

# Currency Proxy Hedging: Beyond correlations



Russell Investments Research/Viewpoint



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Investors hedging currency exposures have many decisions to make, from establishing hedge ratios and strategic benchmarks to setting counterparty concentration thresholds. The composition of an investor's currency exposure may also warrant the use of proxy hedging, where one foreign currency is substituted for another currency of the same notional amount in an overlay programme. This augmentation of a currency hedge can benefit the investor by reducing the number of trades and improving costs by avoiding relatively illiquid currencies while maintaining a low tracking error relative to the currency hedge benchmark. However, the cyclical nature of the economy can also decouple otherwise stable correlations, motivating investors to take a holistic approach that goes beyond correlations.

## The use of currency proxies

There are various reasons why proxy hedging may be useful for an investor. Employing proxies can reduce trading costs by not only executing fewer trades but also substituting illiquid currencies with more liquid currencies. Smart proxy selection can embed fractional carry skews into the portfolio as another cost-saving initiative. Furthermore, certain jurisdictions introduced regulatory changes in 2016, enforcing mandatory collateralisation of non-deliverable forwards (NDFs). Collateralisation can result in performance drag for the investor's portfolio because of the cash or securities that are set aside for margin payments. A cash equitisation programme may be used to alleviate the performance impact but such a solution comes at a cost. Substituting NDFs with deliverable forwards can reduce the operational burden and opportunity costs associated with collateralisation.

When using proxy hedging, it is important to weigh the twin objectives of low cost and low tracking error relative to the full basket of currencies. As a case study, we can look at a currency overlay designed to fully hedge the MSCI World exposures to the U.S. Dollar. By using a ten-year proxy hedging back-test, we can ascertain the effectiveness of the proxy basket relative to the full basket in hedging the index exposures. As at the end of December 2020, there were fourteen currencies in the index. To hedge the full basket of currencies, a U.S. investor would take a short position in each of the fourteen currencies vs. USD in the proportions represented in the index.

Studying the index, we can identify currencies that may be suitable proxy targets (see Figure 1). For example, since the Danish Krone (DKK) is currently pegged to the Euro

(EUR) and commands only a 0.78% weighting in the index, we can reasonably substitute the exposure with EUR. Indeed, the trading cost of a EUR/USD pair versus that of a DKK/USD pair is in favour of EUR/USD, with spread costs more than four times wider for DKK/USD as at the end of 2020. Additionally, the carry cost paid by hedging EUR/USD is very similar to that which is paid by hedging DKK/USD directly. In our case study, proxy hedging can be extended to other currencies in the basket. Perhaps we may decide to only hedge the G10 currencies, employing proxy currencies of EUR and USD for the targets DKK, Hong Kong Dollar (HKD), Israeli Shekel (ILS) and Singapore Dollar (SGD) respectively – the construction of this proxy basket (see Figure 2) would be supported by analysing various factors. Of course, for HKD, ILS, and SGD, using USD as a proxy implies leaving these currencies unhedged. That isn't necessarily an adverse outcome if proxy analyses are supportive.

The ten-year analysis uses static currency weights for simplicity and a standard one-month forward contract tenor. The results exhibit very low tracking error (see Figures 3 and 4) against trading the full basket of fourteen currencies. An annualised tracking error figure of 2 bps (see Figure 5) and an R-squared of 1.0000 (where 1 indicates a perfect basket with respect to tracking power) support our proxy choices. By using USD as a proxy for HKD, ILS, and SGD, we contribute to saving on transactions costs by trading fewer currencies (10 versus 14). We do however forgo the carry pick-up associated with hedging the proxied currencies directly in this case, though the focus should be on the weighted carry as opposed to the full carry.

Figure 1: MSCI World currency weights and proxy factor statistics

CURRENCY	WEIGHT	ANN. CARRY PICK-UP	SPREAD COST (1M FWD), BPS	PROXY	CORRELATION TO TARGET (10YR)	CARRY PICK-UP DIFF.	SPREAD COST DIFF, BPS
AUD	2.20%	0.29%	0.64	AUD			
CAD	3.13%	0.09%	0.78	CAD			
CHF	2.98%	1.09%	1.16	CHF			
DKK	0.78%	0.81%	3.35	EUR	0.9995*	-0.01%	-2.56
EUR	10.04%	0.81%	0.79	EUR			
GBP	4.38%	0.23%	0.40	GBP			
HKD	0.96%	0.09%	1.22	USD	0.9981*	-0.09%	-1.22
ILS	0.10%	0.64%	4.90	USD	0.7112	-0.64%	-4.90
JPY	7.82%	0.41%	0.01	JPY			
NOK	0.18%	-0.14%	2.03	NOK			
NZD	0.09%	0.13%	1.21	NZD			
SEK	1.04%	0.40%	2.28	SEK			
SGD	0.33%	0.05%	0.34	USD	0.8164	-0.05%	-0.34
USD	65.97%	-	-	USD			

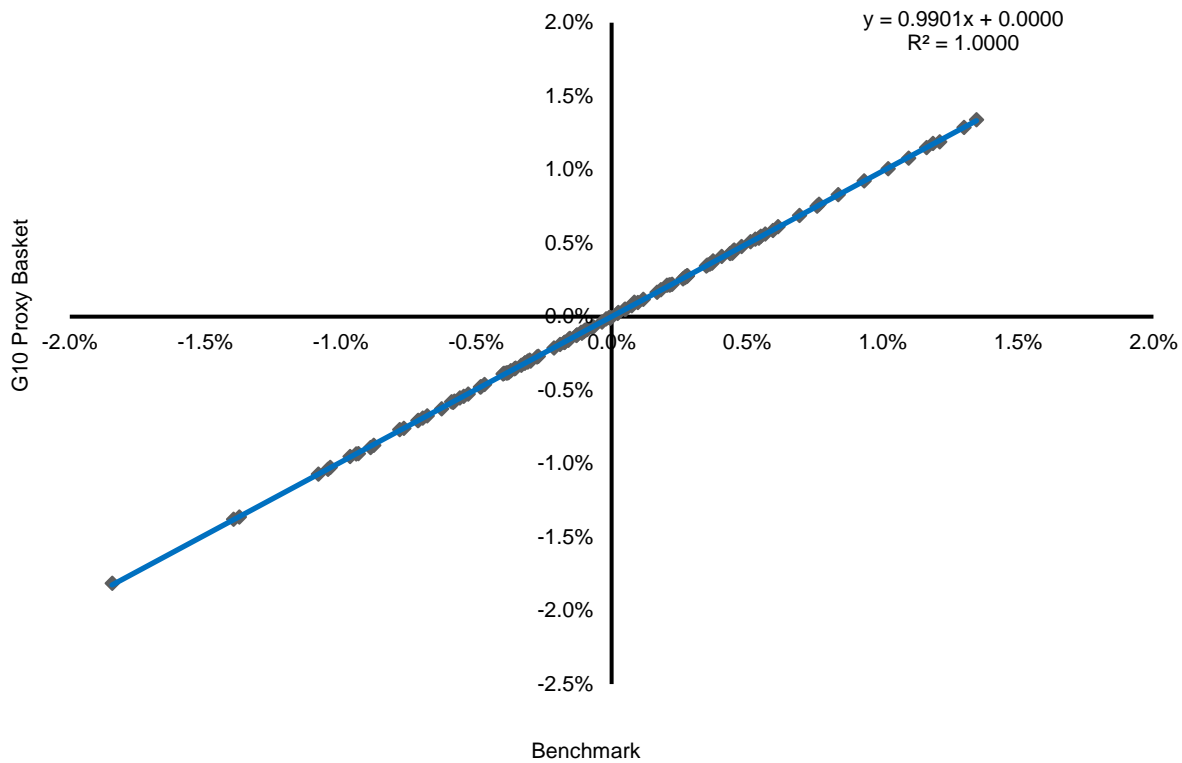
\* Pegged to stated proxy. Source: Russell Investments, Bloomberg, MSCI. Indicative spread costs to enter a new position, via Bloomberg. Data as at 31st December 2020. Base currency USD.

Figure 2: MSCI World G10 proxy basket currency weights

CURRENCY	WEIGHT (PROXY BASKET)
AUD	2.72%
CAD	3.37%
CHF	3.11%
EUR	11.20%
GBP	5.47%
JPY	7.82%
NOK	0.18%
NZD	0.09%
SEK	1.04%
USD	67.35%

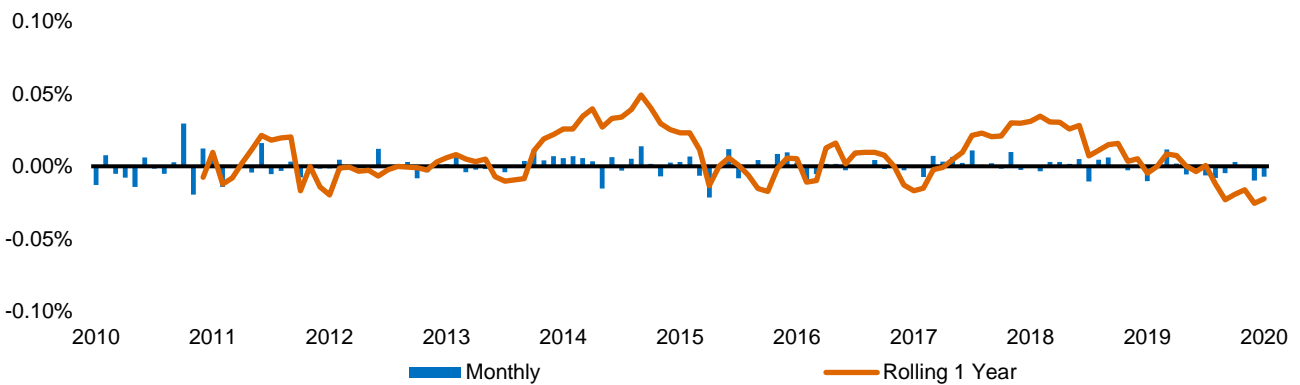
Source: Russell Investments, MSCI. Data as at 31st December 2020. Base currency USD.

Figure 3: MSCI World hedged to USD G10 proxy basket vs. full basket - 10yr analysis



Source: Russell Investments. Data as at 31st December 2020.  
Any past performance is not necessarily a guide to future performance.

Figure 4: Excess returns of MSCI World hedged to USD - G10 proxy basket vs. full basket



Source: Russell Investments. Data as at 31st December 2020.  
Any past performance is not necessarily a guide to future performance.

Figure 5: Tracking error and excess returns of MSCI World hedged to USD - G10 proxy basket vs. full basket

Monthly Tracking Error	0.01%
Annualised Tracking Error	0.02%
Minimum Month Excess Return	-0.02%
Mean Month Excess Return	0.00%
Maximum Month Excess Return	0.03%
R-Squared	1.0000

Source: Russell Investments. Data as at 31st December 2020.

## What makes a good proxy?

Proxy selections can be detrimental if a naïve approach is taken. For example, simply choosing a highly correlated currency as a substitute for a proxy target completely ignores factors such as the interest rate differential. Robust analyses should consider several factors, which includes correlation analyses, but also the exchange rate regime, cost of carry, liquidity and materiality.

## Correlations

While correlations are useful for proxy selections, a currency manager must be conscious of sample bias when conducting correlation analyses. Capturing a relatively large sample (say ten years) can result in ignoring a regime shift. On the other hand, a dataset with a short horizon (say one year) implicitly expects persistence of present market dynamics. An appropriate middle ground may be to compare correlations using several data sets, using various time horizons, essentially confirming whether correlations hold across time. These expansive analyses provide for a more rigorous and less generalist study, reducing the probability of evanescent correlations. Correlation analyses also present a mathematical conundrum when dealing with currency pairs. That is, we cannot measure the correlation of the base currency itself to

the proxy target currency. We can look at an example to illustrate this point. Let's say we are a U.S. investor, hedging our foreign currency exposures and as part of that we would like to substitute HKD for a proxy. For this purpose we may decide to assess the suitability of USD as a proxy for HKD. However, mathematically speaking, there is no correlation between HKD/USD and USD/USD because a correlation does not exist between a variable and a constant (where our constant is  $USD/USD = 1$ ).

In fact, tying oneself to correlations as the absolute arbiter of proxy selections can be misleading. Continuing with our HKD/USD example: a 5-year comparison of correlations suggests there is no currency that would make a good proxy for HKD (see Figure 6). While most pairs exhibit positive correlation, the correlation coefficients are close to 0. Therefore, ignoring other factors, there does not appear to exist a plausible candidate with which to proxy HKD. However, when we introduce additional factors, most importantly the fact that HKD is pegged to USD and that the interest rate differential between the pair is tight, we are presented with a strong proxy in USD. The case of HKD here, as demonstrated, requires the investor to explore factors other than correlations.

Figure 6: 10-year correlation of daily returns.

P(X, Y)	AUDUSD	CADUSD	CHFUSD	EURUSD	GBPUSD	JPYUSD	NOKUSD	NZDUSD	SEKUSD
HKDUSD	<b>0.2159</b>	0.1653	0.0501	0.1122	0.1071	(0.0074)	0.1680	0.1827	0.1712

Source: Russell Investments. Data as at 31st December 2020. Emboldened value denotes strongest correlation.

The numeraire (or base currency as the currency of measurement) problem may also be tackled in other ways. Instead of casting the portfolio base currency out of the list of possible proxies, we can construct a new numeraire. This can, for example, simply be an average of other correlations that use a non-base currency numeraire. While far more data intensive, this should not act as a barrier for such analysis. Figure 7 appends a custom numeraire correlation to measure the suitability of USD as a proxy for HKD for a USD based investor. The result is a manifestation of the pegged regime of the HKD – all else equal, an almost perfect proxy exists in USD from the perspective of correlations. The composition of “XYZUSD” is an average of the USDHKD correlations using numeraires of EUR, GBP, and JPY.

Figure 7: 10-year correlation of daily returns using custom numeraire.

P(X, Y)	AUDUSD	CADUSD	CHFUSD	EURUSD	GBPUSD	JPYUSD	NOKUSD	NZDUSD	SEKUSD	XYZUSD
HKDUSD	0.2159	0.1653	0.0501	0.1122	0.1071	(0.0074)	0.1680	0.1827	0.1712	<b>0.9979</b>

Source: Russell Investments. Data as at 31st December 2020. Emboldened value denotes strongest correlation.

## Exchange Rate Regime

Several factors underpin the movement of currencies, with varying degrees of predictability. The starting point for analysing any currency should be the current state of the exchange rate regime within which a currency exists. Developed market currencies are typically free-floating, whereas certain currencies in the emerging markets universe operate under managed exchange rate regimes. These regimes are sometimes official hard currency pegs, or otherwise managed more loosely around a peg.

At the same time, nations around the world understand the power of relative currency prices as a lever for economic growth and stabilisation. On the other hand, nations must be careful not to disincentivise or disenfranchise market participants through overtly manipulative currency market interventions.

In the case of an official currency peg, that can in fact provide us with a de facto proxy currency without needing to explore other factors that indicate a strong proxy. However, once a currency peg is identified, it is important to apply a qualitative view on the stability of the current peg and

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remain abreast of country- or currency-specific developments that may impact the robustness of the peg. We will also want to consider the expected direction of change in exchange rates if the peg were to be removed. Oftentimes however, it is not easy to identify if or when a currency peg might be discontinued, yet it remains prudent to periodically review the currencies operating under such regimes.

## Cost of carry (or the Implied Forward Interest Rate)

Although strong correlations and stable exchange rate regimes may signal a suitable proxy, we must not ignore the interest rate differential between the currency pair we decide to trade. Entering a short position in a currency resembles the borrowing of that currency and simultaneous lending of the base currency for delivery at a time in the future. The forward points achieved at execution thus broadly represent the short-term interest rate differential between the two economies. If the interest rate differential is positive in favour of the traded (foreign) currency, that means that on a net basis the investor entering a short position in the traded currency must effectively pay an implicit cost to hedge that currency. This 'cost of carry' is an important consideration when choosing proxies.

## Liquidity and trading costs

Proxy hedging may be beneficial in cases where sizing presents problems. For instance, a portfolio that exhibits large monthly turnover in currencies with low average daily volumes could contain potential proxy targets. Otherwise the portfolio may suffer from high trading costs to the detriment of performance.

Spread costs in more readily traded currency pairs tend to be significantly lower than in currency pairs with lower volume. To support transparency and gauge the full effects of proxy hedging, these explicit costs are important to factor into decisions. Indeed, employing a proxy currency that results in higher explicit trading costs should be justified by statistically significant results in the analysis of other factors (e.g., strong positive correlations, beneficial carry differential).

## Materiality

Certain currencies in the hedge basket could have a de minimis weight such that it may be sensible to either proxy hedge or even to leave these currencies unhedged. Not hedging is an active choice, which should be informed by proxy analyses. Otherwise, the portfolio may realise higher tracking error than preferred, particularly in the case where several currencies with insignificant weightings (that together sum to a material amount) are left unhedged.

To benefit from reduced trade frequency, targets should ideally be proxied to currencies that already exist in the portfolio or they should be left unhedged. This is particularly relevant in the case of currencies with an insignificant weighting, in order to avoid executing nominally very small trades when working within hedge ratio tolerance bands. Avoiding the direct trading of these currencies saves costs (ticket charges and potential collateralisation requirements), while not introducing any material tracking error given the currencies' immaterial weighting.

## Proxy hedging in a volatile environment

Ensuing volatility from the COVID-19 virus outbreak provided a period of heightened volatility which we can evaluate from the perspective of proxy hedging. We can use our earlier example of a USD investor implementing proxies to hedge a G10-only derivative of the MSCI World basket. Currency volatility started to climb at the end of February as news of virus contagion poured through. It only accelerated through March, as authorities worldwide imposed lockdowns. For our study, we can look at the return differential between currency hedging using the proxy basket and the full MSCI World basket (see Figure 8 and Figure 9). To provide more useful insights, the results are defined by proxy choices based on analysis as of December 2019 to measure effectiveness during periods beyond that which informed those choices.

During March 2020, the G10 proxy basket performed in line with the full basket. The same materialised in April, thus validating proxy choices for these two particularly volatile months. We can adjust our proxies to illustrate a situation where proxies may not perform in line with the benchmark despite strong historical correlation. Figure 10 shows the results from our same G10 proxy basket with one small change: SGD is now proxied with AUD (the currency with the second highest correlation, 0.7313, as at 31st December 2019) instead of USD. We witness some deviations between the new proxy basket and the full benchmark basket, albeit perfectly offsetting one another over two months. The magnitudes of the differences of the full (unweighted) currency returns are large, cementing the importance of two particular points we have made in this paper: materiality and data. If the SGD weighting had been significantly larger, the proxy hedge would have suffered from a greater deviation from the full basket. For an investor, it is the full basket that is the target benchmark against which performance is measured.

To put this into perspective: for March 2020, each 2.33 percentage point of over- or under-performance of AUD (our proxy) relative to SGD (our target) resulted in a 1 basis point over- or under-performance against the benchmark (full) basket. Clearly, the immaterial weighting of SGD in the full basket cushions a deeper impact upon a return mismatch. If the weight of SGD had been 0.86% instead of 0.43%, then a smaller 1.16 percentage point return difference would be sufficient to generate a 1 basis point deviation relative to the benchmark basket.

At this point we can highlight the importance of data. Ultimately, a dataset (and back-testing) should sufficiently support a correlation analysis as far as it is a key input in selecting a proxy. Given that a currency hedging programme typically is not put in place for very short time horizons, it is important that a proxy basket does not exhibit directional correlation breakdowns. This may be ascertained from testing and is prevalent in our example with the new basket where we see an opposite deviation. Market stresses such as we have witnessed require extra diligence in monitoring positions, for all investors.

Figure 8: MSCI World Currency Hedge Only Returns for March and April 2020

**MARCH**

CURRENCY	WEIGHT	RETURN	WEIGHTED RETURN
AUD	2.30%	5.15%	0.12%
CAD	3.49%	5.69%	0.20%
CHF	3.25%	0.20%	0.01%
DKK	0.65%	0.19%	0.00%
EUR	10.54%	0.31%	0.03%
GBP	5.20%	3.01%	0.16%
HKD	1.12%	-0.53%	-0.01%
ILS	0.11%	1.47%	0.00%
JPY	8.06%	0.26%	0.02%
NOK	0.19%	9.81%	0.02%
NZD	0.10%	4.45%	0.00%
SEK	0.91%	2.30%	0.02%
SGD	0.43%	2.00%	0.01%
USD	63.64%	0.00%	0.00%
<b>TOTAL</b>			<b>0.58%</b>

**APRIL**

CURRENCY	WEIGHT	RETURN	WEIGHTED RETURN
AUD	1.95%	-6.95%	-0.14%
CAD	3.01%	-2.45%	-0.07%
CHF	3.43%	-0.08%	0.00%
DKK	0.70%	0.26%	0.00%
EUR	9.74%	0.30%	0.03%
GBP	4.78%	-1.66%	-0.08%
HKD	1.10%	0.01%	0.00%
ILS	0.11%	-1.81%	0.00%
JPY	8.66%	-0.79%	-0.07%
NOK	0.17%	-2.73%	0.00%
NZD	0.10%	-4.09%	0.00%
SEK	0.85%	-1.36%	-0.01%
SGD	0.38%	-1.10%	0.00%
USD	65.04%	0.00%	0.00%
<b>TOTAL</b>			<b>-0.35%</b>

Source: Russell Investments, MSCI. Data as at 30<sup>th</sup> April 2020. Base currency USD. Any past performance is not necessarily a guide to future performance.

Figure 9: MSCI World G10 Proxy Currency Hedge Only Returns for March and April 2020.

**MARCH**

CURRENCY	WEIGHT	RETURN	WEIGHTED RETURN
AUD	2.30%	5.15%	0.12%
CAD	3.49%	5.69%	0.20%
CHF	3.25%	0.20%	0.01%
EUR	11.19%	0.31%	0.03%
GBP	5.20%	3.01%	0.16%
JPY	8.06%	0.26%	0.02%
NOK	0.19%	9.81%	0.02%
NZD	0.10%	4.45%	0.00%
SEK	0.91%	2.30%	0.02%
USD	65.31%	0.00%	0.00%
<b>TOTAL</b>			<b>0.58%</b>

**APRIL**

CURRENCY	WEIGHT	RETURN	WEIGHTED RETURN
AUD	1.95%	-6.95%	-0.14%
CAD	3.01%	-2.45%	-0.07%
CHF	3.43%	-0.08%	0.00%
EUR	10.44%	0.30%	0.03%
GBP	4.78%	-1.66%	-0.08%
JPY	8.66%	-0.79%	-0.07%
NOK	0.17%	-2.73%	0.00%
NZD	0.10%	-4.09%	0.00%
SEK	0.85%	-1.36%	-0.01%
USD	66.62%	0.00%	0.00%
<b>TOTAL</b>			<b>-0.35%</b>

Source: Russell Investments, MSCI. Data as at 30<sup>th</sup> April 2020. Proxies: EUR for DKK, USD for HKD, ILS and SGD. Base currency USD. Any past performance is not necessarily a guide to future performance.

Figure 10: MSCI World G10 Proxy Currency Hedge Only Returns for March and April 2020.

### MARCH

CURRENCY	WEIGHT	RETURN	WEIGHTED RETURN
AUD	2.73%	5.15%	0.14%
CAD	3.49%	5.69%	0.20%
CHF	3.25%	0.20%	0.01%
EUR	11.19%	0.31%	0.03%
GBP	5.20%	3.01%	0.16%
JPY	8.06%	0.26%	0.02%
NOK	0.19%	9.81%	0.02%
NZD	0.10%	4.45%	0.00%
SEK	0.91%	2.30%	0.02%
USD	64.88%	0.00%	0.00%
<b>TOTAL</b>			<b>0.60%</b>

### APRIL

CURRENCY	WEIGHT	RETURN	WEIGHTED RETURN
AUD	2.32%	-6.95%	-0.16%
CAD	3.01%	-2.45%	-0.07%
CHF	3.43%	-0.08%	0.00%
EUR	10.44%	0.30%	0.03%
GBP	4.78%	-1.66%	-0.08%
JPY	8.66%	-0.79%	-0.07%
NOK	0.17%	-2.73%	0.00%
NZD	0.10%	-4.09%	0.00%
SEK	0.85%	-1.36%	-0.01%
USD	66.24%	0.00%	0.00%
<b>TOTAL</b>			<b>-0.37%</b>

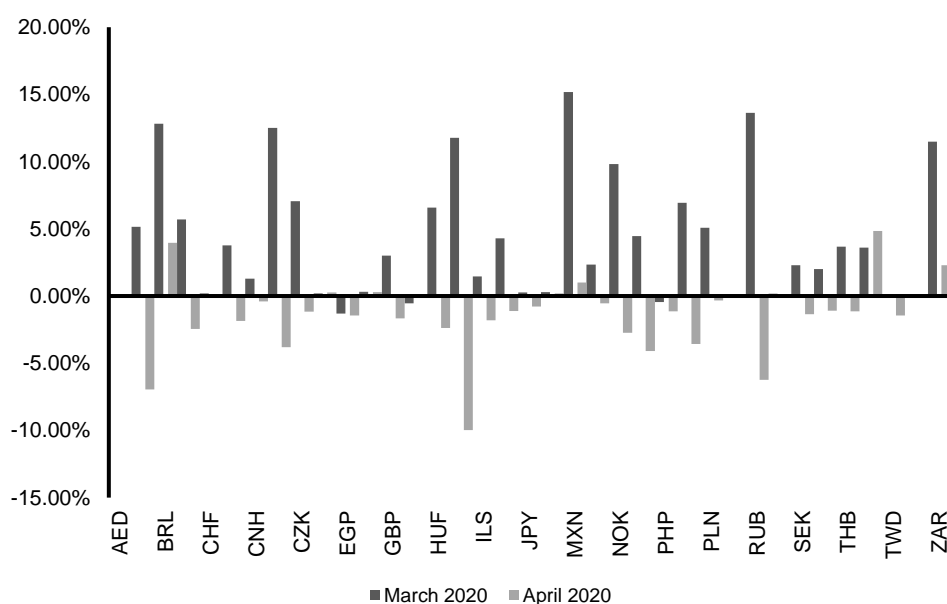
Source: Russell Investments, MSCI. Data as at 30th April 2020. Proxies: EUR for DKK, USD for HKD and ILS and AUD for SGD. Base currency USD. Any past performance is not necessarily a guide to future performance.

## Emerging market currencies

It has long been understood that emerging market currencies are generally expensive to hedge resulting from high interest rates. Spread costs also tend to be wider given the lower volume in many emerging market currencies. Further, non-deliverable forwards which span various emerging market currencies generally require

collateralisation. Ideas concerning how to calibrate these currency exposures, or structuring hedging strategies for them is beyond the scope of this paper. However, it is useful to briefly cover one aspect of emerging market currency hedging – that is the use of developed market proxies. We can conduct a simple study by using correlations to generate a developed market proxy basket out of the MSCI All Country World Index (ACWI).

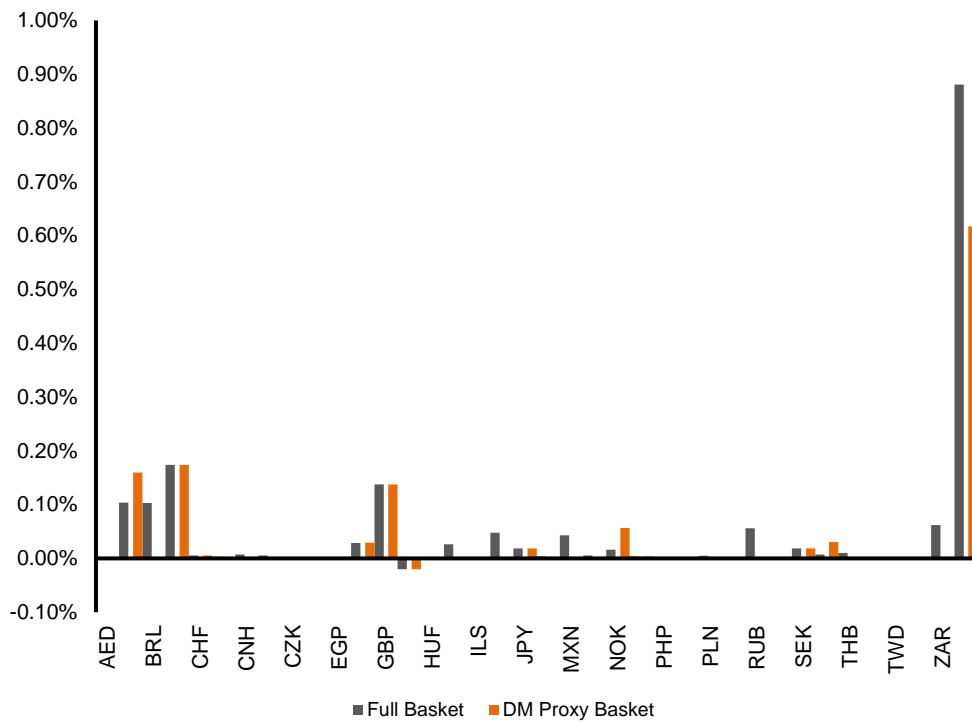
Figure 11: MSCI ACWI Unweighted Currency Hedge Only Returns for March and April 2020.



Source: Russell Investments, MSCI. Data as at 30th April 2020. Base currency USD. Any past performance is not necessarily a guide to future performance.

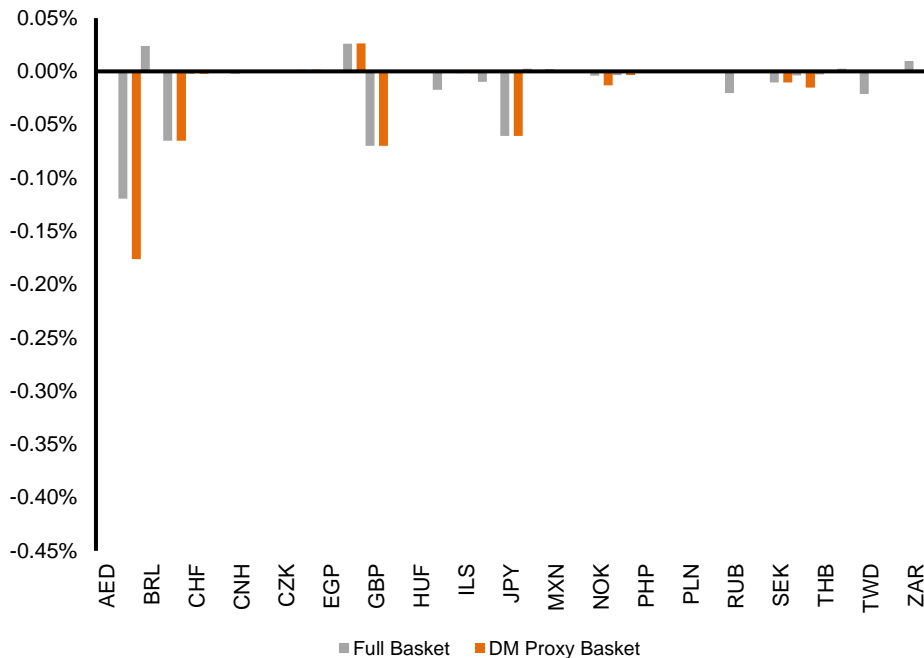


Figure 12: MSCI ACWI Developed Market Proxy Weighted Currency Hedge Only Returns for March 2020



Source: Russell Investments, MSCI. Data as at 31st March 2020. Developed market proxies used for all emerging market currencies. Base currency USD. Any past performance is not necessarily a guide to future performance.

Figure 13: MSCI ACWI Developed Market Proxy Weighted Currency Hedge Only Returns for April 2020.



Source: Russell Investments, MSCI. Data as at 30th April 2020. Developed market proxies used for all emerging market currencies. Base currency USD. Any past performance is not necessarily a guide to future performance.



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Again, we have adopted the perspective of a U.S. investor. For a more aggressive test, we have used the same months of heightened global market volatility from the previous section: March and April 2020. Proxies have been set using data as of 31st December 2019.

A backdrop of chaotic volatility resulted in emerging markets suffering considerably as investors rushed to reign in portfolio risk, initiating abrupt outflows. Consequently, the relative underperformance of emerging market currencies is clearly visible in Figure 11 where unweighted hedge returns during March are high for the majority. In the same month, the developed market proxy basket for the MSCI ACWI index underperformed the benchmark basket by 26 basis points (see Figure 12). It continued to underperform during April, albeit by a smaller degree (see Figure 13). Undoubtedly, the underperformance during March is significant at the portfolio level.

This small study regarding emerging market currencies puts into plain view the potential pitfalls of currency proxy hedging where the proxy targets may be vulnerable to sharp dislocations from the proxy choice. While the selected period is certainly one of extreme volatility, many emerging market currencies exhibit low liquidity and, oftentimes, the

countries are fraught with more fragile political and economic environments. The marriage of these characteristics can instigate outsized idiosyncratic moves even while the global economy is generally stable.

## The bottom line

Proxy hedging is an important topic that should be given due consideration in any currency management programme. An inadequate analysis could result in larger tracking error or higher trading costs. On the other hand, rigorous analysis and prudent selection of proxies can help to reduce trade frequency; deliver savings on trading costs; and facilitate navigation around illiquidity, while maintaining tight tracking error. To do so, the evaluation should cover a range of factors to support the recognition of suitable proxies. Correlations, exchange rate regimes, the cost of carry, liquidity and materiality should collectively form the foundation. Periodic reviews of proxy analyses should be completed to affirm previous understanding, discern developing trends and ultimately inform current proxy choices.

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