A well-formulated strategic asset allocation is the first and most important step towards meeting the goals of an investment plan. Given the importance of currency as an asset class in globally invested portfolios, it follows that the proportion of currency exposure that the portfolio hedges back to the base currency, or the ‘strategic currency hedge ratio’\(^1\), should be consistent with those goals. In this paper we discuss the factors to consider in setting the strategic currency hedge ratio, and propose that an ability to deviate from the strategic position is beneficial for a portfolio. Specifically in this paper we are seeking to identify the strategic hedge ratio that decreases uncompensated volatility.

We find that the results differ significantly for different base currencies and when evaluated over different time periods. As a result, the optimal strategic currency hedge ratio ranges between 0-100%, with results for different currencies clustering in groups with similar characteristics.

The factors to consider

Factors to consider in setting the strategic hedge ratio can be variable or fixed. Those factors which are fixed or slow-moving should heavily influence the choice of strategic hedge ratio. Those factors which are variable or transitory should influence the strategic position to a lesser degree, but will feature more heavily in the course of active currency management, that is, taking positions that may deviate from the strategic allocation.

The factors to consider in determining the strategic hedge ratio are:

- The base currency of the portfolio, including the correlation between asset class and currency returns
- The asset split between bonds and equities in the benchmark
- The types of risk about which the investor is concerned, including the time horizon over which risk is considered
- The amount of risk that the investor is willing and able to tolerate
- The explicit cost of running the currency hedging programme

After the strategic hedge ratio has been set, the decision to tactically deviate from the strategic position in the course of active portfolio management will depend on a multitude of factors, including:

- The portfolio manager’s active view of the investment landscape
- The portfolio manager’s outlook for individual currencies
- The portfolio manager’s assessment of the characteristics of individual currencies\(^2\).

We will only discuss the third of these considerations, as the first two are outside the scope of this paper.

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\(^1\) The currency hedge ratio is measured as the proportion of currency exposure hedged back to the base currency; 100% hedge ratio means fully hedged to the base currency.

\(^2\) For example, the carry and roll impact that results from using currency forwards, which is driven by the interest rate differential. This is an implicit cost (or benefit) of currency hedging and is explained in more detail later in the paper.
The strategic hedge ratio
Globally invested portfolios invest in assets that are denominated in currencies other than the base currency of the portfolio. The return and risk profiles of such assets are made up of two components: the risk/return profile of the ‘international’ asset, and the risk/return profile of the ‘non-base’ currency. Left unhedged, the risk/return profile of a non-base currency exposure is determined by changes in the spot exchange rate between the non-base currency and the base currency of the portfolio. If hedged, the spot exchange rate exposure to the non-base currency is eliminated, but a cost of hedging is incurred, which we will discuss later in this paper.

Risk tolerance determines propensity to hedge
Currency risk will impact different asset class risk/return profiles to differing degrees. For an international bond portfolio, the volatility of the currency exposure will be much greater than the volatility of the local bond exposure. For this reason, international bond portfolios are generally currency hedged. Indeed, if the purpose of having bonds in the portfolio is to reduce volatility, then in order to preserve the role of bonds in the portfolio, many institutional investors may choose to hedge all their non-domestic bond exposure irrespective of the cost of doing so. The exception is emerging market debt where the costs of hedging are higher than for developed markets. We discuss this later in the paper. However, currency hedging may not always be suitable as correlations between the asset classes and currency can change over time.

For assets with higher local price volatility, such as equities, the volatility of the currency exposure is generally relatively less dominant. For this reason, an international equity investor may leave some or all currency exposure unhedged.

We compare the volatility-reduction benefits of currency hedging for US dollar-based global equity and global bond investors on a rolling 10-year basis in Figure 1 below. We use a 10-year lookback because it is generally a long enough period to smooth out outlying observations. Given the greater volatility reduction benefits, it is usually the case that the higher the weight of bonds in a portfolio, the greater the propensity to hedge currency exposure. We show this in Figure 2 right with an example US dollar-based portfolio.

Generalising this, the higher the weight of low-volatility assets in the portfolio, the greater the relative impact of currency volatility, and the higher the propensity to hedge currency risk, all else equal. It follows that the lower the investor’s tolerance for absolute amount of risk in the portfolio, the higher the strategic hedge ratio is likely to be.

Figure 1: The volatility reduction benefit of hedging is much greater for bonds than for equities
Reduction in volatility from currency hedging, 10Y p.a.

Since the strategic hedge ratio is likely to be close to 100% for international bond investors based in any currency, we focus the remainder of this paper on the equity portion of portfolios.

The choice of strategic currency hedge ratio has a limited impact on portfolio returns. The more important impact is on portfolio volatility. With this in mind, the strategic hedge ratio should be set to minimise portfolio volatility, subject to the cost of doing so.
Hedging has a different effect on different groups of currencies

We compare in Figures 3-16 below the 100% currency hedged and unhedged (i.e. 0% currency hedged) volatility of global equity portfolios denominated in various major base currencies. We have organised the base currencies into five groups based on what we believe to be the dominant common drivers of volatility. Group 1 (e.g. USD, JPY) contains those currencies which see increased demand during times of market stress, making them ‘risk-off’ currencies. Conversely, these currencies become ‘funding currencies’ during periods where investors seek exposure to riskier assets. Group 2 (e.g. GBP, EUR) contains those currencies that investors have typically used to generate returns. These currencies have switched between having ‘risk-on’ and ‘risk-off’ characteristics. Group 3 (e.g. CAD, AUD) contains the currencies of countries that have a significant exposure to commodities. Because of the correlation between commodity prices and these currencies, investors often use these currencies to gain (or reduce) commodity exposure in their broader portfolios. Group 4 (e.g. SGD) contains those liquid/readily tradeable currencies which can be used as a proxy for emerging market risk. Because emerging market currency instruments are often illiquid or not readily available in the desired specifications, investors often use proxy currencies instead. Group 5 contains emerging market currencies (e.g. BRL, MXN). We provide results for a selection of currencies from each group; other currencies that fit into these groups are likely to have similar results. We do not discuss group 5 currencies in this paper, but we have written a special paper discussing the Chinese renminbi.

Group 1: Risk-off/funding currencies

Figure 3: Currency hedging decreases equity volatility over rolling 10-year periods for USD-based investors

Global equity volatility hedged and unhedged in US dollars, 10Y p.a

Source: Schroders, Datastream

3 USD is US dollars, JPY is Japanese yen, GBP is pound sterling, EUR is euro, CAD is Canadian dollars, AUD is Australian dollars, SGD is Singapore dollars, BRL is Brazilian real, MXN is Mexican peso

4 What is the appropriate currency hedge ratio for RMB-based investors? Schroders, January 2019. Available on request.
Group 2: Risk-on/variable risk currencies

Figure 7: Currency hedging increases equity volatility over rolling 10-year periods for EUR-based investors
Global equity volatility hedged and unhedged in euros, 10Y p.a.

Source: Schroders, Datastream.

Figure 8: The impact of currency hedging can be explained by the currency-equity correlation
Correlation between the euro and global equities in local currency

Source: Schroders, Datastream.

Group 3: Commodity currencies

Figure 11: Currency hedging increases equity volatility over rolling 10-year periods for CAD-based investors
Global equity volatility hedged and unhedged in Canadian dollars, 10Y p.a.

Source: Schroders, Datastream.

Figure 12: The impact of currency hedging can be explained by the currency-equity correlation
Correlation between Canadian dollars and global equities in local currency

Source: Schroders, Datastream.
**Figure 13: Currency hedging increases equity volatility over rolling 10-year periods for AUD-based investors**

Global equity volatility hedged and unhedged in Australian dollars, 10Y p.a.

![Graph showing currency hedging increases equity volatility over rolling 10-year periods for AUD-based investors](source)

Source: Schroders, Datastream.

**Figure 14: The impact of currency hedging can be explained by the currency-equity correlation**

Correlation between Australian dollars and global equities in local currency

![Graph showing the impact of currency hedging can be explained by the currency-equity correlation](source)

Source: Schroders, Datastream.

**Group 4: EM-proxy currencies**

**Figure 15: Currency hedging increases equity volatility over rolling 10-year periods for SGD-based investors**

Global equity volatility hedged and unhedged in Singapore dollars, 10Y p.a.

![Graph showing currency hedging increases equity volatility over rolling 10-year periods for SGD-based investors](source)

Source: Schroders, Datastream.

**Optimal hedge ratios vary across currency groups**

In the charts that follow (Figures 17-23), we calculate portfolio volatility at different hedge ratios for each of the same base currencies, using data over the 20-year period to 30 November 2018. We then show a summary of the optimal hedge ratio results over different time periods and different end dates in Figure 24.

**Group 1: Risk-off/funding currencies**

**Figure 17: The optimal hedge ratio for USD-based investors is 100%**

Minimum variance global equity portfolios at a range of currency hedge ratios, USD-based investors

![Graph showing the optimal hedge ratio for USD-based investors is 100%](source)

Source: Schroders, Datastream. Calculated over 20 years.
**Figure 18: The optimal hedge ratio for JPY-based investors is 100%**
Minimum variance global equity portfolios at a range of currency hedge ratios, JPY-based investors

Source: Schroders, Datastream. Calculated over 20 years.

**Group 2: Risk-on/variable risk currencies**

**Figure 19: The optimal hedge ratio for GBP-based investors is 62%**
Minimum variance global equity portfolios at a range of currency hedge ratios, GBP-based investors

Source: Schroders, Datastream. Calculated over 20 years.

**Figure 20: The optimal hedge ratio for EUR-based investors is 55%**
Minimum variance global equity portfolios at a range of currency hedge ratios, EUR-based investors

Source: Schroders, Datastream. Calculated over 20 years.

**Group 3: Commodity currencies**

**Figure 21: The optimal hedge ratio for CAD-based investors is 0%**
Minimum variance global equity portfolios at a range of currency hedge ratios, CAD-based investors

Source: Schroders, Datastream. Calculated over 20 years.

**Figure 22: The optimal hedge ratio for AUD-based investors is 23%**
Minimum variance global equity portfolios at a range of currency hedge ratios, AUD-based investors

Source: Schroders, Datastream. Calculated over 20 years.

**Group 4: EM-proxy currencies**

**Figure 23: The optimal hedge ratio for SGD-based investors is 0%**
Minimum variance global equity portfolios at a range of currency hedge ratios, SGD-based investors

Source: Schroders, Datastream. Calculated over 20 years.
In reality, it is unlikely that investors will always be positioned at the optimal hedge ratio; some pragmatism will be required in order to determine whether or not the marginal risk reduction benefits are worth the marginal cost.

Figure 24 reveals that while the optimal hedge ratios for US dollar- and Japanese yen-based investors are consistently 100% in recent times, the optimal hedge ratios are much more variable for euro- and sterling-based investors.

Optimal hedge ratios for different strategic asset allocations

Optimal hedge ratios for the equity portions of portfolios appear to be of similar magnitude for those currencies that sit within the same category. In Figure 25 below, we show the minimum-variance hedge ratios for various multi-asset portfolios based in different currencies. Additionally, our result from earlier in the paper - that portfolios with a higher weight in bonds should hedge more – is evident in the table.

The cost of hedging

The decision to hedge, of course, will come with an associated cost. The cost of hedging is of particular importance in relation to emerging currencies; in the decision about whether to hedge, it is generally accepted that the cost and difficulty of hedging these generally small individual emerging currency exposures is prohibitive.

Figure 24: Optimal hedge ratios are more variable for risk-on currencies than for risk-off

<table>
<thead>
<tr>
<th>Currency</th>
<th>Minimum-variance currency hedge ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>USD</td>
<td>100% 100% 100% 100% 100% 100% 100%</td>
</tr>
<tr>
<td>EUR</td>
<td>55%  28%  78%  79%  16%</td>
</tr>
<tr>
<td>GBP</td>
<td>62%  55%  45%  83%  48%</td>
</tr>
<tr>
<td>JPY</td>
<td>100% 100% 100% 100% 100% 100% 100%</td>
</tr>
</tbody>
</table>

Source: Schroders, Datastream

Optimal hedge ratios for the equity portions of portfolios appear to be of similar magnitude for those currencies that sit within the same category. In Figure 25 below, we show the minimum-variance hedge ratios for various multi-asset portfolios based in different currencies. Additionally, our result from earlier in the paper - that portfolios with a higher weight in bonds should hedge more – is evident in the table.

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Figure 25: The optimal hedge ratio increases as bond weight increases and as currency ‘riskiness’ decreases

<table>
<thead>
<tr>
<th>Equity/bond allocation</th>
<th>100/0</th>
<th>90/10</th>
<th>80/20</th>
<th>70/30</th>
<th>60/40</th>
<th>50/50</th>
<th>40/60</th>
<th>30/70</th>
<th>20/80</th>
<th>10/90</th>
<th>0/100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1: Risk-off/funding</td>
<td></td>
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<tr>
<td>USD</td>
<td>100%</td>
<td>100%</td>
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<tr>
<td>JPY</td>
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<tr>
<td>CHF</td>
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<td>64%</td>
<td>68%</td>
<td>72%</td>
<td>76%</td>
<td>80%</td>
<td>84%</td>
<td>88%</td>
<td>92%</td>
<td>96%</td>
<td>100%</td>
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<tr>
<td>Group 2: Risk-on/variable</td>
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<tr>
<td>GBP</td>
<td>62%</td>
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<td>70%</td>
<td>74%</td>
<td>77%</td>
<td>81%</td>
<td>85%</td>
<td>89%</td>
<td>92%</td>
<td>96%</td>
<td>100%</td>
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<tr>
<td>EUR</td>
<td>55%</td>
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<td>64%</td>
<td>69%</td>
<td>73%</td>
<td>78%</td>
<td>82%</td>
<td>87%</td>
<td>91%</td>
<td>96%</td>
<td>100%</td>
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<tr>
<td>Group 3: Commodity</td>
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</tr>
<tr>
<td>AUD</td>
<td>23%</td>
<td>31%</td>
<td>38%</td>
<td>46%</td>
<td>54%</td>
<td>61%</td>
<td>69%</td>
<td>77%</td>
<td>85%</td>
<td>92%</td>
<td>100%</td>
</tr>
<tr>
<td>CAD</td>
<td>0%</td>
<td>10%</td>
<td>20%</td>
<td>30%</td>
<td>40%</td>
<td>50%</td>
<td>60%</td>
<td>70%</td>
<td>80%</td>
<td>90%</td>
<td>100%</td>
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<tr>
<td>Group 4: EM-proxy</td>
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</tr>
<tr>
<td>SGD</td>
<td>0%</td>
<td>10%</td>
<td>20%</td>
<td>30%</td>
<td>40%</td>
<td>50%</td>
<td>60%</td>
<td>70%</td>
<td>80%</td>
<td>90%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: Schroders, Datastream. Optimal hedge ratio is defined as the hedge ratio that minimises portfolio volatility. Calculated over a 20-year period ending 30 November 2018. Bonds are assumed to be 100% hedged.
Explicit costs
The cost of running a systematic currency hedging programme, that is, maintaining currency exposure at the strategically optimal level, is important to consider when deciding whether or not pursuing ‘optimality’ is worth the associated cost.

For major developed market currencies, the explicit hedging costs (i.e. transaction costs) are minimal, but for emerging market currencies, the costs are much higher. For example, Figure 26 compares the cost of trading USD/CNY non-deliverable forward contracts with the cost of trading EUR/USD forward contracts.

Implicit costs
It is outside the scope of this paper to discuss the process that portfolio management teams go through to analyse the global currency landscape and determine the active currency exposures that they take as a result. It is important, however, to discuss the structural factors that will influence the active currency management decisions, one of which is the cost of carry.

A cost of carry arises because a portfolio must hedge spot exchange rate exposure using forward exchange rate contracts. The portfolio’s investments in non-base currency denominated assets expose the portfolio to spot exchange rate changes, but available currency hedging tools utilise the forward exchange rate to counter these exposures. The relationship between the spot and forward exchange rates is what drives the cost of carry. The term structure of exchange rates determines the cost of hedging irrespective of changes in spot exchange rates: spot exchange rate exposure emanating from ownership of international assets is eliminated by the currency hedge. However, all else equal, a portfolio manager will tactically choose to hedge currency risk if the negative spot return is expected to be greater than the negative cost of carry. If the cost of hedging a currency is greater than the expected negative spot return from that currency, the portfolio may choose to leave the currency exposure unhedged. The term structure of exchange rates is in turn determined by the relative short-term interest rate environments across countries in which the portfolio is invested. The implicit cost of hedging developed market exposures (that is, the cost of carry as described in the next section) is included in the calculations in Figures 3-25.

Evidently, the cost of currency hedging depends on a multitude of variables. The global interest rate environment is impermanent and uncertain, and so the structure of exchange rates is variable. Only transaction costs can be accurately forecast into the future – and even then, not for all currencies. As a result, we would argue that the cost of carry should not feature too heavily in the strategic hedge ratio decision, because it will also feature as part of the portfolio manager’s assessment of the landscape for active investment opportunities during ongoing portfolio management. We suggest that this is true for all major developed market base currency portfolios. It can safely be said, however, that all else equal, a higher cost of hedging would lead to a lower propensity to hedge.

Conclusion
Our results show that the optimal strategic currency hedge ratio differs significantly for different base currencies and when evaluated over different time periods. We find that bonds should generally be 100% hedged, with the exception of emerging market exposure which tends to be expensive to hedge. For the equity portion of multi-asset portfolios, optimal hedge ratios cluster in groups of currencies with similar characteristics. From an active management perspective, we believe that managers should be given sufficient leeway to manage currency exposure away from the strategic benchmark, just as they are permitted to do with other asset classes.
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