

# Managing Currency Exposures

Global asset classes provide access to new and diverse investment opportunities. However, investing overseas introduces foreign currency exposure to a portfolio. Rather than treating it as an afterthought, investors should treat foreign currency as an asset class in its own right, deserving of the same level of scrutiny. Investors looking to future proof their portfolios should consider both short and long term currency risks as well as where the best return opportunities lie. Australian investors have a different perspective on foreign currency to investors elsewhere in the world, and this should be reflected in how local portfolios are built.

## The Basics

### Currency loses when the home team wins

It is easy to be filled with national pride when the \$A appreciates. However, an exchange rate is a measure of relative value and a rising \$A means, by definition, the value of one or more foreign currencies is falling. Remember a rising \$A results in losses for offshore investments.

### Currency exposure can be “hedged” using currency forward contracts or swap contracts

Currency hedging is the process by which currency exposure is removed from a portfolio. The most common technique is to use forward foreign exchange contracts. These are contracts with a bank that generate profits or a loss when exchange rates move. The table below shows how a fully currency hedged overseas portfolio operates.

A fully “currency hedged” portfolio	\$A Rises	\$A Falls
Overseas Assets	Losses	Profits
Forward Foreign Exchange Contracts	Profits	Losses
Combined Currency Impact	Nil	Nil

*Source: SSGA, for illustration purposes only*

### A “Hedge Ratio” expresses how much of the currency exposure is hedged

It is possible to remove some, but not all, of the foreign currency exposure of a global portfolio. The “hedge ratio” expresses the amount of foreign currency exposure that has been hedged. It is calculated as

$$\frac{\text{Face Value of the forward foreign exchange contracts}}{\text{Market Value of the underlying global assets}}$$

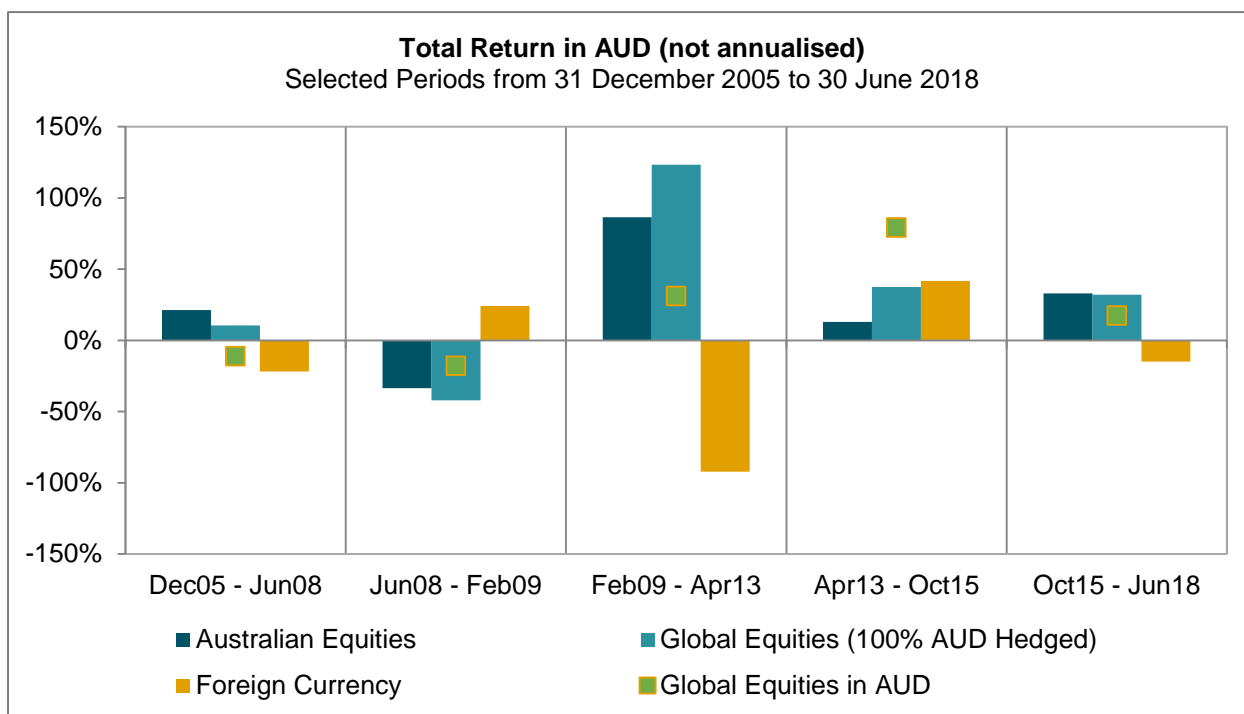
One strategy might have a hedge ratio of 100% (i.e. all the foreign currency exposure has been removed) while another may only have a hedge ratio of 50% (i.e. half the foreign currency exposure has been removed).

### Currency hedging can affect the income distributed from a fund at the end of the tax year

This is obviously a very complex subject and there is more than one way to manage this issue. Suffice to say that Australian investors shouldn't be surprised if currency hedging results in either a large or non-existent year end distributions.

## Some recent history

The significance of foreign currency has been evident in market returns over the last 10 to 15 years. The chart below traces some of the major phases of equity and currency markets since December 2005. The “hedged” global equity returns represent the returns excluding foreign currency fluctuations for Australian investors. The “in AUD” returns reflect the combination of underlying equity performance and foreign currency performance. Australian equity market returns have also been included for comparison.



Source: MSCI, S&P, SSGA. Indices used: S&P ASX 200 for Australian Equities, MSCI World ex Australia for Global Equities. AUD Hedged return has been estimated by SSGA. Foreign currency is the “in AUD” return less the “100% AUD Hedged” return. Past performance is not a reliable guide to future performance. Index returns reflect capital gains and losses, income, and the reinvestment of dividends.

From December 2005 through to June 2008, losses from foreign currencies changed a positive total return on global equities into a negative total return for unhedged Australian investors.

The total return was similarly negative between June 2008 and February 2009, however this time gains from foreign currencies helped offset some of the large losses in underlying equity markets.

Global equity markets experienced an extended rebound between February 2009 and June 2018, but foreign currency results were mixed.

- Between February 2009 and April 2013 foreign currency losses offset some of the large gains from equities.
- Between April 2013 and October 2015 profits from foreign currencies added to the gains from equities.
- Between October 2015 and June 2018 foreign currencies had very little impact on total returns.

## The Philosophical Frame of Reference

### A “normal” or “neutral” currency exposure

Rightly or wrongly, the industry has gravitated over the years to a broad consensus around what a “growth” portfolio looks like. A “growth” portfolio will typically own anything from 60% to 80% in asset classes like equities and property with the remainder in defensive assets like fixed income and cash. Many such portfolios are constructed on the (reasonable) belief that equities will earn a premium over cash and fixed income over the very long term. From such beliefs and analysis are “Strategic Asset Allocations” born.

Unfortunately, there is no such philosophical consensus in relation to foreign currency exposure. A wide range of approaches to “neutral” or benchmark currency exposures exists in the Australian market including:

- fully hedged benchmarks reflecting the belief foreign currencies are primarily a source of risk;
- fully unhedged benchmarks in the belief that foreign currencies are an important source of diversification;
- 50% hedged benchmarks as a way to minimise “regret risk”;
- different benchmark hedges for different asset classes;
- benchmark hedge ratios that vary dynamically with changes in market conditions or currency valuations; and
- benchmark hedge ratios built around key competitor positions.

### Rethinking Currency

This paper argues that foreign currency should be treated like any other asset class. When considering a new asset class most investors begin by deciding if they wish to include that asset class before moving into more detailed benchmark, manager and product considerations. These considerations will typically include expected returns, risks and whether the asset class will have diversifying benefits.

When it comes to international investments many investors do not treat foreign currency exposures on their own merits. A common approach is to search for an answer to the following question:

*“I have some foreign currency exposure. Should I hedge it or not?”*

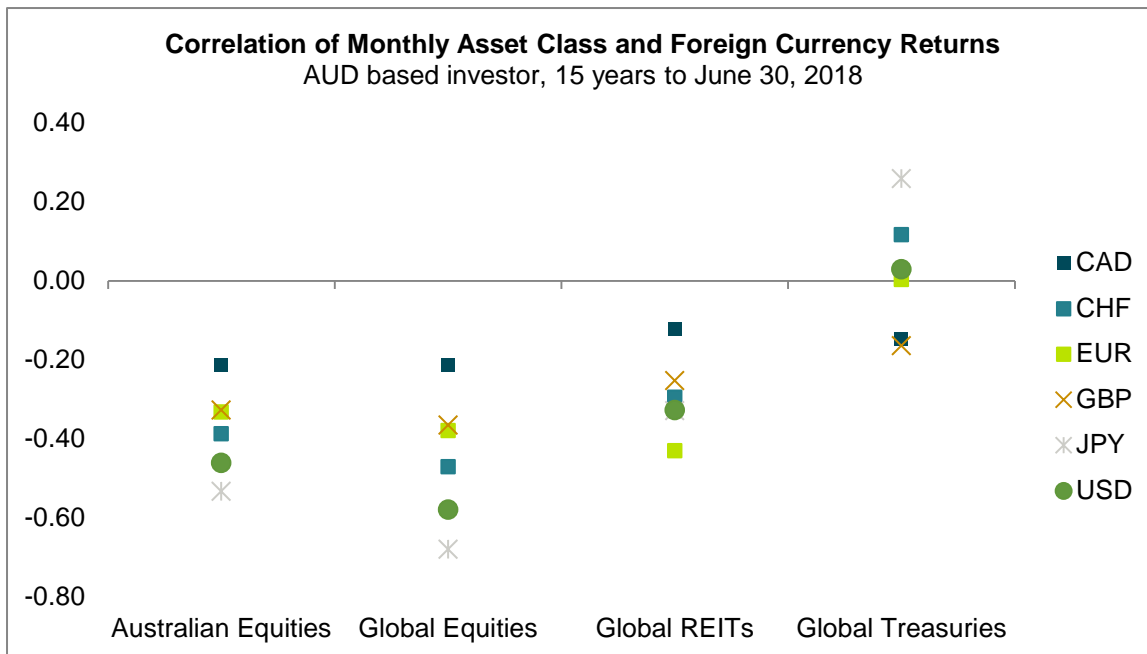
Treating currency as a separate asset class requires investors to answer subtly different questions:

*“Do I want any foreign currency exposure in my portfolio? If so, which ones and how much?”*

At first glance, the difference may appear to be semantics. However these two questions represent fundamentally different investment processes. The first approach treats currency as a by-product of the asset allocation decision. The second approach treats foreign currency as a separate asset class in its own right. Under the second approach, foreign currency needs to justify its place in the portfolio in exactly the same way as any other asset class.

### A Numerical Example

The table below explores the concept of foreign currency as a separate asset class using data over the 15 years to June 2018. It shows the diversification benefits for Australian investors available from individual foreign currencies when compared to selected global asset classes. The underlying asset class returns have had any foreign currency impact removed (ie fully hedged or local currency indices have been used). Lower numbers, representing lower or negative correlations, indicate superior diversification properties.



Source: MSCI, S&P, SSGA. Indices used: S&P ASX 200 for Australian Equities, MSCI World ex Australia Hedged to AUD for Global Equities where hedged returns have been estimated by SSGA, FTSE EPRA/NAREIT Developed Liquid Index in Local Currency for Global REITs, FTSE Non-AUD World Government Bond Index Hedged to AUD for Global Treasuries. Past performance is not a reliable guide to future performance. Index returns reflect capital gains and losses, income, and the reinvestment of dividends.

Later in the paper it is argued that measures such as historic volatilities and correlations like those in the chart above can be unstable. The purpose of the chart is not to forecast future long term correlations. Rather, it is to argue that historically different currencies have different diversification properties and so it is reasonable to argue they can play different roles in a robust long term asset allocation.

To take this one step further, the table below considers the forecast volatility of a portfolio with 60% in growth assets using 15 years of monthly returns to set volatility and correlation assumptions. The (arbitrary) asset allocation on the left identifies 45% of the portfolio invested offshore. Foreign currency exposure has been removed from the performance of each asset class by using hedged or local currency indices and the resulting forecast volatility is shown in Portfolio 1. Foreign currency exposures have then been added back selectively, currency by currency in Portfolio 2 to try and reduce forecast volatility. The results for two portfolios are shown on the right.

Asset Class	Allocation	Foreign Currency	Portfolio 1	Portfolio 2
Australian Equities	25%	CAD	0%	0%
International Equities*	25%	CHF	0%	5%
Australian REITs	5%	EUR	0%	1%
International REITs*	5%	GBP	0%	0%
Australian Fixed Income	10%	JPY	0%	10%
Australian Inflation Linked Fixed Income	10%	USD	0%	16%
International Govt. Fixed Income*	10%		<b>Total FX Exposure</b>	<b>0%</b>
International Credit*	5%		<b>Volatility (% pa)</b>	<b>7.3%</b>
Cash	5%		Total Foreign Assets	45%
<b>* Total Foreign Assets</b>	<b>45%</b>		Average Hedge Ratio	100%
				29% <sup>1</sup>

Source: SSGA. For illustration purposes only. See important disclosures in Appendix under "Sample Portfolio Volatility Calculation". Past performance is not a reliable guide to future performance. Projected characteristics are based upon estimates and reflect subjective judgments and assumptions. There can be no assurance that developments will transpire as forecasted and that the estimates are accurate.

<sup>1</sup> 32% FX exposure / 45% Foreign Assets = 71% FX exposure; ie 29% Average Hedge Ratio

Comparing the two currency allocations on the right, it is clear that foreign currency exposure can have a material impact on total portfolio risk. However it is also apparent that, even in this simplified example, individual currency exposures do not contribute equally to portfolio outcomes. The lower volatility portfolio has a material allocation to both JPY and USD but virtually no allocation to GBP, EUR or CAD.

## Practical Considerations

While treating foreign currency as a separate asset class is a superior theoretical approach it is acknowledged that there are some significant practical constraints for some investors. This theoretical approach is easiest for very large investors with only one multi-asset risk profile to manage. The implementation challenges can be significant for investors trying to build portfolios across multiple risk profiles or objectives. The most common portfolio implementation structure is to use long only asset class pools or funds as building blocks for multi-asset class portfolios. Unfortunately there is no simple way to separate out foreign currency as a separate, long only asset class building block within this structure. The alternative requires multiple portfolios of forward foreign exchange contracts which is too complex and costly for many investors.

However, that does not mean that the asset class principle argued in the paper is irrelevant. Having identified target foreign currency exposures for each investment risk profile, it is often possible to get reasonably close to target using appropriate combinations of hedged, unhedged and variable hedged building blocks. The example below takes three multi-asset portfolios with (arbitrary) asset allocations and aims to deliver a target foreign currency range using limited long-only building blocks. It includes unhedged, hedged and variable hedged pools for international equities, along with unhedged Global REITs and hedged Global Bond pools. The variable hedge pool can be used to exploit different risk or return properties of individual currencies. Obviously, other combinations of hedged and unhedged pools in different asset classes are equally possible.

Sample Portfolio	“Conservative”	“Balanced”	“Growth”
<b>Target FX Exposure (%)</b>	<b>0-5</b>	<b>15-20</b>	<b>30-40</b>
<b>Target Growth Exposure (%)</b>	<b>30</b>	<b>50</b>	<b>70</b>
<u>Growth Assets (%)</u>			
Australian Equities Pool	12.0	20.0	28.0
International: Unhedged	0.0	5.0	16.2
International: 0-100% Hedged	0.0	5.0	9.8
International: 100% Hedged	12.0	10.0	2.0
Global REITs: Unhedged	6.0	10.0	14.0
<u>Defensive Assets (%)</u>			
Australian Bonds	28.0	20.0	12.0
Global Bonds (100% Hedged)	28.0	20.0	12.0
Cash	14.0	10.0	6.0
Weighted Average Growth Assets	30.0	50.0	70.0
Weighted Average FX Exposure	6.0	15.0 - 20.0	30.2 - 40.0

Source: SSGA. For illustration purposes only.

## Interim Conclusions

The remainder of this paper does not seek to explore optimal currency allocations for multi-asset class portfolios as there are too many variables to consider, even for single risk profile portfolios. However this discussion of the philosophical frame of reference leaves two conclusions:

- Foreign currency deserves to be considered on its own terms in any portfolio, whether in a single asset class building block or in a multi-asset class portfolio.
- Individual foreign currency exposures can play different roles within a portfolio.

These conclusions are carried into the remainder of the paper.

## Seven Currency Exposure Perspectives

Given many investors still manage currency exposures at an asset class level, this section of the paper outlines a number of different perspectives for currency exposure within an asset class.




### Perspective 1: Short Term Currency Risk for Equities

Historically some investors have selected currency hedge benchmarks, whether at a total portfolio or an asset class level, based solely on “risk”. The key challenge with this approach is that the lowest risk solution can vary dramatically depending on

- The asset class (or asset classes)
- The time frame for the historical analysis
- How “risk” is defined
- The foreign currency being considered

The first perspective considered below is short term risk for an equity portfolio, where short term risk is defined as the volatility of monthly returns.

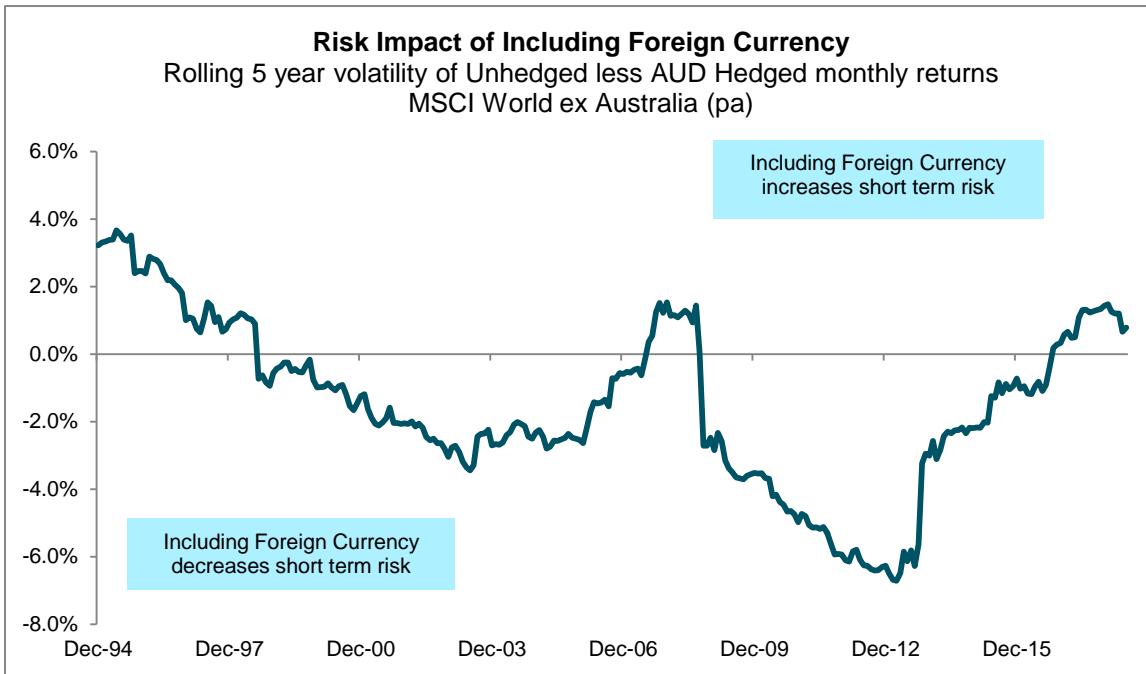
The large resource base in the Australian economy means it is somewhat geared to global growth. As long as this remains true, it is reasonable to expect that the A\$ will be correlated with global growth. That suggests that owning foreign currency (ie being unhedged) could provide some short term tail risk protection for Australian investors in the event of global growth shocks.

Relative Performance	Global Pickup	Global Downturn
AUD for foreign investors	 Strengthens	 Weakens
Foreign currency for AUD investors	 Weakens	 Strengthens

Source: SSGA. For illustration purposes only

This diversification relationship has certainly helped in the face of some historic short term shocks. Notably, in the second half of 2008 a dramatic sell off in global equities was accompanied by a dramatic fall in the Australian dollar. Owning foreign currencies during this period helped insulate portfolios from the short term equity market shock.

The chart following analyses returns for a global equity portfolio from December 1989 to June 2018. It shows the volatility of monthly returns over rolling 5 year periods and hence emphasizes short term volatility or shocks.

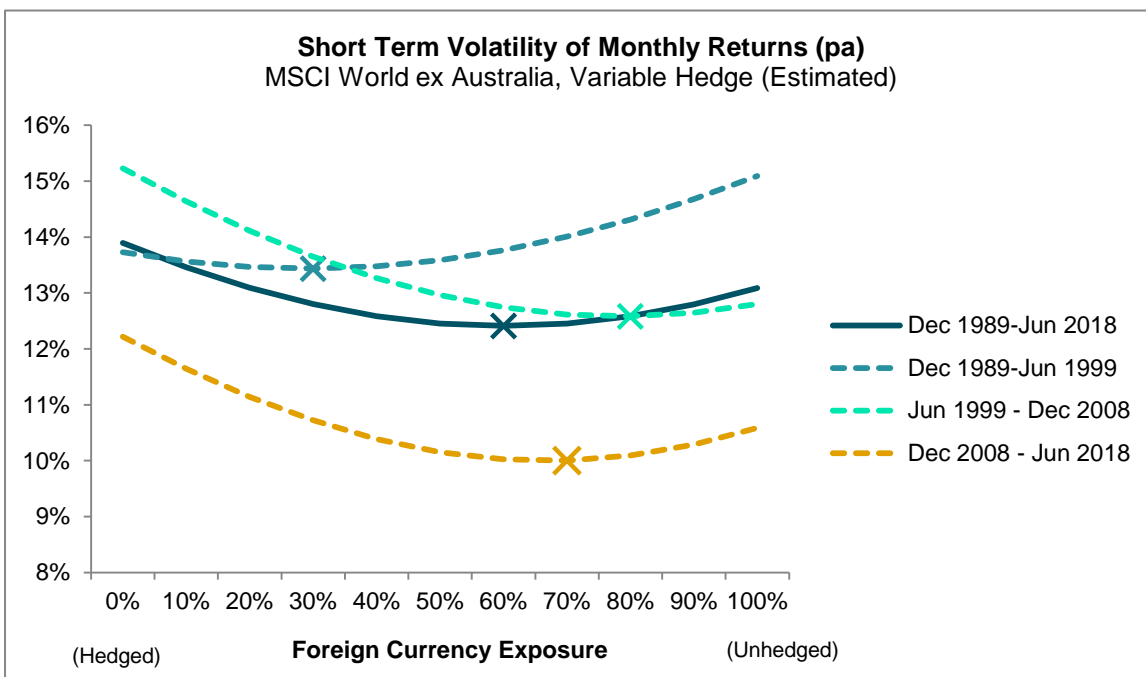


Source: MSCI, SSGA. Past performance is not a reliable guide to future performance. Index returns reflect capital gains and losses, income, and the reinvestment of dividends. Hedged returns have been estimated by SSGA.

The chart suggests that for much of the last 30 years including foreign currency (ie being unhedged) has reduced the short term volatility of a global equity portfolio. However, this has not always been true, including over the most recent history. Clearly there are periods as long as 5 years when foreign currency has increased short term volatility.

**Perspective 2: Short Term Currency Risk for Equities is not Linear**

The picture becomes more complex once partial hedging solutions are considered. The chart below shows the impact of adding currency exposure to a global equity portfolio in 10% increments over the period from December 1989 to June 2018. This period has also been broken into three equally sized sub-periods. The lowest volatility solution is marked for each series.



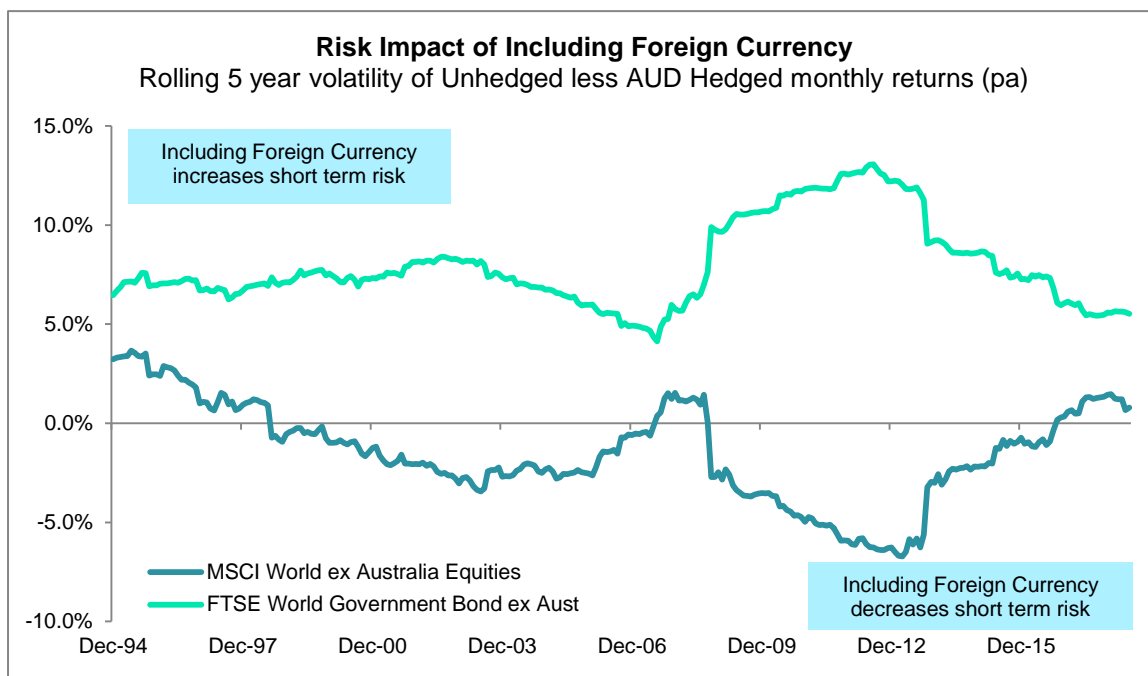
Source: SSGA, MSCI. Past performance is not a reliable guide to future performance. Hedged returns have been estimated by SSGA

The chart shows that risk, defined as short term volatility, is not linear. Adding foreign currency exposure to a global equity portfolio has tended to reduce short term volatility, but only to a point. There is an inflection point at which adding more foreign currency exposure tends to increase portfolio risk.

The chart also confirms the sensitivity of this style of analysis to the historical period. The curves are different shapes and the foreign currency exposure for the portfolio with the lowest volatility varies from 30% to 80% (ie currency hedges of 70% and 20% respectively).

### Perspective 3: Short Term Currency Risk for Fixed Income

Moving from equities to fixed income, the perspective changes. The chart below adds short term volatility for global sovereign fixed income to the global equity series shown previously.



Source: SSGA, MSCI, FTSE. Past performance is not a reliable guide to future performance. Index returns reflect capital gains and losses, income, and the reinvestment of dividends.

The short term risk results are far less ambiguous for global fixed income; adding foreign currency significantly increases short term risk<sup>2</sup>. Given the defensive role bonds often play in investor portfolios, minimizing short term risk is often a key asset class objective. Foreign bond portfolios are often fully hedged to remove currency risk for this very reason.

It is worth reflecting at this point on the two approaches to currency management discussed under “The Philosophical Frame of Reference”. Under the second approach, currency is treated as a separate asset class in its own right. This leads to currency policy being deliberately divorced from other asset allocation decisions.

In practice, under the traditional approach the investor may conclude

“The hedge ratio for global equities should be [50%] and the hedge ratio for global bonds should be [100%]”

Under the second approach, the investor may conclude something quite different

“The portfolio’s total exposure to foreign currency should be [20%]”

As noted earlier in this paper, the differences in hedge policy and currency implementation between these two approaches are subtly different.

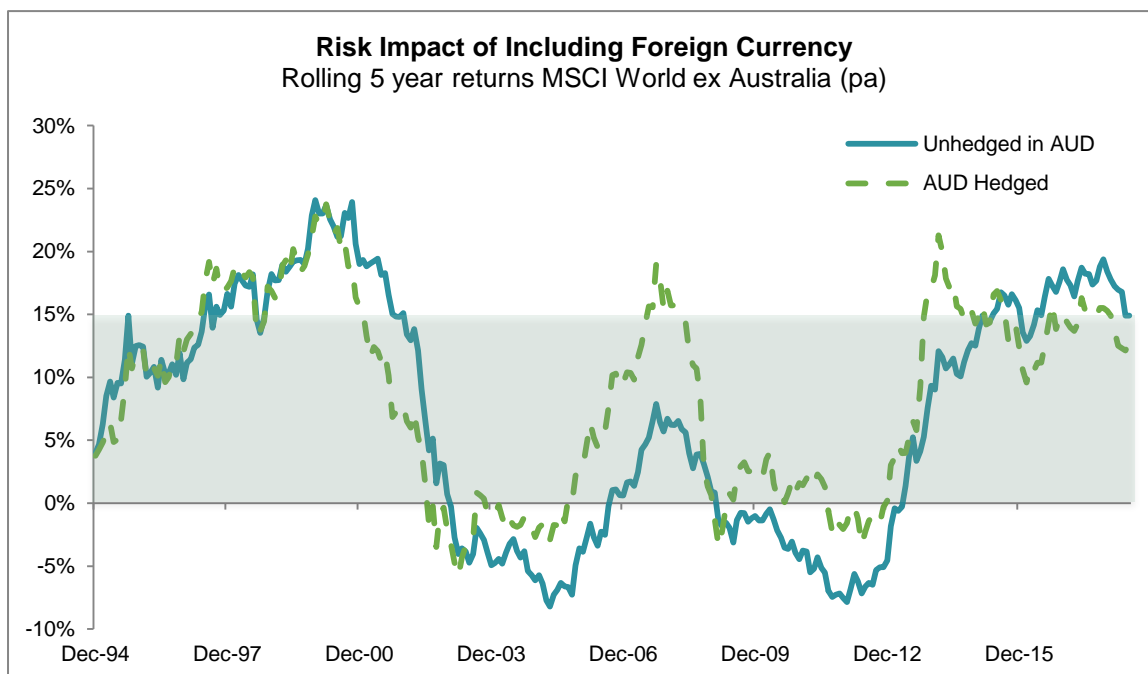
<sup>2</sup> Intuitively, currencies are volatile and so are equities. Whether combining equities and currencies produces higher or lower volatility depends on the correlation between equities and currencies. Government fixed income investments are, on the other hand, much more stable. Adding currency risk to a stable asset class like this is much more likely to increase total volatility regardless of correlations.



#### Perspective 4: Long Term Risk for Equities

Volatility of monthly returns is commonly used in the industry as a proxy for “risk”, and has been the basis for the first three perspectives. However, it is not the only measure of risk that can be used. If the window for measurement is expanded from one month out to five years, the historical currency risk perspective changes.

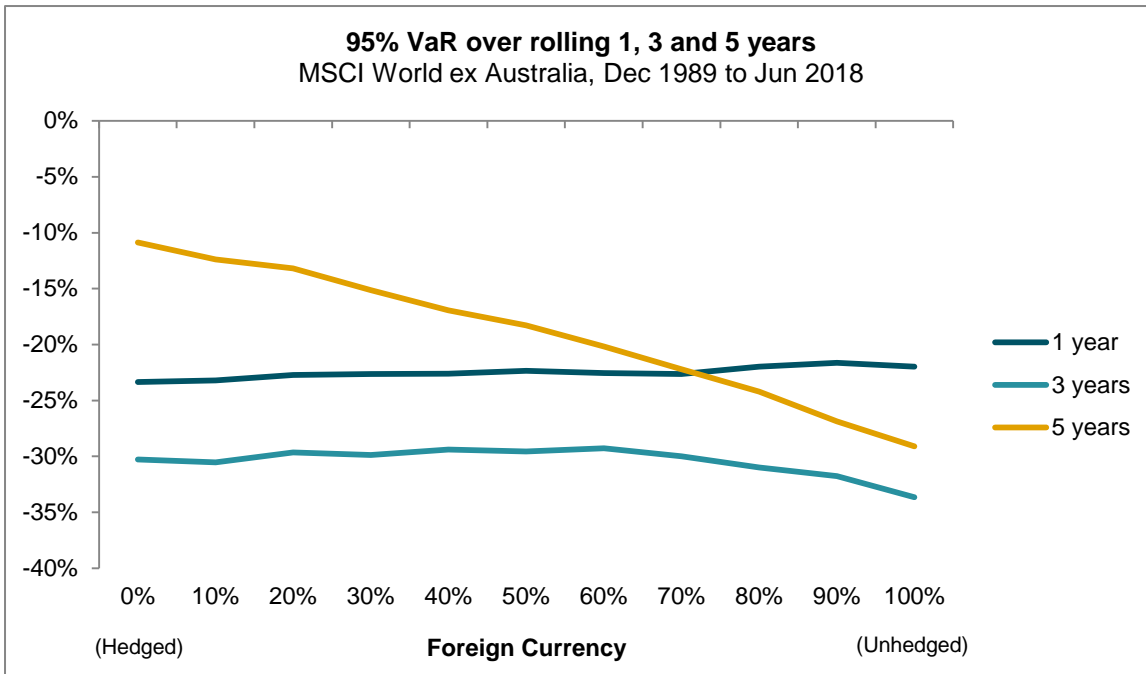
The chart below shows the rolling 5 year returns of MSCI World ex Australia on both a hedged and unhedged basis. While both series are volatile, the hedged series has more 5 year returns grouped between 0% pa and 15% pa (54% vs 39%) and fewer 5 year results that are negative (19% vs 34%).



Source: SSGA, MSCI. Past performance is not a reliable guide to future performance. Index returns reflect capital gains and losses, income, and the reinvestment of dividends. Hedged returns have been estimated by SSGA.

The variability of longer term, 5 year returns is actually lower for a hedged portfolio. Part of the reason is the propensity for the Australian dollar to bounce back after short term sell-offs. For example, while it is true that the AUD sold off heavily in the second half of 2008 when equity markets fell, it also rebounded very strongly during 2009.

Another way to consider longer term risk is the Value at Risk or VaR. How much is the portfolio likely to lose over a given period? The chart following calculates this by ranking the historic rolling 12 month returns and taking the 5th percentile. So 5% (1 in 20) of the historic rolling returns were worse than this number (or, more optimistically, 95% of the returns were better). The same analysis is then shown for rolling 3 year and 5 year periods (showing total, not annualized, results).



Source: SSGA, MSCI. Past performance is not a reliable guide to future performance. Index returns reflect capital gains and losses, income, and the reinvestment of dividends.

The worst 5% of losses over 1 year periods don't vary greatly when the foreign currency exposure is changed. However, once the time period is extended out to 5 years, adding foreign currency exposure significantly increases the worst 5% historic losses between 1989 and 2018.

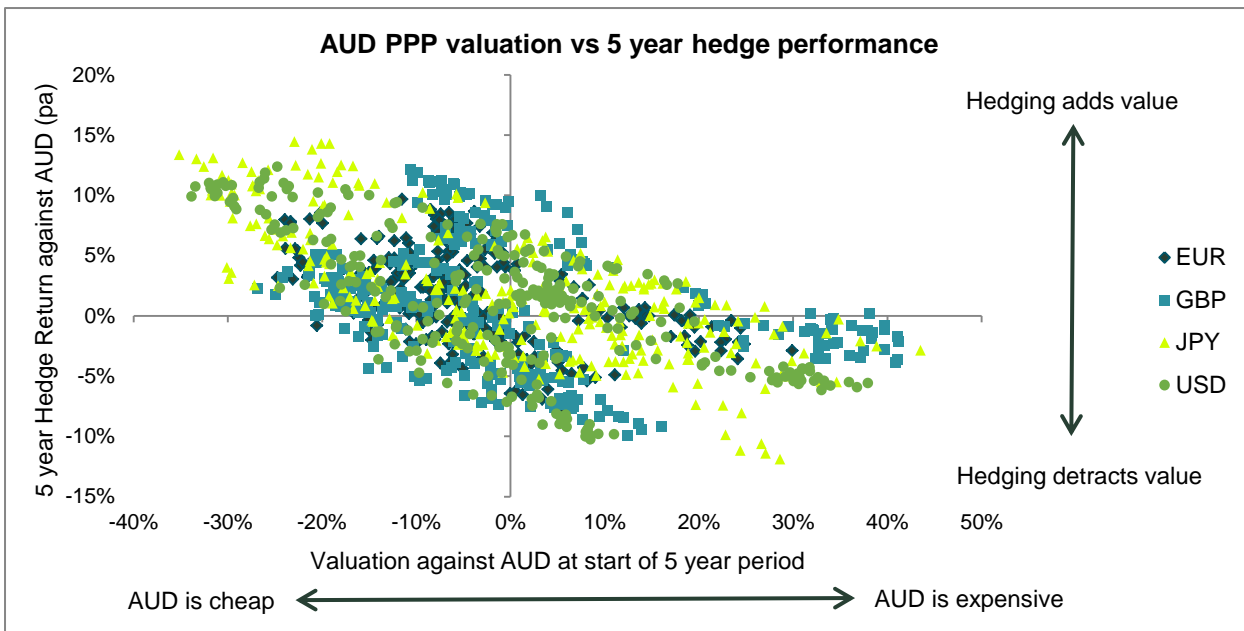
**Perspective 5: Long Term Returns for Currencies**

While currency may be a 'nil sum game' over the very long term, research suggests a number of factors that are reasonable predictors of performance over the long term.

1. Currencies that are cheap under economic models like Purchasing Power Parity ("PPP") tend to outperform over medium to long term horizons.
2. Currencies with higher interest rates tend to outperform over the long term, but with higher risk.
3. Currencies that are less liquid tend to outperform over the long term, but again with higher risk.

The chart below illustrates the first of these relationships over rolling 5 year periods from December 1989 to June 2018. The horizontal axis shows the valuation of the Australian dollar using a PPP model at the start of each five year period. The left hand side represents points where the AUD is below PPP fair value while the right hand side is where the AUD is expensive by this measure.

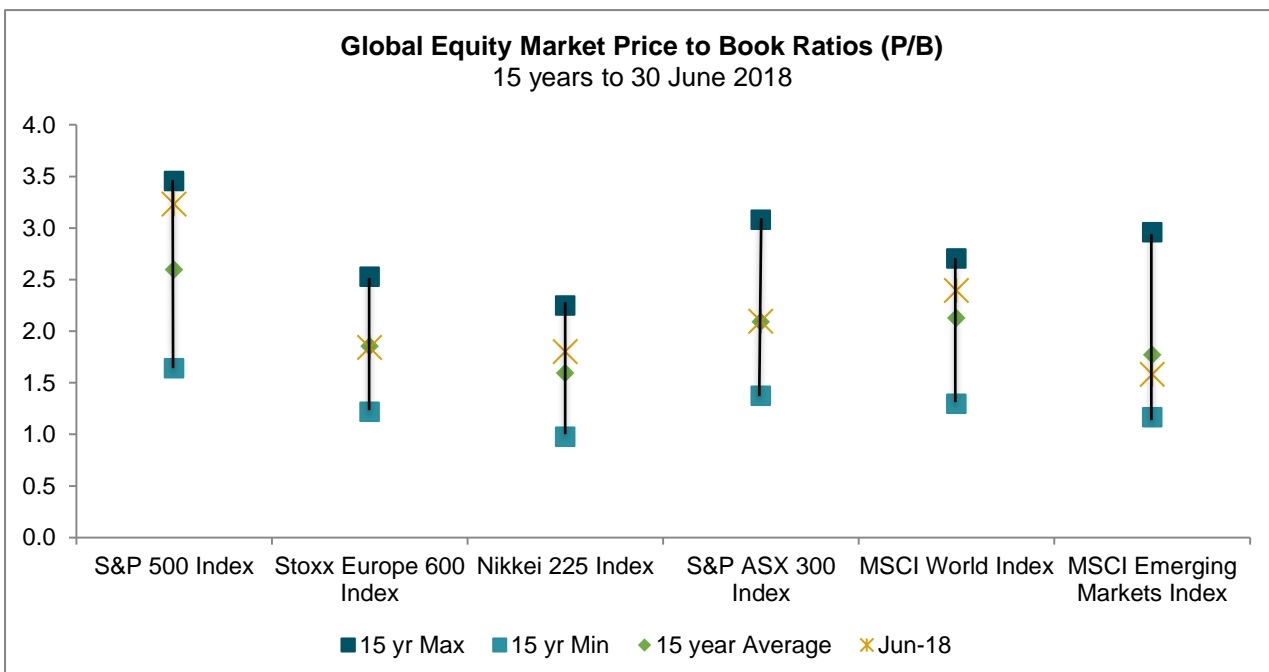
The vertical axis shows the performance of the AUD over the subsequent 5 year period.



Source: SSGA, from December 1989 to June 2018. Past performance is not a reliable guide to future performance. The results shown represent current results generated by our SSGA Purchasing Power Parity equilibrium model. The results do not reflect actual trading and do not reflect the impact that material economic and market factors may have had on SSGA's decision-making. The results shown were achieved by means of a mathematical formula, and are not indicative of actual future results which could differ substantially.

It is true that there are 5 year periods during which hedging the AUD has generated negative returns despite the AUD being cheap relative to PPP at the start. However, the overall pattern of future outperformance aligns with long term valuation remarkably consistently across all four major currencies for the AUD.

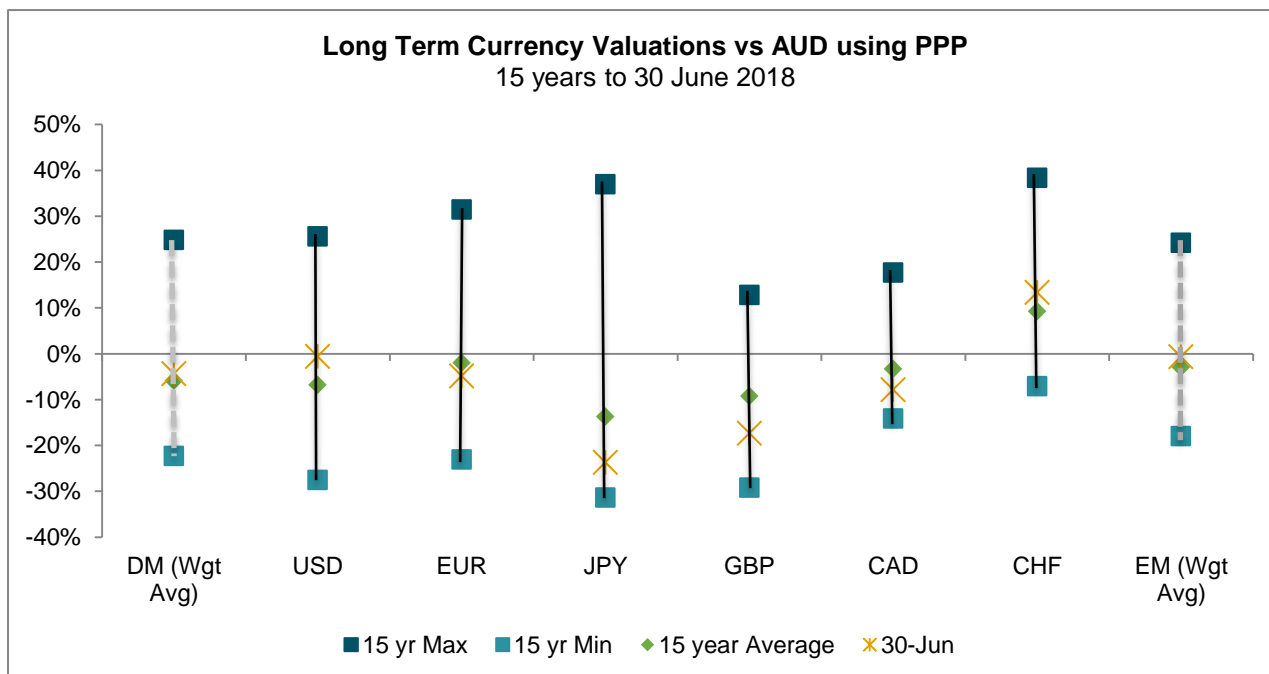
Consideration of currency valuations is not dissimilar to equity valuations. The chart below shows broad equity market relative to book value over the 15 years ended 30 June 2018.



Source: SSGA, Factset

Of course this chart shows broad market aggregates, while individual company valuations will vary widely around these averages. This chart suggests that care should be taken in selecting securities in the US market at the time of writing, as many are highly priced by historical standards.

A similar chart can be prepared for currencies. The chart below shows currency valuations as at 30 June 2018 using relative to long term PPP. Much like equities, long term valuation signals like this are rarely effective in predicting short term performance, but are useful in setting long strategy.



Source: SSGA from December 1989 to June 2018. The results shown represent current results generated by our SSGA Purchasing Power Parity equilibrium model. The results do not reflect actual trading and do not reflect the impact that material economic and market factors may have had on SSGA's decision-making. The results shown were achieved by means of a mathematical formula, and are not indicative of actual future results which could differ substantially.

The Developed Markets comparison suggests that, on average, foreign currencies were slightly cheap relative to the Australian dollar as at 30 June 2018. However, digging a little deeper, the JPY and GBP both looked relatively cheap, the CHF looked expensive, while the two largest currency blocks of USD and EUR looked close to long term fair value. This chart suggests it would have been prudent to err on the side of lower hedge ratios for GBP and JPY and higher hedge ratios for CHF as at 30 June 2018. Emerging markets also looks close to long term fair value, although there are significant variations between different EM currencies as there are for DM currencies.

### Perspective 6: Currency risk changes according to your base currency

Currency is not a “one size fits all” problem for global investors, and portfolios should be tailored for each market depending on its base currency<sup>3</sup>.

When it comes to managing risk in equity portfolios, base currency can be important in the construction process. Even before considering valuation levels or other measures of long-term returns, the same company may look more risky to an investor based in (say) Japan than an investor based in Australia because of currency risk. This distinction is especially apparent for benchmark unaware, or objective based strategies.

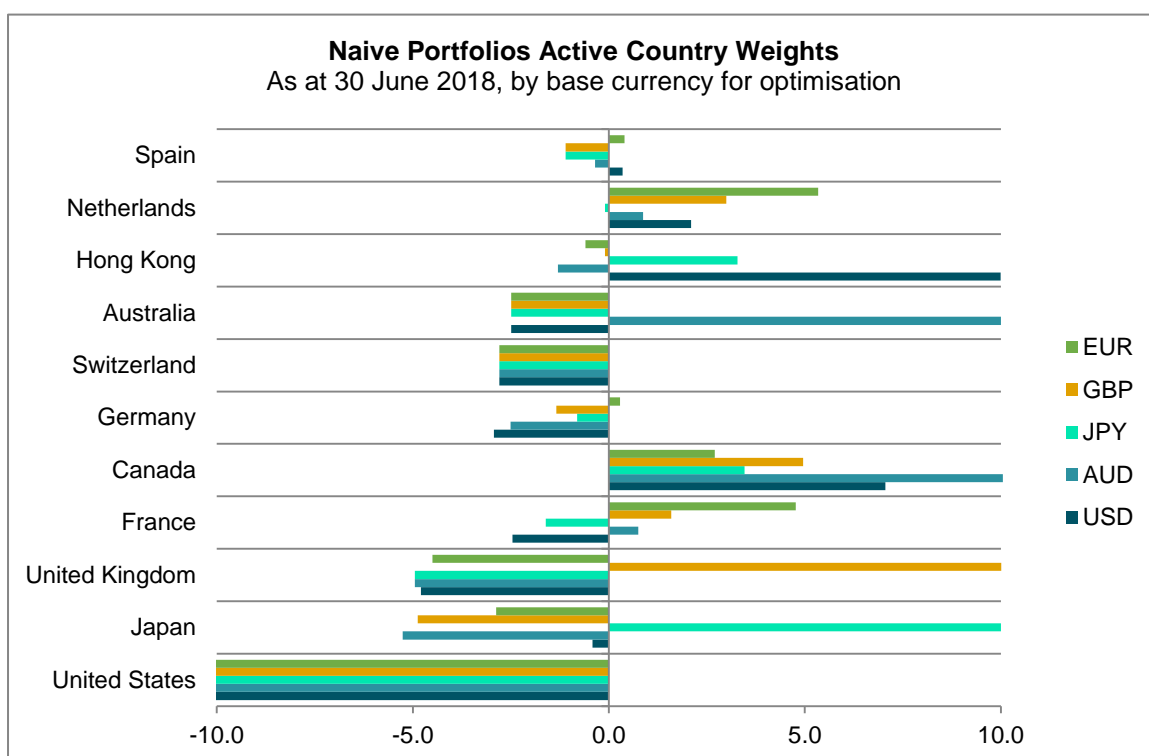
<sup>3</sup> “Base currency” refers to the home currency of the investor; i.e. AUD for an Australian investor

The impact is demonstrated below through a series of portfolios that aim to maximize risk-adjusted return for investors with different base currencies. Each portfolio is constructed with certain common assumptions including;

- Construction using mean-variance optimisation
- MSCI World as at 30 June 2018 as the available universe
- Low Price / Book is a good predictor of superior future returns for individual securities
- GICs sectors are limited to 25%
- Active country weights are limited to +/-10%
- Individual positions are limited to 1.5%

The only difference between the portfolios is the base currency of the investor.

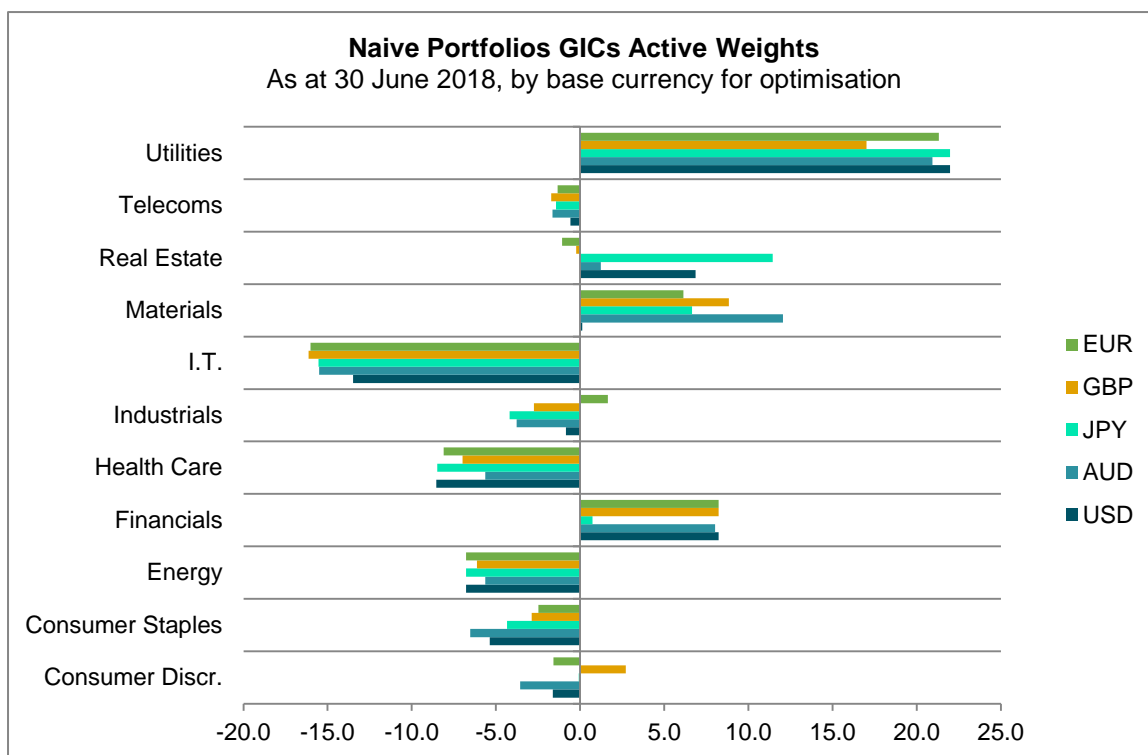
The first chart below shows the active country weights for portfolios optimised across five different base currencies.



Source: SSGA. For illustration purposes only.

Some of the results are intuitive – most notably the preference for home currency assets in the most portfolios other than the USD portfolio. However some of the differences are more complex; the JPY and USD portfolios are underweight France while the AUD and GBP portfolios are overweight.

The picture becomes more complex once the analysis moves into sectors. The second chart shows active exposures by GICs sector.



Source: SSGA. For illustration purposes only

As one would expect there are common themes across the portfolios given they share the same benchmark unaware objective, stock return forecasts, and portfolio construction process. For example, all portfolios have a maximum overweight to Utilities and maximum underweights to IT and Healthcare. However, it is also clear from the chart that there are meaningful variations between base currencies for sector exposures as there were for countries. The EUR portfolio is overweight Industrials while all other portfolios are underweight. The EUR and GBP portfolios are underweight Real Estate while the other portfolios are overweight and so on.

Even in this example, building relatively simple naïve portfolios, currency is not a “one size fits all” problem for global investors. More complex investment processes require solutions tailored for each market.

### Perspective 7: Currency risk in equities is more than just skin deep

So far the analysis presented has treated currency exposure as being synonymous with a security or market’s traded currency. In other words, a US equity security has been assumed to have a 100% exposure to USD.

In practice effective currency exposure at an individual company level is often more nuanced. Take the example of a German auto manufacturer that generates substantial revenue from sales in the US. While it may be quoted in EUR on the stock exchange, its profitability, and hence its price, may be quite sensitive to the USD.

Any portfolio analysis of currency risk needs to be sensitive to stock level nuances. In practice this requires either a highly detailed breakdown of revenue, expenses, debt servicing and profitability by country or complex statistical techniques to infer risk and exposures.

## Conclusions

A policy and strategy for managing currency exposures should be an essential part of every investor's governance framework. Like any investment question, it is not possible to provide a prescription to suit all circumstances. However this paper suggests some useful guideposts.

- Currency risks are not stable and should be carefully managed.
- Currency risks have different impacts on different asset classes. Currency policy should, at a minimum, be set asset class by asset class.
- The most sophisticated investors think of foreign currency as a separate asset class. They target a particular level of foreign currency exposure at a total portfolio level and use forward foreign exchange contracts to adjust their exposures.
- It is often possible to implement foreign currency as a separate asset class by carefully balancing the use of hedged, unhedged and variable hedged funds.
- It makes sense to have at least some foreign currency exposure in all but the most conservative portfolios – the question is how much currency exposure.
- Based on shorter term risk measures, foreign currency is generally a good diversifier for global equity portfolios and AUD investors gain a level of tail risk protection by including foreign currency.
- Based on longer term risk measures, including hedging for equity portfolios makes sense because the AUD has had a tendency to rebound and has historically been a higher yielding currency. The tail risk protection for short term movements can lead to longer term underperformance or volatility.
- Valuation matters in most investment spheres and currency is no different. Relative value is a good predictor of 5 year returns for the AUD against currencies like USD, JPY, EUR and GBP. While the AUD can look like reasonable value against a basket of currencies, this may be made up of a combination of cheap and expensive currencies.
- Equity portfolios, particularly for objective-based strategies, should be tailored for the base currency of the investor.
- To full understand portfolio currency risk one needs to be sensitive to stock level nuances. In practice this requires either a highly detailed breakdown of revenue, expenses, debt servicing and profitability by country or complex statistical techniques to infer risk and exposures.

## Appendix: Important Disclosures

### Sample Portfolio Volatility Assumptions

The sample portfolio volatilities were constructed by combining

- Historic volatility of monthly returns
- Historic correlations of monthly returns
- Asset Class weights shown in the table

The following indices were used for return calculations

<b>Asset Class</b>	<b>Index</b>
Australian Equities	S&P ASX 200
International Equities	MSCI World ex Australia Hedged to AUD
Australian REITs	S&P ASX 200 A-REIT
International REITS	FTSE EPRA/NAREIT Developed Liquid Index in Local Currency
Australian Fixed Income	Bloomberg Ausbond Composite 0+
Australian Inflation Linked Fixed Income	Bloomberg Barclays Australia Govt Inflation Linked All Maturities
International Govt. Fixed Income	FTSE Non-AUD World Govt Bond Index Hedged to AUD
International Credit	Bloomberg Barclays Global Credit Hedged to AUD
Cash	Bloomberg Ausbond Bank Bill
CAD	WM Reuters London 4pm AUDCAD spot rate
CHF	WM Reuters London 4pm AUDCHF spot rate
EUR	WM Reuters London 4pm AUDEUR spot rate
GBP	WM Reuters London 4pm AUDGBP spot rate
JPY	WM Reuters London 4pm AUDJPY spot rate
USD	WM Reuters London 4pm AUDUSD spot rate



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