



Russell Investments Informed Dynamic Currency Hedging

A smarter way to manage uncompensated currency risk

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Executive summary

As volatility rises in currency markets, investors are re-thinking their currency hedging policies and are looking to improve the risk-return profile of their international currency exposure. Passive currency hedging has been widely implemented to fully or partially neutralize currency exposures derived from international assets. In passive hedging, the Target Hedge Ratio remains static regardless of market conditions, such as currency valuations, economic developments and sentiment. We believe that allowing Target Hedge Ratios to vary according to factors that are rewarded in currency markets (such as Carry, Value and Trend) is a smarter way to manage currency risk and generate additional returns than a static hedge ratio.

This paper presents Russell Investments' Informed Dynamic Currency Hedging model (IDCH) which looks for opportunities to raise expected returns and reduce cash flow drawdown from currency hedging within an investor's international portfolio. The model aims to improve the effectiveness of a passive hedging program by changing from time to time the Target Hedge Ratio at the currency level such that exchange-rate exposures are tilted toward rewarded factors. The approach leverages Russell Investments' long-standing research and experience in currency factors (Conscious Currency®) to provide a more attractive currency hedging policy.

Russell Investments' Informed Dynamic Currency Hedging model can add significant value compared to a static 50% hedged policy. For a Canadian dollar (CAD)-based investor, IDCH raises returns by 50 basis points¹ and improves the return-to-risk ratio by 13% relative to a static 50% hedged policy. Russell Investments' Informed Dynamic Currency Hedging goes a long way to solving the conundrum of what and when to hedge.

THREE REASONS TO CONSIDER DYNAMIC CURRENCY HEDGING:

1. Higher risk-adjusted returns

Excess return of 0.50% per annum with lower portfolio risk for a CAD-based investor over a 50% static Hedge Ratio

2. Reduces cash drawdown

Prevents untimely liquidation of assets to fund currency hedging losses

3. Solves the conundrum of adjusting a Hedge Ratio

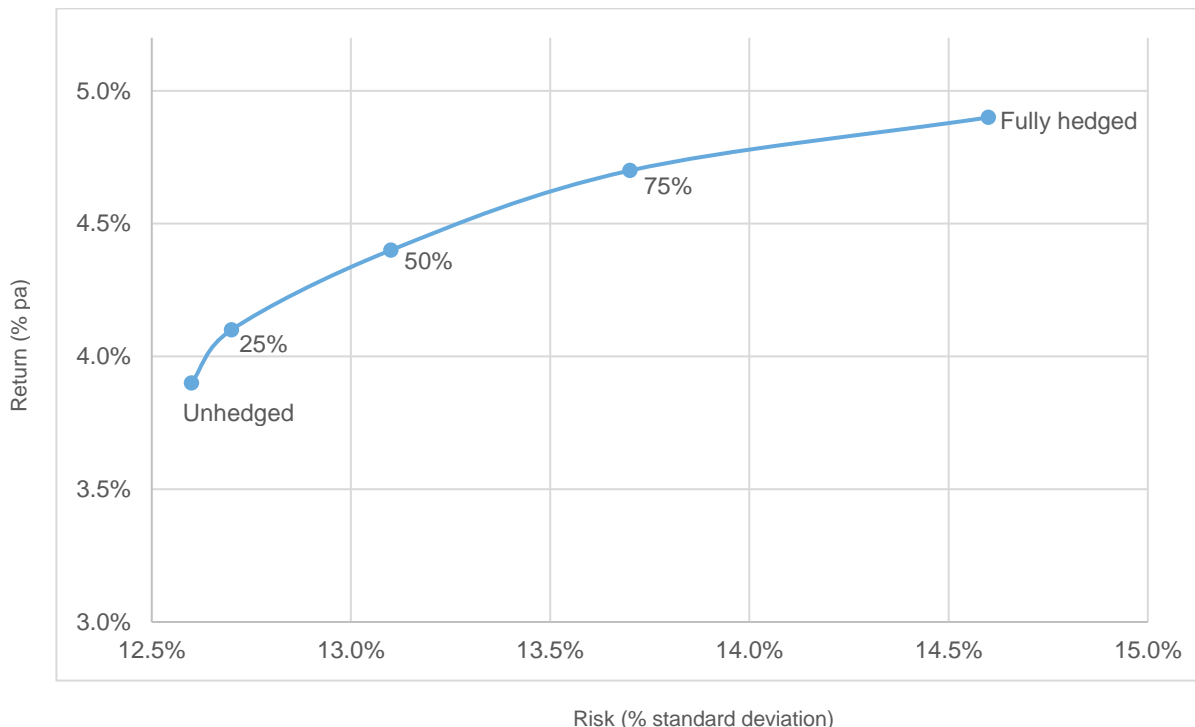
In dynamic hedging, the systematic rules define the hedge levels for each currency. As a result, this avoids being behind the curve in reacting to market events.

¹ This back-tested return over the period between December 1999 and September 2016 assumes a global developed-market equity portfolio excluding Canada. We approximate the equity portfolio by using the capitalization-weighted equity markets denominated in the G10 currencies excluding CAD: AUD, CHF, EUR, GBP, JPY, NOK, NZD, SEK and USD. The neutral Target Hedge Ratio is 50% and the dynamic currency-specific Target Hedge Ratios are allowed to vary between 0% and 100%.

Introduction: Currency management is often overlooked

Over the very long term, the return impact of currency exposure from an international portfolio usually reverted for a CAD-based investor. For Canadian investors, currency exposure can be risk-reducing. As illustrated in Exhibit 1, an unhedged international developed-market equity portfolio realized about 14% less volatility than a fully hedged portfolio for a CAD-based investor between December 1999 and September 2016 (12.6% versus 14.6% annualized portfolio standard deviation). In the time period analyzed, a fully hedged portfolio increased returns relative to an unhedged portfolio, but we do not expect a systematic increase in returns from currency hedging for a CAD investor as that was due to the changing valuation of the Canadian dollar between December 1999 and September 2016.

Exhibit 1: Risk/return characteristics of different currency hedging levels (Dec 1999-Sep 2016)



The chart shows a risk/return profile from investing in a developed market ex Canada equity portfolio for various hedging strategies. Source: Russell Investments from December 1999 through September 2016.

Globally, many institutional investors choose to partially or fully hedge their underlying exposures to avoid uncompensated risk from their currency exposure. There is, however, no consensus on what the appropriate strategic currency hedging policy should be. The optimal Target Hedge Ratio may vary according to the investor's base currency and the foreign currencies represented in the underlying portfolio. Campbell, Serfaty-De Medeiros, and Viceira (2010) find that so-called 'safe haven' currencies, in particular the dollar, yen, euro (deutschmark) and Swiss franc, are negatively correlated to movements in equity markets, hence it is undesirable to fully hedge assets denominated in these currencies. However, investors with safe-haven currencies as base currencies should generally be currency-hedged. Alternatively, investors with pro-cyclical base currencies, such as CAD based investors, may prefer to remain unhedged or have lower currency hedge ratios due to the expectation that currency exposure will reduce total portfolio volatility. These results imply that the optimal strategic hedging policy is not uniform, and differs by base and investment currency.

In addition, timing the implementation of a strategic hedging policy (for example, deciding when to move from 0% to a 100% Hedge Ratio) means taking a view on the direction of currency. It can be extremely costly when the home currency depreciates after the adoption of the policy. Policies are too often incorrectly revised after a large adverse currency move has already occurred. Deciding when to enter into a currency hedge is as essential as deciding how much to hedge.

In addition to remaining unhedged and selecting a static Target Hedge Ratio, this paper introduces a third alternative: Russell Investments' Informed Dynamic Currency Hedging (IDCH) model. At a glance, the following table (Exhibit 2) compares the two passive approaches (unhedged and statically hedged) with dynamic hedging, which we will discuss in more detail in this paper.

Exhibit 2: Summary of different hedging approaches for a Canadian investor

| | UNHEDGED | PASSIVELY HEDGED | DYNAMIC HEDGING |
|-------------------------------|--|--|--|
| Hedging approach | <ul style="list-style-type: none"> In an unhedged portfolio, currency exposure is driven by the asset mix | <ul style="list-style-type: none"> In a passive hedging approach, an investor defines a static hedge ratio – most commonly between 50% and 100% | <ul style="list-style-type: none"> Rules-based currency management approach, using factor signals to tilt hedge ratios around a central point, with the aim of achieving higher returns Works around chosen hedge ratio – for example 50% (point of “no regret”) |
| Risk implication | <ul style="list-style-type: none"> Investors tolerate higher risk from currency exposure as historically it has reduced total portfolio volatility | <ul style="list-style-type: none"> This removes some or all foreign currency risks (depending on level of hedge) | <ul style="list-style-type: none"> Typically reduces portfolio volatility slightly more than passive hedging |
| Return implication | <ul style="list-style-type: none"> The long-term return impact of currency exposure in an international portfolio is typically small and reverts over time. | <ul style="list-style-type: none"> The long-term return impact of passively hedged currency exposure in an international portfolio is typically small and reverts over time. | <ul style="list-style-type: none"> Dynamic hedging has the potential to achieve economically significant excess returns over passively hedged policy. |
| Cash flow implications | <ul style="list-style-type: none"> No cash flows from currency hedging | <ul style="list-style-type: none"> Investors can experience large negative cash flows from this strategy | <ul style="list-style-type: none"> Typically lower cash flow draws vs passive hedging |
| Cost implication | <ul style="list-style-type: none"> No currency hedging costs | <ul style="list-style-type: none"> This approach is relatively low cost. | <ul style="list-style-type: none"> Very cost-effective approach, on a net-of-fee basis |
| Overall assessment | <ul style="list-style-type: none"> In the medium to short term, foreign currency exposure is volatile but historically has reduced total portfolio volatility Investors who take this approach may miss the opportunity to take advantage of trend and mean reversion in currency returns. | <ul style="list-style-type: none"> While passive hedging can often be a cost-effective approach, the decision of what, when and how much to hedge can be challenging. Once a hedging benchmark has been set, it is typically reviewed on a very infrequent basis. A static approach limits the opportunity to take advantage of rewarded currency factors and market dislocations, and as such can also forego potential outperformance. | <ul style="list-style-type: none"> Better balance of risk and return than passive hedging A dynamic approach can give investors the chance to have the best of both worlds: <ul style="list-style-type: none"> Take advantage of rewarded currency factors and market dislocation, targeting positive returns The potential to reduce large negative cash flows from static currency hedging Dynamic Hedging removes the conundrum of what and when to hedge, given the rules determine this for you |

We believe an investor can improve the risk-return outcome relative to a static hedge policy by implementing an IDCH strategy. This solves the conundrum of what and when much to hedge.

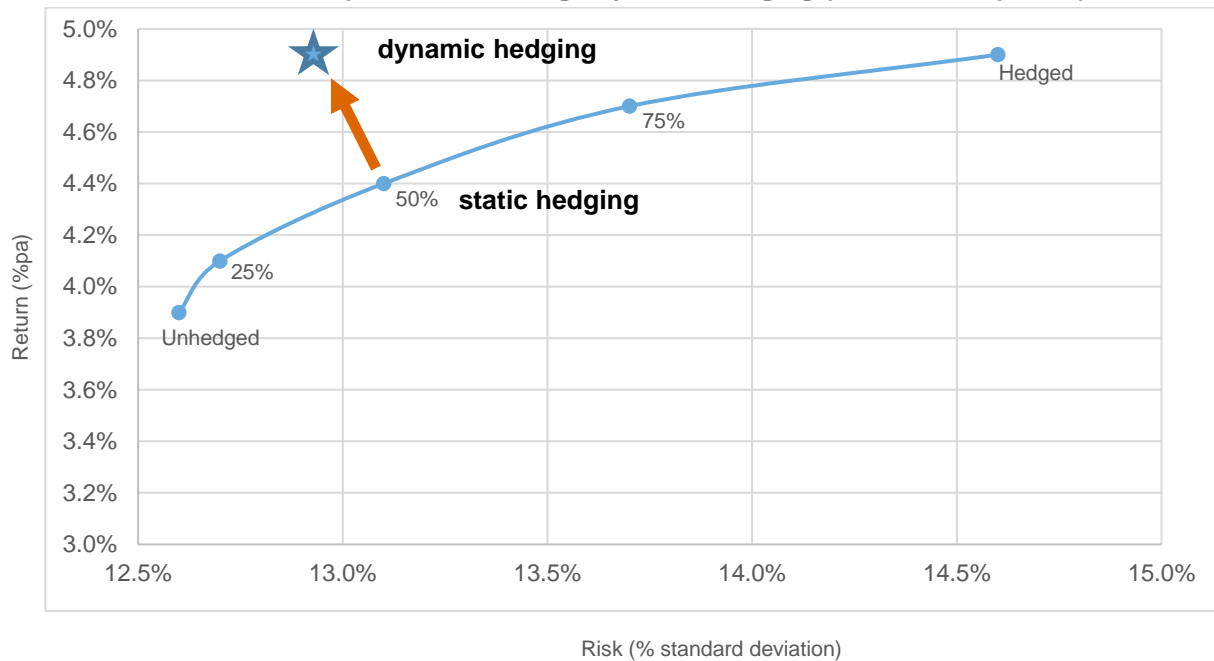
Russell Investments' IDCH program benefits from both Russell Investments' dedicated infrastructure for currency management, originally developed to support its passive hedging programs, as well as its currency factor models which have consistently added value since 2000.

Informed Dynamic Currency Hedging: Solving the conundrum of what and when to hedge

Dynamic hedging seeks to improve returns, while retaining risk management objectives

As illustrated in Exhibit 3, dynamic hedging seeks to improve returns, while retaining the risk management objectives of a strategic hedge ratio.

Exhibit 3: Risk/return improvement through dynamic hedging (Dec 1999–Sep 2016)



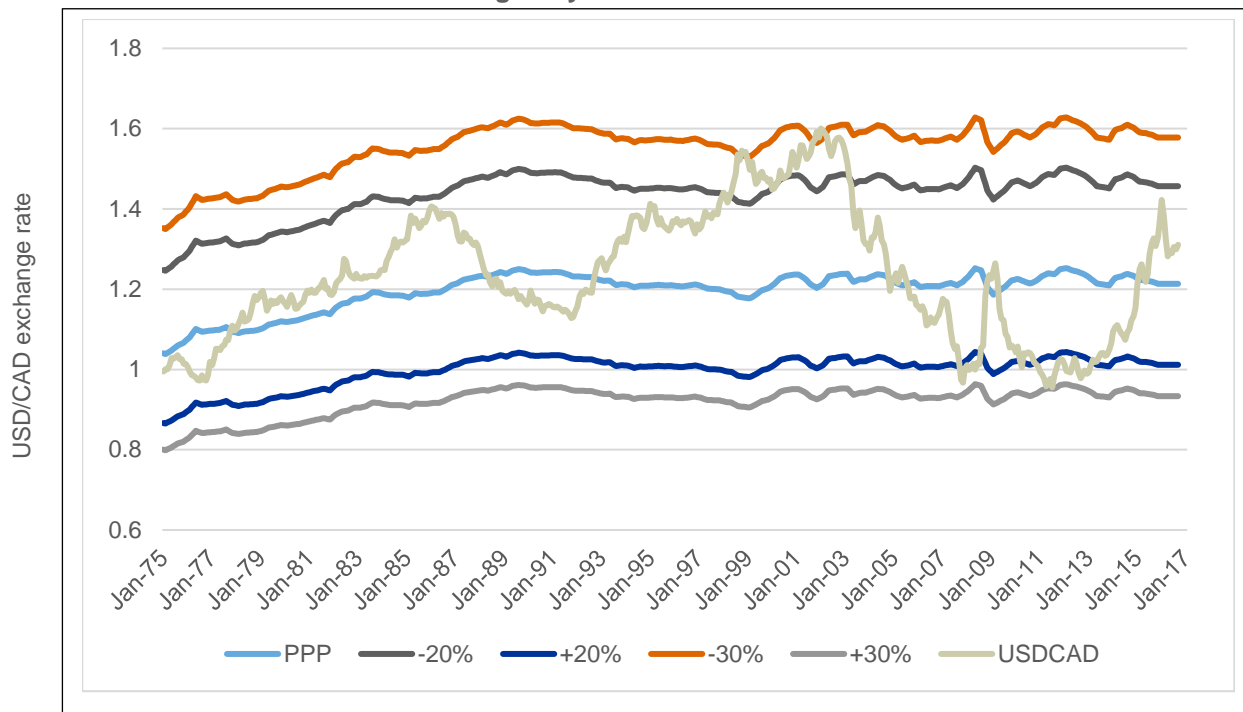
The chart shows a risk/return profile from investing in a developed market ex Canada equity portfolio for various hedging strategies. Source: Russell Investments from December 1999 through September 2016.

Mispricing frequently exists within the currency markets

As illustrated in Exhibit 4 using the USD/CAD exchange rate, currencies go through prolonged return cycles which can take them far away from what economists would consider fair value. It is not rare to see the market exchange rate (beige line) deviate 20% or 30% from the purchasing power parity rate² (PPP, light blue line). However, when the exchange rate is far from PPP, there is a tendency for it to eventually return to fair value. In other words, there is evidence of trending and mean reversion in currency markets.

² Purchasing Power Parity (PPP) ultimately means equalizing the purchasing power of two differing currencies by accounting for differences in inflation rates and cost of living. It is effectively the exchange rate at which all goods cost the same everywhere. It is a good value anchor for exchange rates.

Exhibit 4: USD/CAD market rate regularly deviates from PPP



Source: Thomson Reuters, Datastream, from 1975 to September 2016. Bands around exchange rate.

WHAT IS INFORMED DYNAMIC CURRENCY HEDGING?

Informed Dynamic Currency Hedging is a systematic hedging approach. IDCH uses signals from persistent currency factors to increase or decrease the Target Hedge Ratio on international currency exposures in anticipation of appreciation or depreciation of the base currency. The strategy aims at enhancing currency hedging returns while mitigating downside risk and associated cash drawdowns.

Informed Dynamic Currency Hedging: Targeting stronger risk-adjusted returns

Carry, Value and Trend offer a robust framework

The IDCH strategy tries to take advantage of these long currency return cycles by changing the actual Hedge Ratio over time within bands around a neutral strategic Hedge Ratio. Often, a neutral Hedge Ratio of 50% is assumed as it minimizes regret.

The systematic adjustment of the Hedge Ratio is derived from Russell Investments' Conscious Currency® framework based on Carry, Value and Trend. These currency factors are good at capturing predictability in the returns from foreign exchange markets. Furthermore, drawdowns in currency factor returns do not often happen concurrently, indicating that diversification benefits can be obtained by combining the currency factors.

- **Carry** is tilting currency exposure toward currencies with higher interest rates and away from currencies with lower interest rates.
- **Value** is currency exposure toward currencies which are undervalued according to a fundamental measure of fair value, for example purchasing power parity, and away from overvalued currencies.
- **Trend** is tilting currency exposure toward currencies that have shown positive momentum and away from currencies with negative momentum.

The IDCH ratio is applied to equity markets denominated in any of the G10 currencies. Consequently, this allows investors to hedge their currency risk in either a single-currency foreign equity portfolio (for example, a Canadian investor wanting to dynamically hedge Japan equity) as well as multi-currency global developed-market portfolios.

Putting Informed Dynamic Currency Hedging into Practice

By applying empirically calibrated weights to the three factors of Carry, Value and Trend, we determine how much of each currency should be hedged against the client's base currency. To make sure no leverage is incurred, we constrain each currency-specific Hedge Ratio to be between 0% and 100% against the client's base currency. By way of example, the returns presented in this paper are based on a 50% benchmark with a +/-50% leeway allowing the target Hedge Ratio to vary between 0% and 100%. But, if an investor wanted to limit the hedges from a minimum hedged ratio of 25% to a maximum hedged ratio of 75%, then we would implement constraints of 25% around the benchmark of 50%. Consequently, investors have the ability to apply additional limits on the minimum and maximum the model should deviate from their strategic Hedge Ratio or use limits based on risk constraints.

On a monthly basis, the currency signals based on Carry, Value and Trend are converted into currency-specific Target Hedge Ratios. This is done by calculating the relative signal strength between the currency to be hedged and the investor's base currency. Therefore, when the IDCH signals are favorable toward the investor's base currency relative to the portfolio currencies and indicate a positive expected return, then the Target Hedge Ratio will increase up until a maximum of 100%. Similarly, if the IDCH signals are unfavorable toward the investor's base currency relative to the portfolio currencies, then the Target Hedge Ratio will decrease up to a minimum of 0%. The client's constraints and bespoke design are applied to the model's target Hedge Ratio.

Historically, the raw signals, calculated each month, have moved slowly demonstrating consistency in the models' raw output. To avoid high turnover, the model may also be calibrated to trigger adjustments when the Target Hedge Ratio incremental change is sufficiently large (e.g. in hedge ratio increments of 25%).

Deeply rooted in the practices of passive hedging, the IDCH program is implemented around strict guidelines and controls. Russell Investments has developed a robust, scalable, and straight-through process for trading currencies, with the incentive to reduce the spreads paid by the client and to transfer to Russell Investments most of the operational cost and risk associated with foreign currency execution. Russell Investments' dedicated currency management platform can operate under bespoke pre-set tolerance limits, rebalancing rules and multiple tenors to manage liquidity and cash requirement. Counterparty risk management is also handled in Russell Investments' currency management system.

The Target Hedge Ratio is adjusted and applied to currency exposures held in clients' international portfolios. All of our hedging mandates operate within the context of our daily portfolio management process. On a daily basis, the currency portfolio management team will monitor the hedges against the portfolio and adjust for any large deviation arising from either cash flows or market movements.

A progressive transition from passive to dynamic is also possible, gradually expanding the leeway around the static benchmark hedge ratio.

Return Characteristics

The objective of our IDCH strategy is to outperform the statically hedged benchmark and reduce cash drawdowns. In this section, we evaluate the efficacy of the IDCH for the period between December 1999 and September 2016³.

In Exhibit 5, we visualize the value-added from IDCH over static hedging policies. The four lines show the CAD cumulative impact of currency on a global developed-market equity portfolio excluding Canada for four currency hedging policies: unhedged (orange line), statically hedged at 50% (light blue), fully hedged (dark blue) and dynamically hedged (grey). IDCH allows the currency-specific hedge ratios to vary between 0% and 100% (a neutral starting point of 50% +/- bands of 50%).

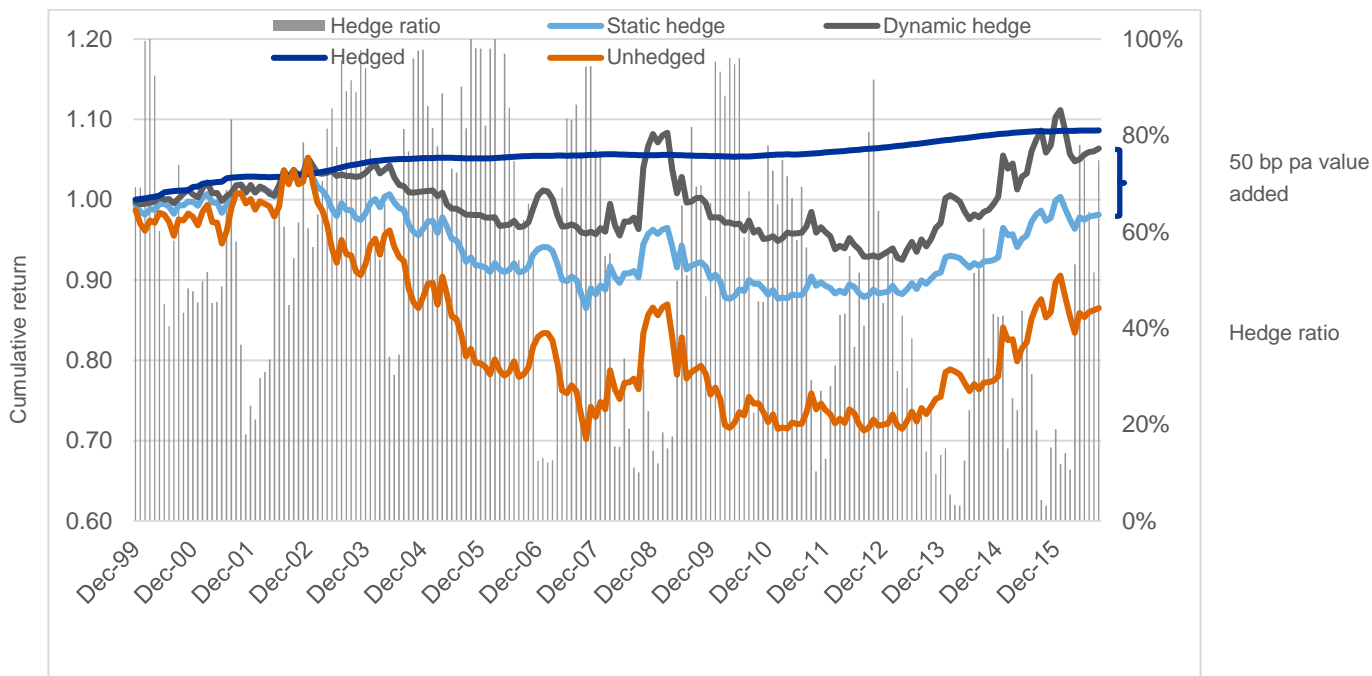
WHY RUSSELL INVESTMENTS?

- Strong performance characteristics
- Strategy tailored to suit desired parameters
- Robust portfolio management process
- C\$69.6 bn managed in FX overlays¹

1. as of September 30, 2016

³ We assume that the CAD-based investor evaluates the various currency hedging policies for a global developed-market equity portfolio excluding Canada. We approximate the developed global equity index by using the capitalization-weighted equity markets denominated in the G10 currencies (except CAD): AUD, CHF, EUR, GBP, JPY, NOK, NZD, SEK and USD.

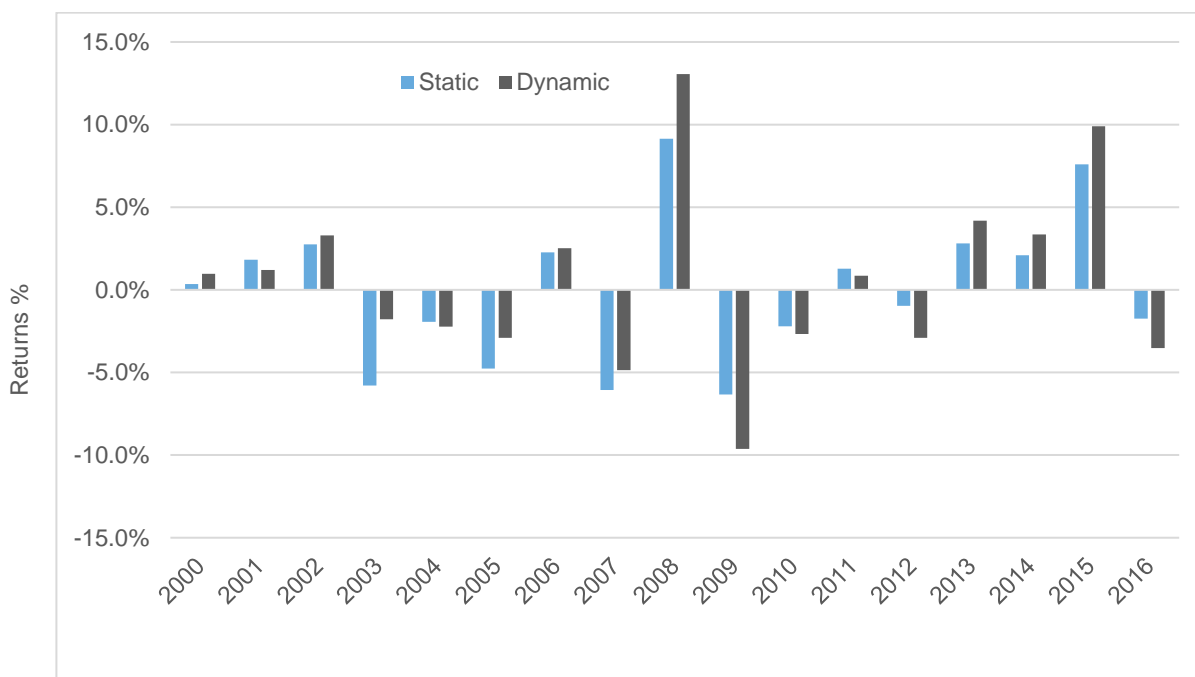
Exhibit 5: Value-added from Informed Dynamic Currency Hedging over a full market cycle



The Chart shows cumulative currency impact from investing in a developed market ex Canada equity portfolio for various hedging policies. The dynamic hedging policy uses informed dynamic hedging.
Source: Russell Investments, Thomson Reuters, Datastream, December 1999 through September 2016.

Fully hedged, unhedged and statically hedged policies lead to different return outcomes with large intermediate term fluctuations. Between 2002 and 2011, an unhedged global equity investor suffered from CAD strengthening and the orange line (unhedged position) falls to a significantly lower level than the dark blue line (fully hedged) as the CAD was 30% undervalued at the beginning of this analysis. This reverses beginning in about 2013 when CAD begins to weaken. The dynamically hedged investor in this illustration uses signals from the IDCH model to vary the Hedge Ratio over time and can take advantage of both periods of CAD strength and weakness to add value relative to a static hedge ratio. The grey cumulative currency return line is about 8% higher over the 16-year period; the geometric annual excess return is 50 basis points per year.

Exhibit 6: Value-added from IDCH over a full market cycle



Source: Russell Investments.

In Exhibit 6, we compare the returns of the IDCH strategy to the 50% static hedge by calendar year. The IDCH program outperforms the static benchmark in 10 of the 16 calendar years. It can do particularly well in years with large positive (2008 and 2015) and negative currency returns (2007 and 2009). From time to time (2010 to 2012) the IDCH strategy might mildly underperform the static hedge. This period is characterized by a trendless market, i.e. relatively low magnitude of currency returns. From this observation, we surmise that IDCH has a higher probability of generating excess returns over a static hedge when currency markets exhibit strong trends. The average excess return of 50 basis points is achieved at a tracking error of 2.4% versus the 50% hedged portfolio, resulting in an information ratio of 0.2.

In Exhibit 7, we show the impact of IDCH in the portfolio context, i.e. we consider the interaction between currency and equity returns of the underlying portfolio. Passive hedging at a static Hedge Ratio of 50% leads to a higher level of portfolio volatility (13.1% compared to an unhedged portfolio (12.6%). As portfolio returns are affected by static hedging over this specific sample period, 50% static hedging raises the return-to-risk ratio to 0.34 from 0.31 for an unhedged portfolio.

Moving from static to IDCH yields an improvement in the balance of risk and return. Returns are 50 basis points higher with IDCH. Portfolio risk for a dynamic hedging solution is lower (12.9% compared to 13.1%) and the return-to-risk ratio is consequently about 12.7% higher than with static hedging (0.38 vs. 0.34).

Another important consideration of currency hedging is the cash-flow impact. When the base currency weakens, hedged investors need to payout cash to settle forward contracts. When the base currency strengthens, they receive payments. Unhedged investors never receive nor pay cash. Exhibit 7 shows that the IDCH program slightly reduces the worst cash drawdown relative to a static 50% hedging policy (-12.6% versus -12.7%). Lowering the cash outflow from currency hedging can ease the pressure to liquidate assets at inopportune times.

Exhibit 7: Portfolio impact of IDCH

| SIMULATED PORTFOLIO RETURN (DEVELOPED EQUITY EXCL. CA) 12/1999-09/2016 | UNHEDGED | 50% STATIC HEDGING | DYNAMIC HEDGING |
|--|----------|--------------------|-----------------|
| Portfolio return (annualized arithmetic average) | 3.9% | 4.4% | 4.9% |
| Portfolio risk (annualized standard deviation) | 12.6% | 13.1% | 12.9% |
| Return / Risk | 0.31 | 0.34 | 0.38 |
| Worst 1-year portfolio | -34.4% | -38.0% | -35.4% |
| Worst portfolio drawdown | -45.3% | -47.1% | -44.4% |
| Cash drawdown (% of portfolio value) | 0.0% | -12.7% | -12.6% |

Source: Russell Investments.

Conclusion: Significant increase in risk-adjusted return

Choosing the right hedge ratio for a currency policy is a difficult task. As market conditions change, the right strategic hedge ratio may be inappropriate from time to time. The IDCH program gives investors the flexibility to take advantage of new market information and to adjust a currency program's target hedge ratio accordingly.

The IDCH program's systematic nature captures currency trends which reduces portfolio risk and drawdown while improving expected returns.

Russell Investments' IDCH model generated average excess returns of 50 basis points per year relative to a 50% hedged policy over the period between December 1999 and September 2016. Furthermore, it also has had beneficial effects on overall portfolio risk, reduced cash drawdowns and improved the balance of return-to-risk at the total portfolio level.

FOR MORE INFORMATION:

Contact Russell Investments for more information about our currency management services.



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