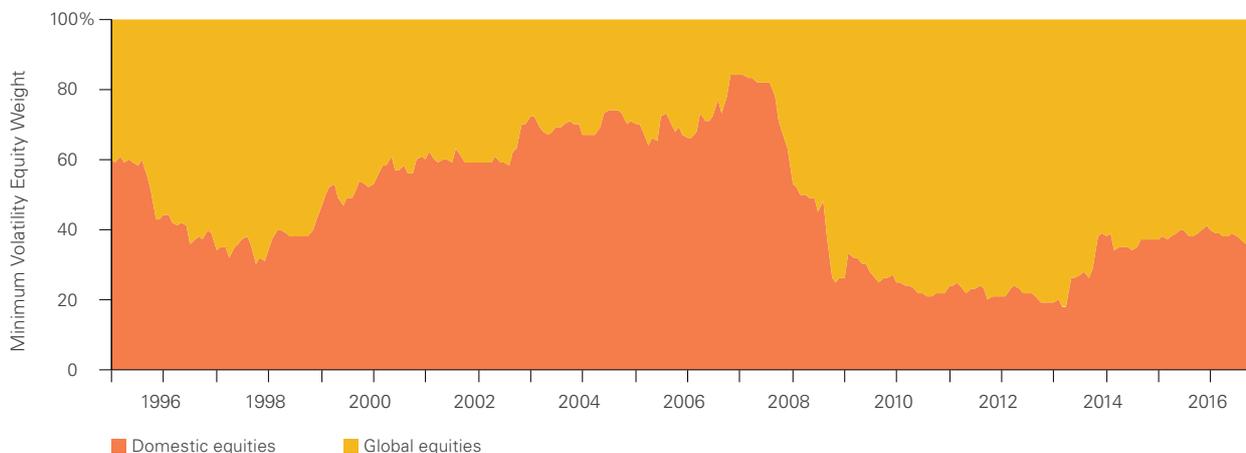


Note: S&P/ASX 300 Accumulation index versus MSCI World ex-Australia in AUD (as of Dec. 2016).

Sources: Vanguard's Investment Strategy Group, based on data sourced from Factset.

Figure 9: The volatility minimising home bias has varied through time

Rolling 5 Year Equity Home Bias Minimum Volatility Portfolio



Note: The chart shows the portfolio weights of the minimum volatility equity portfolio based on rolling 5 year periods from January 1990 to December 2016. Domestic equities is represented by S&P/ASX 300 Accumulation Index and global equities by MSCI World ex Australia Unhedged Index.

Sources: Vanguard, based on data sourced from Factset.

Figure 10: Australian assessment of factors affecting the decision to invest in global assets



Validate home bias		Reduce home bias	
Risk and return impact of adding foreign securities			Significant diversification benefits
Domestic-sector concentration			Sector concentration is high
Domestic-issuer concentration			Security concentration is high
Domestic transaction costs		Consistent with global markets	
Domestic liquidity		Consistent with global markets	
Domestic asset taxes	Some benefits exist		
Other domestic market risk factors ¹²		Nothing notable for Australia	

Sources: Vanguard Investment Strategy Group, adapted from Scott (2016).

Allocation within the defensive allocation

The allocation to bonds plays a critical role in the asset allocation mix by providing downside protection during periods of equity market volatility. They fulfill the role of the defensive split within a portfolio, providing diversification and a buffer against equity risk during downturns.

The three key principles underpinning Vanguard’s selection of bonds for the diversified funds are: Diversify broadly by issuer type and maturity; balance domestic and global exposure to increase diversification benefits; and hedge currency to preserve the defensive characteristics of the underlying bonds.

Broad diversification

To capture the defensive characteristics of bonds, it is critical to hold a broadly-diversified allocation to high quality, investment grade bonds across maturities. While the potential for additional income from holding high yield bonds may be attractive, it brings with it a higher correlation to equities, compromising diversification when it is most needed (Figure 3b). Figure 11 illustrates that the globally diversified broad benchmark (Global Aggregate) provides the most consistent outcome compared to selecting the individual components in isolation.

Domestic / Global mix

As with the equity allocation, we believe in forming a globally diversified mix of Australian and global bonds. Selecting the preferred domestic/global bond mix can be driven by a range of considerations, including, investor goals and objectives, a requirement to match domestic liabilities, currency hedging costs and risks, and the diversification benefits of holding global bonds.¹³ The expected portfolio diversification benefits of bonds increase with the inclusion of globally diversified bond exposures. This is due to the imperfect correlation of interest rates and inflation between Australia and other countries, as well as the diversity of issuers within the global indices, comprising some 18,000 issues within the Bloomberg Barclays Global Aggregate index compared to around 300 issues within the Bloomberg AusBond Composite index. Just as with equities, however, there has not been a consistently optimal historical domestic/global bond allocation to minimise volatility (Figure 12).

¹² Factors vary but may include geopolitical risks, governance risks and restrictions on investors.

¹³ For a more detailed discussion on the case for global bonds, see Philips et al. (2014).

Figure 11: Bond market sub-sectors display wide returns (%) variation relative to the broad market

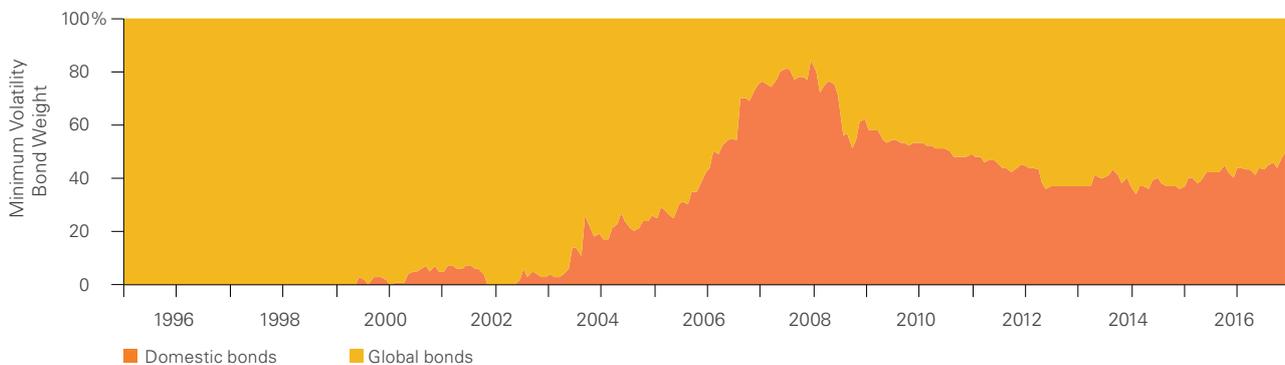


Notes: Calendar year total returns (%) for stated benchmarks. Aust. Composite is represented by the Bloomberg AusBond Composite 0+Y Index, Australian Credit by Bloomberg AusBond Credit 0+Y Index, Aust. Govt. Bonds by Bloomberg AusBond Govt 0+Y Index, Aust. Bank Bill by Bloomberg AusBond Bankbill Index, Global Aggregate by Bloomberg Barclays Global Aggregate Hedged in AUD, Global Corp. Bonds by Bloomberg Barclays Global Corporates Hedged in AUD, Global Govt. Bonds by Bloomberg Barclays Global Government Related Hedged in AUD, Global Securitised by Bloomberg Barclays Global Securitised Hedged in AUD, Global High Yield by Bloomberg Barclays Global High Yield Hedged in AUD.

Sources: Bloomberg, Barclays Live.

Figure 12: The volatility minimising home bias has varied through time

Rolling 5 Year Bond Home Bias Minimum Volatility Portfolio



Note: The chart shows the portfolio weights of the minimum volatility bond portfolio based on rolling 5 year periods from February 1990 to December 2016. Domestic bonds is represented by the Bloomberg Ausbond Composite Index and Global bonds by Bloomberg Barclays Global Aggregate Index Hedged in AUD.

Sources: Vanguard, based on data sourced from Barclays Live, Bloomberg and Factset.

Bonds over cash for defensive exposure

There are some important contrasts between holding bonds for defensive exposure and holding cash. Bonds have provided greater diversification benefits with risky asset classes, such as equities, compared to cash. The interest rate duration of bonds, has led to a greater degree of downside protection during periods of negative equity markets, as shown in **Figure 3b**. Vanguard does not believe that cash plays a meaningful role in a diversified portfolio with a long term horizon, as investors are giving up the term premium received by holding duration exposure. In addition, over the long term, bonds would be expected to provide better protection against inflation than cash. Cash is held within the Conservative portfolio, however, as it helps to shield against short term inflation shocks.

The case for currency hedging bonds

Holding global bonds with low, or even negative yields, still makes sense for long term investors. For a global portfolio which hedges currency risk, investors can

capture the difference in yield when their home currency has higher short term interest rates than the currencies of other bond markets. For an Australian investor, when currency is hedged to AUD, global bonds provide similar returns to domestic bonds of similar quality and duration, while capturing the additional diversification benefits of a global portfolio (see **Figure 14**).

The case for currency hedging requires assessment of a range of factors, which is explored further in the next section. In the case of bonds the investment considerations are clear cut — when overseas bonds are left unhedged, the volatility of the currency can offset the diversification benefits of holding bonds in a multi-asset portfolio (**Figure 15**). As such, Vanguard’s position is to fully hedge the currency exposure of global bonds. The case for hedging the currency risk from holding global equities is considered further in the next section.

The role of bonds in a rising rate environment

The period of low rates and anticipated rate increases since the Global Financial Crisis has led many investors to attempt to protect their portfolio by shortening duration within the defensive assets.¹⁴

We caution investors against trying to time allocations to cash and short duration fixed income. In general, a short duration strategy entails substantial foregone income,

and the market also prices in expectations for future interest rate movements. **Figure 13** shows that, in a scenario where the yields expected by the market are realised, both short term and long term treasuries will perform in line with the broader index. It is only in the unexpected scenarios that a bet on short (high yield) or long (low yield) duration may pay off, however, this carries risks if the alternative scenario plays out.

Figure 13: Duration tilts: Short-duration strategies are not without risks



Note: Forecast displays the distribution of 10,000 simulations of VCMM for 5 year annualized returns of the asset classes shown as of December 2016 in AUD. The chart shows the 5th, 25th, 50th, 75th and 95th percentiles. The scenarios are obtained based on sorting the 3-month and 30 year treasury yield at the end of every year from VCMM. The three scenarios combined are a subset of the 10,000 simulations from VCMM. Treasury Index – Bloomberg AusBond Aggregate Treasury Bond Index, Short Term (ST) Treasury Index – Bloomberg AusBond Aggregate Treasury 1-5 Yr Bond Index, Long Term (LT) Treasury Index – Bloomberg AusBond Aggregate Treasury 10+ Bond Index.

Sources: Vanguard, from VCMM forecasts (see appendix).

¹⁴ For further discussion on the role of bonds in a rising rate environment, see Westaway et al. (2015).

Figure 14: Currency hedging provides additional return when the bonds of low yield countries are hedged back to Australian dollars.

Estimated bond returns when hedged to AUD

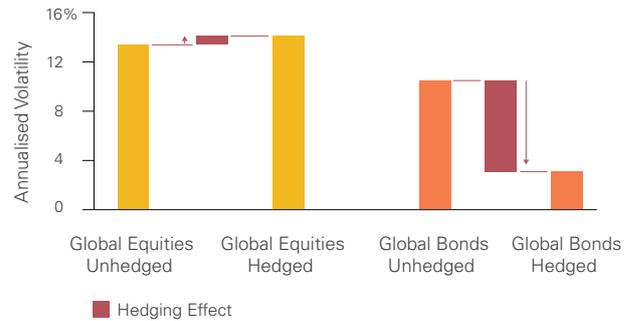


Note: The figure displays estimated hedged bond returns. Currency hedge returns are calculated as the difference between the Australian 1-month bank-bill rate and the 1-month LIBOR or equivalent rate from the designated country.

Sources: Vanguard calculations using data from Bloomberg for 31 December 2016.

Figure 15: Unlike the case for currency exposure within equities, if bonds are left unhedged, currency volatility will significantly add to risk.

The Effects of Hedging Currency on Global Stocks and Bonds



Notes: Comparisons of unconditional volatilities based on monthly returns for the period 28 February 1990 to 31 December 2016. Note that the MSCI World ex Australia with local currency was used as a proxy for AUD hedged global equities. Other indices used: MSCI World ex Australia for unhedged global equities, Bloomberg Barclays Global Aggregate Hedged in AUD for global hedged bonds and Bloomberg Barclays Global Aggregate Unhedged in AUD for unhedged global bonds.

Sources: Barclays Live, Factset.

Portfolio currency exposure and hedging considerations

By investing in global assets — be they equities or bonds — exposure to foreign currency is created. How investors elect to manage foreign currency exposure depends primarily on three factors:

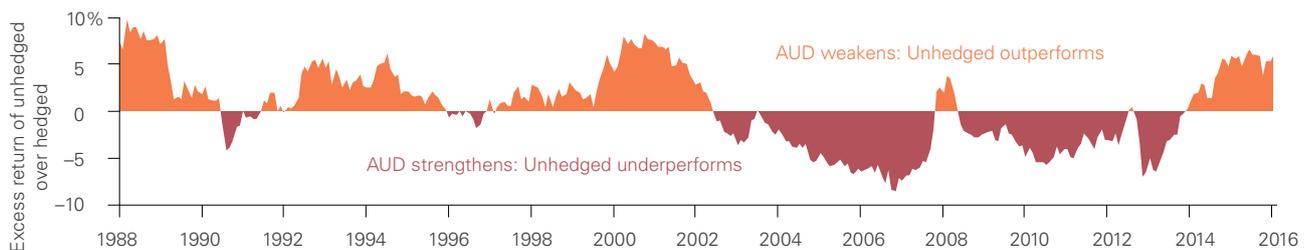
1. Investment considerations
2. Behavioural factors
3. Cost effective implementation.

Absent of cost considerations, it is a reasonable forward-looking assumption that over extended time horizons, the gross returns will be similar between a hedged and unhedged investment. As shown in **Figure 16**, returns have fluctuated over time. Therefore, we believe that the decision of whether to hedge currency exposure should be based primarily on risk, not return.

The preferred level of currency exposure balances the investment case for holding currency exposure, with behavioural considerations and implementation costs. Following is an assessment of how an Australian investor may think of these factors.

Figure 16: Returns from currency vary, though currency exposure doesn't deliver a long term expected return.

5 year annualised excess return of Unhedged vs Hedged return (MSCI World ex AU)



Notes: The excess return of unhedged equities is calculated by subtracting the return of hedged equities from the return of unhedged equities for the period 31 December 1983 to 31 December 2016. The return of unhedged equities is the rolling 5 year annualised return of the MSCI World ex Australia index AUD Unhedged. The return of hedged equities is the rolling 5 year annualised return of the MSCI World ex Australia index AUD Hedged (ignoring interest rate differentials).

Sources: Vanguard calculations using data from Factset.

Factors influencing the currency hedging decision

1. Investment considerations

What is the relationship between the investor's home currency and overseas equities?

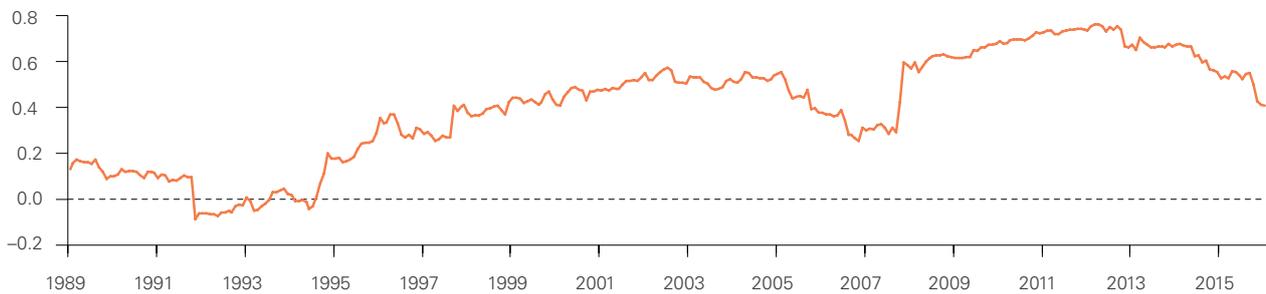
The correlation of an investor's home currency to global equities has a bearing on the diversification benefits of currency exposure. The Australian dollar has displayed a positive correlation to overseas equities through most of its post float history (the Australian dollar floated in December 1983). This would suggest a higher allocation to foreign currency is appropriate for Australian investors. However, the correlation has varied considerably through time and can't always be relied upon to be a source of diversification over shorter time periods (Figures 17a and 17b).

Do all investors benefit from the diversification benefits of foreign currency exposure?

Due to the time varying relationship between the Australian dollar and global equities, not all investors will be better off by being exposed to currency fluctuations throughout their investment time horizon. Hedging a component of foreign currency can provide a more consistent experience across different investors regardless of the period during which they were invested. Figure 18 illustrates that, historically, the dispersion of return outcomes for investors across different time periods would have narrowed with the introduction of currency hedging without meaningful changes to median expected returns.

Figure 17a: The Australian dollar has tended to correlate positively with global equities, though the relationship varies through time.

Rolling 5 year correlation – MSCI Currency basket vs MSCI Global Equity Return (Local currency)

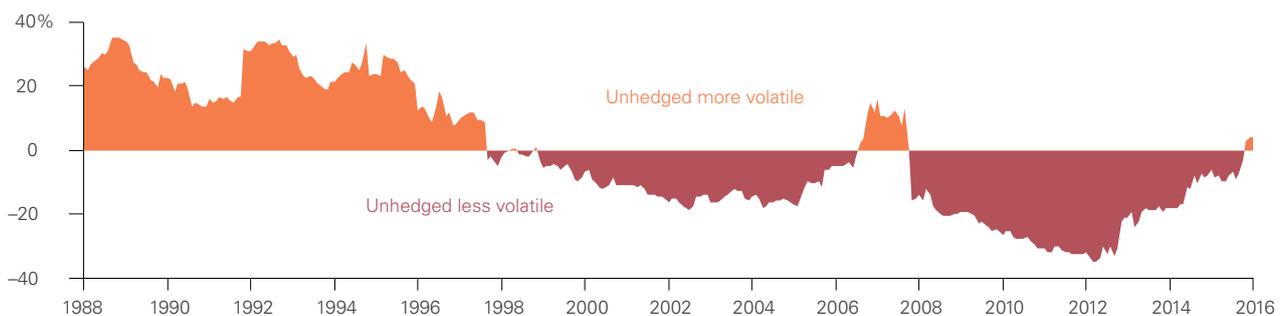


Notes: The chart shows the rolling 5 year correlation of the Australian dollar return against the MSCI World ex Australia index in Local currency for the period 31 December 1984 to 31 December 2016. The Australian dollar return comprises a basket of the five largest currencies that make up the MSCI World ex Australia index in proportion to their index weights. The currencies are USD, GBP, EUR, JPY, CHF.

Sources: Vanguard calculations using data from MSCI, Factset.

Figure 17b: Unhedged equities don't always demonstrate less volatility than hedged equities.

Rolling 5 year MSCI Global Equity market volatility (AUD unhedged vs AUD hedged)

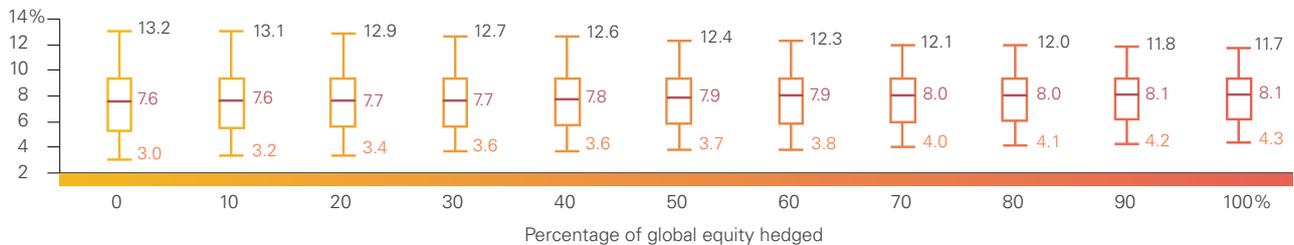


Notes: The volatility discount is calculated by dividing the volatility of unhedged equities by the volatility of hedged equities for the period 31 December 1983 to 31 December 2016. Unhedged equities is the rolling 5 year annualised standard deviation of the MSCI World ex Australia AUD Unhedged. Hedged equities is the rolling 5 year annualised standard deviation of the MSCI World ex Australia AUD Hedged return.

Sources: Vanguard calculations based on data from MSCI, Factset.

Figure 18: The dispersion of outcomes experienced by investors can be narrowed by hedging a component of the foreign currency exposure

Dispersion of Annualised 10-year Returns: 40% Equity Home Bias – 70/30 Portfolio



Notes: Return distribution of different levels of foreign equity currency exposure for the period 28 February 1990 to 30 June 2016. Portfolios are constructed with a 70% allocation to equities, split 40% to Australian equities and 60% to Global equities; and a 30% allocation to bonds, split 30% to Australian bonds and 70% to Global bonds. Indices used: Australian equity – MSCI Australia Total Return; Global equity (unhedged) – MSCI World ex Australia, with net dividends reinvested, unhedged, in AUD; Global equity (hedged) – MSCI World ex Australia, with net dividends reinvested, local currency; Australian bonds – Bloomberg AusBond Composite Index; Global bonds – Bloomberg Barclay’s Global Aggregate Index, hedged in AUD.

Sources: Vanguard calculations using data from MSCI, Factset.

2. Behavioural factors

Investor risk tolerance for large performance deviations?

The preferred level of foreign currency exposure needs to consider the potential for prolonged periods where the currency moves unfavourably. During times of home currency appreciation, consideration for the risk tolerance of investors to withstand the impact to returns needs to be given. **Figure 16** demonstrates the length of time that unhedged returns can underperform hedged returns.

What is the impact of home bias?

When determining the preferred hedge ratio for global equities, a change in equity home bias has a bearing on the decision. As equity home bias is reduced, the exposure to foreign currency increases, requiring an increase in the hedge ratio to manage the impact of currency risk on the portfolio.

3. Cost effective implementation

Can the currency hedging decision be implemented cost effectively?

The foreign currency market is very deep and liquid with more than \$5Tn traded daily. Hedging developed market currency exposure can be achieved cost effectively. The historical correlation of the AUD with emerging market equities shows a similar pattern to developed markets, however, the costs for hedging emerging market currencies continues to be elevated in comparison. As such, Vanguard’s preferred implementation of currency hedging is through the developed markets portion of the portfolio.

The hedging decision requires a whole-of-portfolio perspective

The decision to hedge foreign currency cannot be made in isolation from other asset allocation decisions. A decision to reduce equity home bias needs to take account of the additional currency exposure introduced to the portfolio, and may warrant an increased allocation to hedged global equities to appropriately balance the factors driving the decision to hedge. The uncertain impact of currency volatility on portfolio outcomes reduces as the investment time horizon lengthens. As such, it is appropriate that portfolios with higher levels of growth assets can also accommodate an increased allocation to foreign currency, as the potential diversification benefits of holding foreign currency exposure have time to play out. This is reflected in the sample portfolios in **Figure 19**.

Figure 19: Portfolio currency exposure in sample asset allocations combining global bonds and global equities.

Growth / Income allocation	(%)			
	30/70	50/50	70/30	90/10
Domestic / International mix*	33/67	35/65	37/63	39/61
Global equity hedge ratio	30	30	30	30
Global bond hedge ratio	100	100	100	100
Portfolio currency exposure	12.5	21	29.5	38

*Assumes an equity home bias of 40% and a bond home bias of 30%

Source: Vanguard.

Property

In line with our approach to the growth and defensive asset allocations, where broad market-cap-weighted indices are used to track domestic and international exposures, no specific over-weighting to property is included within the Diversified Funds.

Historically, Australian investors have shown a preference for property investment, and in managed funds, this exposure is typically achieved through REITs. However, REITs are already included in the relevant broader Australian equity benchmark accounting for 8.6% of the index weight as seen in **Figure 20a** for the ASX 300. Similarly, the global equity exposure achieved through the MSCI World ex-Australia Index includes a 3% weight to REITs. Thus, additional direct REIT exposure results in an overweight to REIT securities already included in the broad indices.

Further, the use of REITs to diversify the broader portfolio is met with significant challenges. The S&P/ASX 300 A-REIT Index is dominated by a handful of names with 4 firms making up well over half of the index (**Figure 20b**). A dedicated additional allocation to REITs then increases the idiosyncratic firm-specific risk. Moreover, since 1990, REITs have maintained a correlation with the broader equities of about 0.6 (**Figure 21**), considerably greater than the correlations seen for defensive asset classes used to shield against equity downturns like fixed income with a correlation of -0.10 (**Figure 3a**).

Encompassing a broader view of a household's assets, Australian investors already maintain significant property holdings, with investment properties forming 43% of total personal investments outside of Superannuation,¹⁵ so

additional property exposure in the form REITs only adds to a household's total exposure to property. Given REITs more concentrated exposures locally, lack of substantial diversification benefits, and household's existing property exposure, a dedicated overweight to REITs is not included within the diversified funds.

Figure 20a: Listed property is already included in the broad benchmark

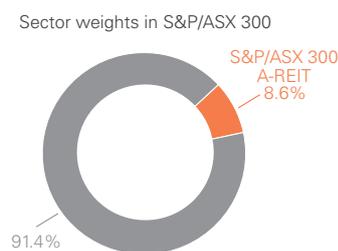
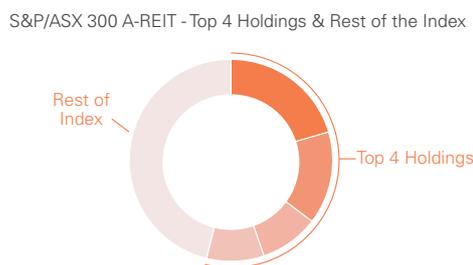


Figure 20b: Australian REIT indices are heavily concentrated



Notes: S&P/ASX 300 and S&P/ASX 300 A-REIT sector and holding data as at 31 December 2016

Source: Bloomberg.

Figure 21: REITs are strongly correlated with equities

Rolling Five Year Correlation between Equities and REITs



Notes: The chart shows the rolling five year correlation for various asset classes. The dataset runs from 30 April 1990 to 31 December 2016. The equity index is constructed from a 40% weighting to S&P/ASX 300 Accumulation Index and 60% to MSCI World ex Australia Index. The REIT Index is constructed from a 50% weighting to S&P/ASX 300 A-REIT Index and 50% to FTSE/NAREIT Developed Index in AUD.

Sources: Bloomberg, FactSet, Thomson Reuters Datastream.

¹⁵ Rice Warner 2015 *Personal Investments Market Projections*.

Other asset classes and alternative investment strategies

There are a variety of other asset classes that are considered in the construction of the funds. Several of these and the rationale behind their non-inclusion are as follows:

- **High yield bonds** — This sector of the broader bond asset class behaves similarly to equities and without the downside protection of investment grade bonds (Figure 3b).
- **Inflation-linked bonds** — Linkers can provide strong protection to real spending power, however the market in Australia is far from developed. Additionally, our research has found that best protection is in the form of short term linkers,¹⁶ which domestically are not deep or liquid enough.
- **Commodities** — While commodities may present potential diversification and inflation protection benefits, their inclusion in a portfolio presents complexity and cost issues. Furthermore, there is a strong overlap between commodities and Australian equities given the large materials sector (Figure 8a).
- **Infrastructure** — Listed infrastructure is already included within global and Australian equity indices.

While non-traditional and alternative investment asset classes and strategies may offer potential incremental improvements to a portfolio of traditional equities, bonds and cash, there are numerous challenges that do not align well with the objective of Vanguard's Diversified Funds. These include:

- **Cost** — Most alternative strategies are more costly than traditional assets hampering their ability to be additive to the broader portfolio.
- **Transparency** — Alternative asset classes and investment strategies frequently lack the same transparency and clarity of equities, bonds, and cash, which complicates investor's ability to understand how the Diversified Funds align with their objectives.
- **Liquidity** — Most alternative assets and strategies are less liquid than traditional assets, and during periods of market stress this can be particularly challenging for investors and may not align well with many investor objectives.
- **Active** — Alternatives are typically actively managed which means they tend to have a wider dispersion in outcomes relative to traditional assets (Figure 22). The returns are not the same for all investors in an asset class. The inclusion of these asset classes within a portfolio, therefore, should be considered an individual decision, specific to unique investor needs.

Figure 22: Alternative asset managers have substantially wider dispersion in manager performance than traditional assets



Notes: Public U.S. active fixed income and active equity distributions were based on data provided by Morningstar, Inc., for mutual funds domiciled in the United States from January 1, 1994, through July 31, 2014. Equity-market neutral, dedicated short bias, fixed income arbitrage, convertible arbitrage, event-driven, global macro, managed futures, long/short equity, and emerging markets' distributions were based on data provided by Lipper TASS, for hedge funds in existence from January 1, 1994, through July 31, 2014. All funds are U.S.-dollar-denominated, adjusting for survivorship bias in each category. Leveraged buyout, real estate, and venture capital distributions based on data provided by Preqin. Each distribution was based on an IRR (internal rate of return) calculation from a series of annual cash flows from each fund. For private equity funds that had not yet distributed 100% of the fund's capital back to the limited partners, IRR calculations were based on an ending NAV value. Each distribution has been adjusted so that the median resides at point zero, to isolate the dispersion.

Sources: Vanguard calculations, using data from Morningstar, Inc., Lipper TASS, and Preqin.

¹⁶ For further discussion on short term inflation protected securities, see Davis et al. (2012).

Passive implementation

The broad equity and fixed income allocations are built using market-cap-weighted index funds. Market-cap-weighted indexing is a valuable starting point for many investors. It can be delivered inexpensively and provides exposure to the broad market while offering diversification and transparency.

Active management typically comes with higher costs, manager risk, decreased tax efficiency, and wider variability of returns relative to the market portfolio.¹⁷ After accounting for all applicable costs (commissions, management fees, bid-ask spreads, administrative costs, market impact), the average investor trails the market. Although skilled managers exist and can provide the opportunity for outperformance, identifying managers that can persistently beat the market eludes most investors.¹⁸

With use of an active manager, selection is critical to success, and successfully choosing a manager that will outperform in the future is difficult. Focusing on the firm and its people, philosophy, and process can help in the search for a skilled manager. Ultimately, identifying talent, choosing low-cost investments, and staying patient are important to succeeding with active management. For investors inclined toward active management,¹⁹ risk tolerance, cost, tracking error, and conviction in their ability to pick winning managers can all be factors in deciding the active/passive mix.

When constructing diversified funds Vanguard's starting point is for the fund to have an enduring place in a portfolio, and to have broad applicability for investors. Designing the right blend of active exposure is conditional on the unique goals and requirements of an individual investor, with the preferred position varying widely. Owing to the highly conditional nature of active investing, generally higher costs and wider dispersion of relative returns — for most investors, a globally diversified low cost index portfolio will form the basis of a suitable investment strategy.

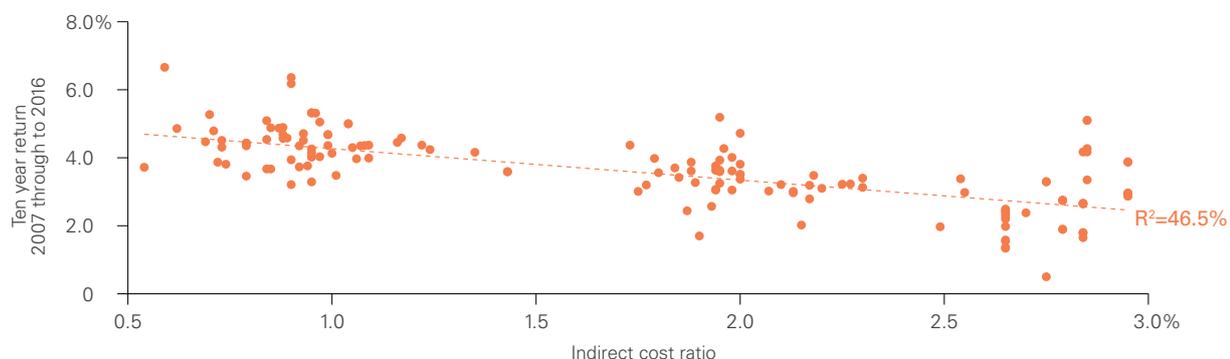
Rebalancing

The weights of assets within a portfolio will have a tendency to drift over time based on differences in their returns. This creates a shift from the target strategic asset allocation of the fund and therefore a change in its risk-return profile. Historically, given the strong equity risk premium, a portfolio that has been left without rebalancing has typically seen itself become overweight to equities relative to its target and subsequently increase in overall volatility. By rebalancing a portfolio to its strategic allocation, the investor can ensure that the portfolio is aligned to its original risk-return profile.

Professionally managed funds, such as the diversified funds, monitor and adjust portfolios with a regularity beyond the scope of most investors. In practice, a

Figure 23. The relationship between low cost and high returns is an enduring one.

Multi-Sector Growth Funds — Returns and Indirect Cost Ratios



Notes: The chart shows the relationship between the ten year returns of funds against their indirect cost ratios (ICR). A calculated R² shows the variation in the returns of the sample funds that is explained by the variation in the indirect cost ratios. 147 Growth funds were selected from the Morningstar Australia Fund Multisector Growth Category for the period 01 January 2007 to 31 December 2016 out of a total of 345 funds. Funds were excluded from calculations if they were classified as index funds, did not include ICR or 10 year return datapoints or were liquidated during the period. Results are consistent across Morningstar categories.

Sources: Vanguard calculations, Morningstar.

¹⁷ For a more detailed discussion on tax-efficient investing, see Donaldson et al. (2015).

¹⁸ For a more detailed discussion on indexing, see Harbron et al. (2016).

¹⁹ For a more detailed discussion on active management, see Wallick et al. (2015).

disciplined monitoring approach in conjunction with a threshold rule ensures that the portfolio is distanced from any tactical or dynamic biases.²⁰

The rebalancing process is made more efficient from a cost perspective through the use of cash flows, including fund inflows and outflows to adjust the portfolios back to original targets. This strategy ensures that the number of rebalancing events can be kept at a minimum, reducing costs and tax impacts, yet still enables investors to maintain an asset allocation aligned with their intended risk-return characteristics.

Conclusion

Vanguard Diversified Funds are professionally-managed single-fund solutions whose design reflects our key investment principles of Goals, Balance, Cost and Discipline. They are a product of our global expertise in capital markets and portfolio construction research as well as Vanguard's extensive practical experience with investors.

To the detriment of their portfolio and performance, too many investors focus on the markets, the economy, individual manager performance, or the performance of a given security or strategy instead of focusing their efforts on the core fundamentals of balanced asset allocation and a long-term investment perspective.

We believe a top-down approach to asset allocation and a straightforward design that keeps investment costs low offers investors the best chance of investment success.

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²⁰ For a more detailed discussion on rebalancing, see Zilbering et al. (2015).

Appendix

About the Vanguard Capital Markets Model

IMPORTANT: The projections or other information generated by the Vanguard Capital Markets Model regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results, and are not guarantees of future results. VCMM results will vary with each use and over time.

The VCMM projections are based on a statistical analysis of historical data. Future returns may behave differently from the historical patterns captured in the VCMM. More important, the VCMM may be underestimating extreme negative scenarios unobserved in the historical period on which the model estimation is based.

The Vanguard Capital Markets Model is a proprietary financial simulation tool developed and maintained by Vanguard's Investment Strategy Group. The model forecasts distributions of future returns for a wide array of broad asset classes. Those asset classes include Australian and international equity markets, several maturities of the Australian Treasury and corporate fixed income markets, international fixed income markets, money markets, commodities, and certain alternative investment strategies. The theoretical and empirical foundation for the Vanguard Capital Markets Model is that the returns of various asset classes reflect the compensation investors require for bearing different types of systematic risk (beta). At the core of the model are estimates of the dynamic statistical relationship between risk factors and asset returns, obtained from statistical

analysis based on available monthly financial and economic data from as early as 1960. Using a system of estimated equations, the model then applies a Monte Carlo simulation method to project the estimated interrelationships among risk factors and asset classes as well as uncertainty and randomness over time. The model generates a large set of simulated outcomes for each asset class over several time horizons. Forecasts are obtained by computing measures of central tendency in these simulations. Results produced by the tool will vary with each use and over time.

The primary value of the VCMM is in its application to analysing potential client portfolios. VCMM asset-class forecasts—comprising distributions of expected returns, volatilities, and correlations—are key to the evaluation of potential downside risks, various risk–return trade-offs, and diversification benefits of various asset classes.

Although central tendencies are generated in any return distribution, Vanguard stresses that focusing on the full range of potential outcomes for the assets considered, such as the data presented in this paper, is the most effective way to use VCMM output.

The VCMM seeks to represent the uncertainty in the forecast by generating a wide range of potential outcomes. It is important to recognise that the VCMM does not impose “normality” on the return distributions, but rather is influenced by the so-called fat tails and skewness in the empirical distribution of modelled asset-class returns. Within the range of outcomes, individual experiences can be quite different, underscoring the varied nature of potential future paths. Indeed, this is a key reason why we approach asset-return outlooks in a distributional framework.

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