To Hedge Or Not To Hedge:
Assessing Currency Management Solutions for International Equity Portfolios

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Abstract

The decision to manage currencies in international equity portfolios is a complex one, and is intrinsically related to the final objective of the investor, whether it is risk reduction, or improvement in risk adjusted returns. In the absence of a confident view on the direction of foreign currency, a risk averse investor might choose to just hedge the currency exposure of her portfolios. On the other hand, there are well documented risk premia within the broader currency market that offer positive expected returns. An active investor can benefit from such risk premia and use currencies as a source of portable alpha to generate additional source of risk adjusted returns, above and beyond what a hedged equity portfolio could provide.
Currency is far and away the most liquid of the world’s major asset classes. Powered by the engine of global commerce and the continuous flow of foreign currency exchange (FX) to pay for goods and services, more than $5 trillion changes hands in the currency markets every day\(^1\). The recent dramatic weakening of the British pound and Mexican peso since the surprising Brexit and US presidential elections and the strengthening of the US dollar\(^2\) over the last five years are just the latest reminders to international equity owners that currency risk cannot be ignored.

The decision to manage currencies in international equity portfolios is a complex one, and is intrinsically related to the final objective of the investor, whether it is risk reduction, improvement in active returns, or improvement in risk adjusted returns. Both the academic and practitioner communities have long debated the subject with no clear conclusion as to what is the best course of action. Perold and Shuman [1988] concluded that hedging should be the policy and lifting the hedge should be an active investment decision. Arnott and Henriksson [1989] argued that in the absence of a confident view on currencies, a hedge would reduce the risk of global investing significantly. Froot [1993] on the other hand, reached almost the opposite conclusion, arguing that in the long run, purchasing power parity (PPP) holds, therefore currencies are implicitly hedged. An explicit hedge could actually increase the risk in the portfolios. Bailey, Ng, and Stulz [1992] focused on the Japanese market. There appeared to be little evidence for improvement for hedging the exposure to the Nikkei, but major improvement could be achieved by obtaining better forecasts of exchange rate changes.

More recently, Campbell, Medeiros, and Viceira [2008], as well as Martini [2010], Boudoukh, Katz, Richardson, and Thapar [2015], and Chen, Kritzman, and Turkington [2015] looked at the
issue of hedging from a risk management perspective: a hedging program should be dynamic and seek to address the currencies which are positively correlated with the equity returns. Peterson LaBarge et al. [2014] reported that a reasonable assumption is for hedged and unhedged investment to produce similar gross returns over long time horizons. The impact of currency hedging on equity portfolio risk is more nuanced since it is a function of the relative volatility of the asset versus the currency. Finally LeGraw [2015] found that currency hedging reduces volatility over short horizons for USD investors but not over long horizons.

The results of all these studies are mixed. They depend on:

- The domicile of the investor
- The investment horizon
- The timing of the study
- The desired outcome, i.e. risk reduction or improvement in active return

So, what are we to take away from these various, and often times conflicting, points of view? Should investors hedge or not hedge? In this study, we comprehensively address the issue of currency risk in an equity portfolio and provide a clearer framework with a rather unexpected answer – for many investors, to hedge or not is not the question. The traditional “one-size-fits-all” approach is not feasible given the range of asset owner objectives.

We demonstrate that in the long run, because of purchasing power parity, hedged and unhedged equity portfolios end up in a very similar place, both from a risk and return point of view, albeit with significant variation in risk adjusted returns through time. We trace the source of the similarity in risk adjusted returns to the time-varying nature of correlation between equities and
currencies, and we provide both statistical and economic reasons for it. It could very well be, that in the face of such time variation and in the absence of a confident view on the direction of foreign currency, a risk averse investor might choose to just hedge the currency exposure of her portfolios.

On the other hand, while individual currency returns are on average zero and highly time varying, there are well documented risk premia within the broader currency market that offer positive expected returns. Such premia are accessible through long short portfolios of currencies.

An active investor can benefit from the risk premia embedded in the currency market and use currencies as a source of portable alpha by allocating to an absolute return currency mandate to generate additional source of risk adjusted returns, above and beyond what a hedged equity portfolio could provide.

**DATA AND STUDY DESIGN**

We analyze the impact of currency exposure on a market-weighted portfolio of international developed equities (MSCI World ex USA Index) from the perspective of an investor domiciled in the US. Our analysis is conducted using monthly data between January 1995 and December 2016. We focus on the currencies of the G10 countries represented in the index (Australia, Canada, Euro Area, Japan, New Zealand, Norway, Sweden, Switzerland, United Kingdom). Such currencies are most liquid according the 2016 BIS Survey. As of December 2016, this subset represents about 94% of the individual currency exposure in a MSCI World ex USA Index portfolio. Exhibit 1 provides the breakdown of the currency exposure of the portfolio of MSCI World ex USA Index. The euro, Japanese yen and British pound combined account for about 67% of the total
currency exposure of the portfolio. The Swiss franc, Canadian dollar and Australian dollar account for about 23%, while the Swedish krona, Norwegian krone and New Zealand dollar represent only about 3.4% of the portfolio, with the remainder of the currencies\textsuperscript{4} accounting for 6%. For the rest of this paper, when we refer to the international developed equities portfolio we are referring to the portfolio built at month end from the G10 currencies represented in the MSCI universe and rescaling the weights proportionally so that they sum up to 100%.

\begin{center}
\textbf{Exhibit 1}
\end{center}

\begin{center}
\textit{Currency Exposure of MSCI World ex USA Index (December 2016)}
\end{center}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{currency_exposure_bar_chart.png}
\end{figure}

\textbf{EXPECTED RETURNS AND RISK FROM CURRENCY INVESTING}

Much of the debate on currency hedging centers on the argument that currency exposure represents a source of uncompensated risk. In the absence of a confident view on the direction of foreign currency it probably makes sense to fully hedge because the two-sided nature of the currency market makes it unlikely that the normal expected return from being unhedged is
sufficiently positive to justify bearing additional risk. To examine whether currency hedging actually increases the portfolio returns, we compared the cumulative returns of an unhedged and fully hedged\textsuperscript{5} indexed portfolio of international developed equities from the perspective of an investor domiciled in the US from 1995 through 2016. As suggested by Exhibit 2, the unhedged equity portfolio has an annualized return of 6.4%, while the hedged equity portfolio has an annualized return of 6.8%. The slight difference in the two portfolios can be attributed to the negative annualized returns of the market cap-weighted portfolio of foreign currency, which are neutralized in the hedging portfolio. These returns include both the spot exchange rate moves and the interest rate differential between rates for the foreign currencies and US dollar. This finding is not surprising since over long time horizons purchasing power parity holds and expected foreign currency spot returns adjusted for inflation should be zero.

\textit{Exhibit 2}

\textbf{Cumulative Returns of Unhedged and Hedged Equity Portfolios (Jan 1995-Dec 2016)}

![Cumulative Returns Chart]

However, while the currency returns were within a half percent of zero, they were highly time-varying. Exhibit 3 shows three distinct periods (US dollar appreciation from 1995-2002, US dollar...
depreciation from 2002-2011 and US dollar appreciation from 2011-2016) during which currency return did not wash out, each corresponding to a US dollar cycle.

Exhibit 3

Cumulative Returns of the Currency Hedging Portfolio (Jan 1995-Dec 2016)

In addition to the effect of currency hedging on portfolio returns, we also investigated how hedging alters the risk that currency exposure contributes to an equity portfolio. Exhibit 4 shows different risk measures for both an unhedged and fully hedged equity portfolio. Interestingly, over the 20-year period the volatility of the two portfolios is fairly comparable. While the hedged portfolio incurred lower maximum drawdowns, it experienced similar negative tail return defined as the average performance in the worst 10% of months.
Exhibit 4

Risk Profile of Unhedged and Hedged Equity Portfolios (Jan 1995-Dec 2016)

<table>
<thead>
<tr>
<th></th>
<th>Unhedged International Equity Portfolio</th>
<th>Hedged International Equity Portfolio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volatility</td>
<td>16.31%</td>
<td>15.85%</td>
</tr>
<tr>
<td>Max Drawdown</td>
<td>-55.76%</td>
<td>-52.36%</td>
</tr>
<tr>
<td>Tail Return</td>
<td>-8.63%</td>
<td>-8.50%</td>
</tr>
</tbody>
</table>

However similarly to what we observed for the returns, there is a lot of time variation in the total risk of the hedged and unhedged portfolios. As shown in Exhibit 5, when realized volatility using 5-year rolling estimates of monthly returns was compared, the hedged portfolio actually realized slightly higher volatility than the unhedged one during the period 2000-2008. But from 2008-2016 that relationship reversed by a significantly wider margin.

These time-dependent variations in the portfolio risk are one of the reasons many investors choose to hedge. For those like defined benefit plans with regularly recurring liabilities that can be adversely affected by a short-term spike in volatility, periods of lower returns and/or modestly higher volatility are the price they are willing to pay for a smoother overall return stream. It is important to look closer at the source of volatility for both hedged and unhedged portfolios. First, we looked separately at the volatility of the currency portfolio and equity portfolio, the two major elements of the hedged portfolio. Over the time period 2000-2016, the currency portfolio experienced an annual volatility of roughly 8%, compared to the 16% for international equity portfolios shown in Exhibit 5. Between 2002-2007, currency volatility remained stable, hovering around the long-term mean before peaking at 9% after the financial crisis. This behavior is
consistent with the previous finding that the hedged portfolio realized lower volatility than the unhedged one after 2008.

*Exhibit 5*

*Rolling 5-Year Volatility of the Unhedged and Hedged Equity Portfolios (Jan 2000- Dec 2016)*

When we further examined the correlation between the individual currency returns and their respective local equity markets, we found a great deal of variation across the G10 currencies.
Economic theory suggests several drivers of the correlation between the individual currency returns and their respective local equity markets, including monetary and fiscal policy; trade and capital flows. Exhibit 7 shows that commodity currencies (such as the Australian dollar, Canadian dollar, Norwegian krone and New Zealand dollar) as well as currencies of small open economies such as the Swedish krona are generally pro-cyclical and positively correlated to their respective local equity markets. On the contrary, safe haven currencies (such as the Japanese yen and the Swiss franc) display negative correlations while the Euro and British pound appear to be uncorrelated with their respective local equity markets. As mentioned earlier, Campbell, Medeiros, and Viceira [2010] have pointed out the distinct risk of compound loss when hedging a negatively correlated currency. Our finding of a mixture of positive, negative and no correlations suggests that to hedge or not does not have one simple answer. Rather, investors should dissect and only hedge the positively correlated currencies but not the rest.

Exhibit 7

*Correlation of the Foreign Currency Returns with the Local Equity Markets (Jan 1995-Dec 2016)*
As shown in Exhibit 8, the degree of co-movement between currencies and local equity varies significantly through time. The correlation of the Euro and British pound with their respective equity markets increased steadily over much of the sample starting from -40% at the beginning of the 2000s to a peak of roughly +35% for the British pound and over 60% for the Euro at the end of 2014. The positive correlation of the Euro to the slumping European stock markets starting in 2009 was due to the financial markets’ perception of the euro as a risky currency driven by the European debt crisis. The resolution of the Greek crises in 2015, and sharp increase in the euro area current account surplus again boosted the perception of the euro as a safe currency, muting its positive correlation with risk proxies. It is important to note that the Euro and British pound jointly represent about 45% of the currency exposure of an international developed equity portfolio and the swings in their correlation with local equities can therefore have a sizeable impact on the total risk of the equity portfolio.
This evidence makes us question the stability of the relationship between currency and local equity markets. Hedging foreign currency exposures is not without its challenges; at a minimum a hedging program should be carefully designed to take these instabilities into consideration.

THE CASE FOR THE ACTIVE MANAGEMENT OF CURRENCY

So far, our data has suggested that currency hedging to lower uncompensated risk for the portfolio should never be a one-size-fits-all approach, but rather an individual-situation-dependent active decision. Moving away from a hedging centric framework where currencies are seen as an uncompensated source of risk for the portfolio to an active currency management framework has the potential of unlocking additional sources of returns for the final investor.

Institutional investors have a choice of two basic types of active currency mandates commonly known as “Active Currency Overlay” and “Absolute Return” (see Pojarliev and Levich [2014]). With an active currency overlay, the manager starts from the currency exposure embedded in the underlying portfolio and attempts to combine portfolio risk reduction with return enhancements by varying the hedge ratio for each foreign currency between 0% and 100%. By comparison, in an absolute return mandate, the manager seeks to generate a positive return by taking on currency exposure subject to a pre-determined risk budget. Absolute return mandates have the potential to add value with little impact on the volatility as currency investment strategies are typically uncorrelated to traditional assets. In the remainder of this paper we will focus on an absolute return mandate since the results are more general and do not depend on the composition of the underlying equity portfolio.
While individual currency returns are on average zero and highly time varying, there are well documented risk premia within the broader currency market that offer positive expected returns. Such premia are accessible through long short portfolios of currencies.

Carry is the most well-known and studied currency premium with the most powerful results in the literature. The currency carry trade involves buying currencies from countries with higher interest rates and selling currencies associated with lower interest rates. This spread between interest rates represents the carry premium. This strategy is motivated by the failure of uncovered interest rate parity (UIP) which hypothesizes that the carry gain due to the interest rate differential is offset by a commensurate depreciation of the investment currency. But what is interesting is that this hypothesis often fails to hold up for long periods (Hansen and Hodrick [1980]). Empirical studies from the 1980s onwards have documented that high interest rate currencies do not depreciate as much as UIP predicts. In fact, they often appreciate and contribute to the carry premium, an irregularity known in the academic literature as the forward rate bias or “forward premium puzzle.” The historical positive return to currency carry coupled with its potential for significant losses in periods of capital market stress has been associated with a risk premium that investors want to be rewarded with for holding systemic risk in their portfolio. The academic literature has proposed several different explanations of the risk factors embedded in the carry portfolio ranging from macroeconomic risk (see also Lustig and Verdelhan [2007], Kojien, Moskowitz, Pedersen, Vrugt [2017]) to crash, volatility, and liquidity risk (see also Brunnermeier, Nagel, and Pedersen [2008], Menkhoff, Sarno, Schmeling and Schrimpf [2012]).
Value is based on the assumption that prices should ultimately revert to intrinsic value over the long run. One of the oldest and most popular measures of currency fair value is the purchasing power parity (PPP) implied exchange rate. The concept is based on the law of one price, where in the absence of transaction costs and official trade barriers, identical goods will have the same price in different markets when the prices are expressed in the same currency. Suppose that the price of foreign goods is unusually high relative to the price of domestic goods. To get this ratio back to a more “normal” level, either foreign prices needs to decline or domestic prices needs to rise, or both. In practice, prices of local goods tend to be sticky whereas the exchange rate is highly flexible. The adjustment to the PPP exchange rate occurs through trade flows: absent trade barriers, demand would flow from country with the higher prices to the country where goods are cheaper, weakening the currency of the country with higher priced goods. Over a sufficiently long period, countries with high (low) inflation relative to their trading partners tend to experience currency depreciation (appreciation). The tendency for PPP to hold over the long run leads immediately to a value-oriented investment strategy predicated on mean reversion: buy undervalued currencies and sell overvalued currencies.

While rigorous economic studies have documented a statistically significant tendency for exchange rates to revert to their PPP implied values over time, a variety of forces, including monetary and fiscal policies, can create countervailing pressures that prevent currencies from reverting to their intrinsic value in the intermediate term. The risk that these discrepancies will continue or deepen before reverting to fair value provides the value premium that can be exploited for alpha.
Over the years, long-short currency strategies that systematically target carry, value and other more esoteric premia have become a staple of certain large institutional portfolios, where they are commonly used as an important diversifier and complement to other return streams. Yet the broader equity institutional investor base has largely limited its FX focus to the question of hedging. Exhibit 9 shows the backtested performance of simple implementations of the carry and value strategies in G10 currencies in line with current practice in industry and research. At the end of each month we sort currencies according to each factor and form zero cost long-short portfolios (See appendix for more details on portfolio construction). Over the past twenty years, the individual carry and value premia would have realized a Sharpe ratio close to 0.5. As expected, carry displays higher returns than value. However, the carry portfolio has also higher correlation with equity markets and bigger peak-to-through losses. For that reason, we also focus on combined carry-and-value currency portfolios with progressively higher weightings to value. At the highest end of the scale, a currency portfolio with a 30/70 carry/value exposure would have realized a Sharpe ratio of 0.63 with just a 0.19 correlation to equities and 9% maximum drawdown, suggesting a currency strategy using an optimal balance of these well-established risk premia has the potential to yield significant positive returns with a relatively low correlation to the equity market.

There is one other feature of a currency strategy that is important to highlight here. A currency strategy is typically implemented using forward contracts which require only a modest commitment of capital and can therefore provide a very high return on capital. An investor could target a 5% active risk in currencies by committing only 3.2% of the capital, equating to an expected return on capital of almost 100%. Given the high liquidity of the currency market and
the fact that the leverage is embedded in the forward contracts themselves and does not come from outright borrowing, this magnitude of leverage is easily supported. Of course, an investor needs to have the comfort level (not to mention investor-policy leeway) to employ leverage. The currency strategy’s efficient use of capital also means that investors need to put less of the rest of their capital at risk to achieve the same expected returns. Thus, while the leverage certainly introduces its own risks, employed appropriately it can be a powerful mechanism for improving overall portfolio risk-adjusted returns. The low correlation to the equity market as well as the high capital efficiency make a currency strategy an ideal candidate for a portable alpha solution.

Exhibit 9

Simulated Performance of Currency Strategies (Jan 1995-Dec 2016)

<table>
<thead>
<tr>
<th></th>
<th>Carry</th>
<th>Value</th>
<th>50%Carry+50%Value</th>
<th>40%Carry+60%Value</th>
<th>30%Carry+70%Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obs</td>
<td>263</td>
<td>263</td>
<td>263</td>
<td>263</td>
<td>263</td>
</tr>
<tr>
<td>Annual Excess Return</td>
<td>2.6%</td>
<td>2.47%</td>
<td>3.2%</td>
<td>3.0%</td>
<td>2.9%</td>
</tr>
<tr>
<td>Volatility</td>
<td>5.2%</td>
<td>4.55%</td>
<td>4.9%</td>
<td>4.8%</td>
<td>4.6%</td>
</tr>
<tr>
<td>Sharpe ratio</td>
<td>0.50</td>
<td>0.54</td>
<td>0.65</td>
<td>0.63</td>
<td>0.63</td>
</tr>
<tr>
<td>Maximum Drawdown</td>
<td>-20%</td>
<td>-8%</td>
<td>-14%</td>
<td>-12%</td>
<td>-9%</td>
</tr>
<tr>
<td>Skewness</td>
<td>-1.00</td>
<td>-0.21</td>
<td>-0.57</td>
<td>-0.49</td>
<td>-0.32</td>
</tr>
<tr>
<td>Correlation with International Equity</td>
<td>42%</td>
<td>5%</td>
<td>32%</td>
<td>27%</td>
<td>19%</td>
</tr>
<tr>
<td>Avg Gross Notional (x AUM)</td>
<td>1.25</td>
<td>1.25</td>
<td>1.25</td>
<td>1.25</td>
<td>1.25</td>
</tr>
<tr>
<td>Turnover</td>
<td>50%</td>
<td>79%</td>
<td>103%</td>
<td>113%</td>
<td>95%</td>
</tr>
</tbody>
</table>

ADDING AN ACTIVE CURRENCY STRATEGY TO AN INTERNATIONAL EQUITY PORTFOLIO

To quantify the potential benefits of treating foreign currency exposure as an active investment decision for a traditional equity investor, we measured the impact of adding the currency strategy to the equity portfolio at incremental levels of targeted active risk. In line with the findings of Martini [2010] and Pojarliev and Levich [2014] Exhibit 10 shows that even adding the currency strategy with fairly modest risk targets can significantly benefit the portfolio.
As we increase our commitment to target 50bps of active risk, the expected return of the portfolio increases by 0.3%, while the overall portfolio volatility remains almost unchanged because of the low correlation of the currency strategy with the equity portfolio and the very high return on capital provided by the currency strategy. Using currency to move up to 200bps of active risk causes the expected return to increase by 1.17% while the portfolio volatility increases by merely 0.27%.

The Sharpe ratio of the combined portfolio improves steadily, going from 0.34 in the base case up to 0.47 under a 500bps active risk target scenario\(^\text{14}\) (See Exhibit 11). These findings are robust across sub-periods\(^\text{15}\). In terms of downside risk outcomes, the portfolio targeting 500bps of active risk in the currency strategy has almost identical tail return (the average performance in the worst 10% of months), skewness and peak-to-trough falls as the portfolio without the currency strategy. It is important to emphasize that to achieve that target risk level the portfolio requires
an average gross notional of 2.3 times. As noted previously, this magnitude of leverage is easily supported and plays a crucial role in improving the risk/return profile of the combined portfolio.

*Exhibit 11*

**Impact of Adding an Active Currency Strategy to an International Equity Portfolio (Jan 1995-Dec 2016)**

<table>
<thead>
<tr>
<th></th>
<th>Unhedged International Equity Portfolio</th>
<th>Active Currency Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>with 50bps of risk in active currency strategy</td>
<td>with 100bps of risk in active currency strategy</td>
</tr>
<tr>
<td>Obs</td>
<td>263</td>
<td>263</td>
</tr>
<tr>
<td>Annual excess return</td>
<td>5.2%</td>
<td>5.5%</td>
</tr>
<tr>
<td>Volatility</td>
<td>16.3%</td>
<td>16.4%</td>
</tr>
<tr>
<td>Sharpe ratio</td>
<td>0.32</td>
<td>0.34</td>
</tr>
<tr>
<td>Maximum drawdown</td>
<td>-55.8%</td>
<td>-55.9%</td>
</tr>
<tr>
<td>Tail return</td>
<td>-8.6%</td>
<td>-8.7%</td>
</tr>
<tr>
<td>Skewness</td>
<td>-0.56</td>
<td>-0.57</td>
</tr>
<tr>
<td>Correlation to equities</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Gross notional</td>
<td>100</td>
<td>113</td>
</tr>
<tr>
<td>Capital allocated to equities</td>
<td>100.0%</td>
<td>99.7%</td>
</tr>
<tr>
<td>Capital allocated to Active Currency Strategy</td>
<td>0.0%</td>
<td>0.3%</td>
</tr>
</tbody>
</table>

Exhibit 12 illustrates how the addition of an active currency strategy targeting 500bps can materially improve the international equity portfolio returns through time.
CONCLUSION

The academic and practitioner literature on currency management in equity portfolios has been centered around the optimal hedge ratio. We demonstrate that in the long run, due to the law of purchasing power parity, hedged and unhedged equity present very similar overall risk and return characteristics. However, we show significant variation exist in risk-adjusted returns through time and consequently currency hedging should account for time horizon as well as the changing nature of the correlation between currencies and their respective equity markets.

We further demonstrate actively managing the compensated risk embedded in the currency markets offers additional uncorrelated returns for the portfolio. We use the example of a developed equities investor that approaches the currency exposure of her portfolios as an active investment decision by allocating to an absolute return currency mandate. We show that an
absolute return currency program provides such an investor with an additional source of risk
adjusted return, above and beyond what a hedged equity portfolio could provide.
APPENDIX

Currencies Returns

We focus on G10 currencies: Australian dollar (AUD), Canadian dollar (CAD), Swiss franc (CHF), Euro (EUR), British pound (GBP), Japanese yen (JPY), Norwegian krone (NOK), New Zealand dollar (NZD), and Swedish krona (SEK). We obtain spot exchange rates from WMR and Bloomberg NY Close. For the pre 1999 period we proxy Euro with Deutsche Mark (DEM). We compute returns for 1-month currency forwards, \( R(t, j) \), from the perspective of a dollar based investor as follows:

\[
R(t, j) = \left( \frac{S(t, j)}{S(t-1, j)} - 1 \right) + i(t, j) - i(t-1, USD)
\]

Where \( S(t, j) \) is the spot exchange rate in USD per unit of foreign currency \( j \) and \( i(t, j) \) is the 1M deposit rate for country \( j = AUD, CAD, ..., USD \).

Risk Premia Measures in Currencies

Carry

We measure carry using the 1M Deposit rate provided by Bloomberg. Before 2013 carry was proxied by 1M BBA Libor fixing (1M NIBOR and 1M STIBOR for NOK and SEK. For EUR we use DEM 1M Libor before 1/1/1999 and then switch to 1M EURIBOR).

Value

We measure value by using (%) bilateral misvaluations of spot exchange rate from the OECD purchasing power fair values obtained from Bloomberg.

Currency Premia Portfolio Construction

Following Asness, Moskowitz, and Pedersen [2013] for any security \( j = 1, ..., N \) at time \( t \) with signal \( F(t, j) \) we linearly weight securities according to the following scheme:

\[
w(t, j) = c \times \left[ \text{rank}(F(t, j)) - \frac{1}{N} \sum \text{rank}(F(t, j)) \right]
\]
where the weights across all securities sum to zero, representing a dollar neutral long-short portfolio and $c$ is a scalar such that max absolute weight is equal to 30%.
ENDNOTES

These materials represent the views and opinions of the authors regarding the economic conditions, asset classes, or financial instruments referenced herein and are not necessarily the views of QMA. We thank Roy Henriksson, Edmund Bellord, Mark Cohen, Martin Tarlie and Yesim Tokat-Acikel for many helpful comments.
REFERENCES


We use the US Dollar Index (USDX) which measures the value of the US Dollar relative to a basket of foreign currencies. Such index was up 37.55% since the bottom in June 2011 and December 2016.

The Euro Area legacy currencies are treated as Euro for this exercise. We do not include Hong-Kong, Singapore, Denmark, and Israel. The currencies of the first three countries have managed or stabilized currency arrangements. The Israeli Shekel is free floating but represents only 0.2% of global currency turnover according to the 2016 BIS survey. As a comparison, Norway the smallest in G10 accounts for about 1.4% of daily global currency turnover.

The hedged portfolio is built by neutralizing the currency exposure by entering a short position in the foreign currency using 1M currency forwards. The hedged portfolio returns are gross of transaction costs from currency trading.

Often some use of economic leverage is required. The leverage is predominantly embedded in the derivatives (FX Forwards) themself and does not come from outright borrowing.

Various international agencies, such as the OECD and IMF as well as many private banks and financial institutions, such as The Economist magazine, compute PPP indices for most countries.

We believe that the characteristics of the developed currency markets do not lend them self to relative value momentum strategies and therefore we do not include it in our study. See Aiolfi, Henriksson, Hudock, Lockwood, and Tokat-Acikel [2015] for more details.

All returns are in excess of the risk free rate but gross of transaction costs.

The results are robust across sub-periods. Over the last decade (Jan 2007-Dec 2016) the currency strategy with 30/70 carry/value exposure would have realized a Sharpe ratio of 0.51 with a 0.23 correlation to equities.

We assume the initial capital commitment is set using a 5-day 99% VaR and that an equivalent amount is set aside to buffer against margin calls. While the initial capital commitment is small, an investor might decide for a larger outlay.

The expected return on capital is defined as the ratio between the annualized expected excess return of the currency strategy and the capital commitment. In the example shown in Exhibit 9, the active currency strategy with a 30/70 carry/value exposure has an expected Sharpe ratio of 0.63. Therefore, a currency strategy targeting 5% active risk is expected to generate 3.2% excess return. Assuming a 3.2% capital requirement (two times 5-day 99% VaR), the expected return on capital is computed as 3.2%/(1.6%x2)=100%.

All returns are in excess of the risk free rate but gross of transaction costs.

For example over the last decade (Jan 2007-Dec 2016) the Sharpe ratio of the combined portfolio would have increased from 0.18 in the base case up to 0.26 under a 500bps active risk target scenario.