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# Currency Returns and Hedging Decisions

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WHEN INVESTORS BUY AN ASSET DENOMINATED IN A FOREIGN CURRENCY, their return is determined by the return of the foreign asset and the return of the currency. The impact of exchange rate movements on the investor's return can be reduced by hedging the currency exposure of the foreign asset. Unfortunately, despite decades of research, exchange rate models have shown little success in predicting currency movements. Without the ability to forecast exchange rates, how should investors decide if and when to hedge their currency exposures?

In this paper, we construct a framework that highlights some of the key ingredients required to make informed currency hedging decisions. Those are: (1) the forward currency premium as measured by the ratio of current forward exchange rate to current spot exchange rate, (2) the variance of the foreign asset's returns, and (3) the variance of the currency's returns. Our framework may be used to increase expected portfolio returns or control total portfolio volatility.

## SETTING UP THE PROBLEM

A foreign asset's currency exposure can be hedged by selling a forward currency contract for the asset's value today. The hedged return will equal the unhedged return of the asset plus the return of the short forward contract. To see this, we begin with the following example. Suppose a US-domiciled investor has \$1 to invest today (time $t$). The investor purchases a security denominated in euros and hedges his currency exposure by selling a forward contract (with maturity $t + 1$) for \$1 worth of euros. We define the spot rate ($S_t$) as the number of home currency units per unit of foreign currency. For example, if 1 EUR = 1.3 USD, then $S_t$ is 1.3, and the investor sells a forward contract for \$1 / $S_t$ = \$1 / 1.3 euros. The investment value in USD at time $t + 1$ is:

| | Asset | Short Forward |
|---|---|---|
| Time $t + 1$ | $\$1 \times (1 + R_L) \times (1 + R_C)$ | $(\$1 / S_t) \times (F_t - S_{t+1})$ |

$R_L$ is the return of the asset in euros, $R_C$ is the currency return and equals $(S_{t+1} / S_t - 1)$, and $F_t$ is the forward exchange rate at time *t* for delivery at *t + 1*. When $R_C$ is positive, the US dollar has depreciated against the foreign currency and an unhedged investment would benefit from its currency exposure. When $R_C$ is negative, the US dollar has appreciated against the foreign currency and the currency exposure detracts from the unhedged return.

The payoff from selling the forward contract is the money received from selling the contract at time *t*, $(F_t / S_t)$, minus the delivery of the spot exchange rate at time *t + 1*, $(S_{t+1} / S_t)$. The second term can be recognized as $(1 + R_C)$. This allows us to rewrite the investment value at time *t + 1* as:

| | Asset | Short Forward |
|---|---|---|
| Time *t + 1* | $\$1 \times (1 + R_L) \times (1 + R_C)$ | $\$1 \times (F_t / S_t - 1) - \$1R_C$ |

The term $(F_t / S_t - 1)$ is the forward currency premium (FCP) at time *t*. Thus, the hedged return (HR) from time *t* to *t + 1* is the unhedged return (UHR), *minus* the currency return, *plus* the forward currency premium at time *t*. In equation form:

$$UHR = R_L + R_C + R_LR_C, \tag{1}$$

$$HR = R_L + R_LR_C + FCP = UHR - R_C + FCP \tag{2}$$

Covered interest rate parity (an arbitrage condition) generally implies FCP + 1 = (1 + I) / (1 + I*), where I is the home interest rate from time *t* to *t + 1*, and I* is the foreign interest rate. When I* is small, FCP ~ (I – I*). That is, the forward currency premium is related to the difference between home and foreign interest rates and can be positive or negative.

It is clear from equation (2) that the currency return still plays a role in determining the hedged return (through the term $R_LR_C$). Why? When a market moves, the investor may no longer be perfectly hedged. Recall, the investor hedged the initial value of the asset, not the final value. If the local value of the asset appreciates ($R_L > 0$), the investor will be under-hedged. Conversely, if the local value of the asset depreciates ($R_L < 0$), the investor will be over-hedged. The relative magnitude of the over- or under-hedged position is equal to $R_L$. The impact this has on the hedged return is $R_L$ multiplied by $R_C$—the relative magnitude of the over- or under-hedged position times the currency return. The term $R_LR_C$ appears in the equations for unhedged and hedged returns.

Investing is forward looking. Thus, the next step in developing a decision framework for making informed currency hedging decisions is to examine the expected returns of hedged and unhedged investments. Taking the expectation of equations (1) and (2), we get:

$$E(UHR) = E(R_L) + E(R_C) + E(R_L)\,E(R_C) + COV(R_L,R_C), \tag{3}$$

$$E(HR) = E(R_L) + E(R_L)\,E(R_C) + COV(R_L,R_C) + FCP \tag{4}$$

The covariance of the local asset and currency return enters these equations because of the term $R_L R_C$.

Expected returns add linearly. The expected return for a portfolio of assets is the weighted average sum of their individual expected returns. When expected returns are the driving factor behind a currency hedging decision, we can examine each currency pair individually.

This is not true for total variance. If we have a portfolio of N assets (each denominated in a different currency) with weights $w_i$, the total unhedged and hedged portfolio variances are:

$$VAR(UHR) = \sum w^2_i \left[VAR(R^i_L) + VAR(R^i_C)\right] + 2 \sum w_i w_j \, COV(R^i_L, R^j_C) + H.O.T. \quad (5)$$

$$VAR(HR) = \sum w^2_i \left[VAR(R^i_L)\right] + H.O.T. \quad (6)$$

A portfolio's standard deviation equals the square root of its variance. H.O.T. stands for "Higher Order Terms." These are generally smaller in magnitude than the terms shown in equations (5) and (6). Therefore, they are of lesser importance in determining total portfolio variance. In the interest of brevity, they are not discussed in this paper.

Equations (3) through (6) provide a framework for making informed currency-hedging decisions. It is important to understand the central terms in this framework. Those are the:

1. Asset and currency's expected returns: $E(R_L)$ and $E(R_C)$.
2. Forward premium: FCP.
3. Asset and currency's variances: $VAR(R_L)$ and $VAR(R_C)$.
4. Covariance of the asset and currency returns: $COV(R_L,R_C)$.

To gain a better understanding of these terms, the remainder of this paper explores how exchange rates are determined and the characteristics of currency returns. We finish by constructing a simple currency-hedging strategy to demonstrate how the framework that we develop can be used to increase the expected return of a portfolio that holds assets denominated in multiple currencies. We do this without making predictions about future exchange rate movements.

## PEELING THE ONION

### Exchange Rate Arrangements

Table 1 contains different exchange rate regime classifications based upon the official statements of de jure policy by the national authorities.[1]

1. During the last decade, a number of exchange rate regime classification techniques have been developed that do not rely on the official stated regime by the national authorities. These classification techniques are based on actual de facto behavior. The de facto classification often diverges from the de jure classification.

**Table 1**

**Exchange Rate Arrangement of IMF Countries**

| Classifications | Number of Countries |
|---|---|
| Managed and independent float* | 90 |
| Fixed peg arrangement | 44 |
| Pegged arrangement within bands | 14 |
| Crawling pegs | 5 |
| Other | 34 |
| **Total** | **187** |

*Includes Eurozone countries.
See endnote for source information.

An independent float exchange rate arrangement is where market participants determine the price of one currency compared to another. Since the collapse of Bretton Woods, major currencies such as the US dollar, euro, and the Japanese yen are largely determined by independent float arrangements. A managed float arrangement is where the exchange rate is generally determined by market forces. The central bank, however, will intervene to prevent undesirable or disruptive movements in the exchange rate.

A fixed peg arrangement is where the country's central bank buys or sells its currency, another currency, or a basket of currencies to keep its exchange rate fixed against a single currency or basket of currencies. For example, China was pegged against the US dollar until 2005. A fixed peg arrangement within bands is similar to the fixed arrangement, but the exchange rate is allowed to vary within a predefined band. A crawling peg arrangement is used to change the value of a country's currency in response to a set of economic indicators.

The "other" category refers to countries that use alternative methods to control the value of their currency. One example is a currency board. With a currency board, a country commits to fixing the value of its currency with a different country's stronger currency. The board is ready to convert its currency into that foreign currency on demand. For example, a currency board is used to control the value of the Hong Kong dollar with respect to the US dollar.

### Historical Currency Returns

Using data from January 1985 to June 2011, we investigate the return characteristics of the nine major independent currencies. Those are the US dollar, the euro, (the German mark prior to 1999), Japanese yen, British pound, Australian dollar, Canadian dollar, Swiss franc, Norwegian krone, and Swedish krona. Over this period, long-term returns for these currencies look fundamentally different than equity and fixed income returns.

Table 2 shows average monthly returns and standard deviations for the US dollar versus the other major currencies. For example, a US investor holding Japanese yen would have experienced an average currency return of 0.4% per month. The US dollar, on average, depreciated with respect to the yen over this time period. For the eight currency returns shown, only one is more than two standard errors from zero. That is, over this time period, average currency returns have not been statistically different from zero.

**Table 2**

**Average Monthly Returns, Standard Deviations, T-Stats, and Annualized Returns for the US Dollar versus the Other Major Currencies**

**January 1985–June 2011**

| HOME – USD | AUSTRALIA | CANADA | GERMANY | JAPAN | NORWAY | SWEDEN | SWITZERLAND | UK |
|---|---|---|---|---|---|---|---|---|
| **Average Return** | 0.1% | 0.1% | 0.3% | 0.4% | 0.2% | 0.2% | 0.4% | 0.1% |
| **Standard Deviation** | 3.5% | 2.0% | 3.2% | 3.4% | 3.2% | 3.3% | 3.4% | 3.0% |
| ***T-Stat*** | *0.6* | *1.0* | *1.8* | *2.2* | *1.2* | *0.9* | *2.1* | *0.9* |
| **Annualized Compound Return** | -0.1% | 0.8% | 2.6% | 4.1% | 1.3% | 0.5% | 3.4% | 1.0% |

See endnote for source information.

In contrast, over this time period, average equity returns (except for Japan) have generally been over three standard errors from zero. Average local fixed income returns have generally been over seven standard errors from zero.

**Table 3**

**Average Monthly Returns, Standard Deviations, and T-Stats for Local Equity and Fixed Income Returns**

**January 1985–June 2011**

| Local Equity Returns | AUSTRALIA | CANADA | GERMANY | JAPAN | NORWAY[2] | SWEDEN[1] | SWITZERLAND | UK | US |
|---|---|---|---|---|---|---|---|---|---|
| **Average Return** | 1.1% | 0.9% | 0.9% | 0.2% | 1.1% | 1.4% | 0.9% | 0.9% | 1.0% |
| **Standard Deviation** | 4.8% | 4.5% | 6.4% | 5.7% | 7.0% | 7.1% | 5.0% | 4.6% | 4.5% |
| ***T-Stat*** | *4.1* | *3.5* | *2.6* | *0.8* | *2.7* | *3.5* | *3.2* | *3.5* | *3.8* |
| **Local Fixed Income Returns** | | | | | | | | | |
| **Average Return** | 0.8% | 0.7% | 0.5% | 0.4% | 0.5% | 0.7% | 0.4% | 0.7% | 0.6% |
| **Standard Deviation** | 1.5% | 1.6% | 1.0% | 1.1% | 1.0% | 1.3% | 1.0% | 1.8% | 1.4% |
| ***T-Stat*** | *9.3* | *8.1* | *9.0* | *5.8* | *7.2* | *7.8* | *7.0* | *7.2* | *7.9* |

1. Local fixed income returns for Sweden from 01/31/91.
2. Local fixed income returns for Norway from 01/31/95.
See endnote for source information.

### Return Persistence or Reversal

While long-term realized currency returns do not appear to have been statistically different from zero, there have been episodes when the US dollar has strongly appreciated or depreciated with respect to other currencies. For example, the Australian dollar depreciated strongly with respect to the US dollar from the late 1990s until January 2002, then proceeded to rise sharply against the US dollar over the following two years. Can short- to medium-term currency movements be predicted?

To test whether this month's currency return can predict next month's currency return, we regress next month's currency return on this month's currency return (lowercase variable implies logs, $s_t = \log[S_t]$).

$$\text{Regression: } s_{t+1} - s_t = a + b\,(s_t - s_{t-1}) + \text{error}$$

**Table 4**

**Regression of Next Month's Log Currency Return on This Month's Log Currency Return**

**January 1985–June 2011**

| Local Equity Returns | AUSTRALIA | CANADA | GERMANY | JAPAN | NORWAY | SWEDEN | SWITZERLAND | UK |
|---|---|---|---|---|---|---|---|---|
| **b** | 0.08 | -0.03 | 0.05 | 0.02 | 0.07 | 0.17 | 0.03 | 0.10 |
| ***b T-Stat*** | *1.42* | *-0.45* | *0.91* | *0.41* | *1.00* | *2.75* | *0.56* | *1.70* |
| **$R^2$** | 0.6% | 0.1% | 0.3% | 0.1% | 0.5% | 3.0% | 0.1% | 0.9% |

See endnote for source information.

It is clear from these regressions that the current month's currency return is not a predictor of the next month's return. The average absolute t-stat of the regression coefficients in Table 4 is less than 1, and the average $R^2$ is less than 0.7%.

### Purchasing Power Parity (PPP)

Does purchasing power parity explain short- or medium-term currency movements? PPP is the law of one price applied to the international goods markets and states that identical goods should sell for the same price in different countries when those prices are expressed in the same currency. Thus, if country A has high inflation and country B has low inflation, PPP implies that country A's currency should depreciate with respect to country B's currency. If we define p and p* as the log of the price levels at home and abroad, relative PPP may be expressed as:

$$E_t(s_{t+1} - s_t) = E_t(p_{t+1} - p_t) - E_t(p^*_{t+1} - p^*_t)$$

Deviations from PPP should eventually be arbitraged away (subject to the cost of doing so). Many economists have a "deep-seated belief" in some variant of the PPP theory of exchange rates. The current academic consensus is that, over long periods of time, PPP *probably* holds. Deviations from PPP, however, have a half-life of approximately five years. This implies that it takes five years for a deviation from PPP to decrease by half.

While PPP probably holds over a long period of time, it does not hold continuously and is *not* a useful tool for predicting short-term currency movements. We can demonstrate this by running monthly regressions of log currency returns versus the difference in log inflation changes.

$$\text{Regression: } s_{t+1} - s_t = a + b\,(p_{t+1} - p_t - p^*_{t+1} + p^*_t) + \text{error}$$

Relative PPP implies that the regression coefficient *b* should equal 1 for each currency pair. Table 5 shows the results for the currencies examined in this paper. With respect to the US, we can reject that *b* equals 1 at the 95% level for seven of the eight currency pairs. We find an average regression $R^2$ of 0.3%. That is, the differences in monthly inflation rates between country A and country B does NOT explain the variation in currency returns between countries A and B.

**Table 5**

**Stage 1 Testing of Relative PPP**

**January 1985–June 2011**

| Local Equity Returns | AUSTRALIA | CANADA | GERMANY | JAPAN | NORWAY | SWEDEN | SWITZERLAND | UK |
|---|---|---|---|---|---|---|---|---|
| **b** | 0.82 | -0.03 | -0.12 | -0.84 | -0.01 | -0.34 | -0.04 | 0.26 |
| **b Standard Error** | 0.55 | 0.36 | 0.45 | 0.44 | 0.38 | 0.38 | 0.50 | 0.35 |
| ***b T-Stat w.r.t. 1*** | *-0.33* | *-2.84* | *-2.49* | *-4.15* | *-2.69* | *-3.56* | *-2.10* | *-2.12* |
| **$R^2$** | 0.7% | 0.0% | 0.0% | 1.1% | 0.0% | 0.3% | 0.0% | 0.2% |

See endnote for source information.

### Uncovered Interest Rate Parity (UIP)

Uncovered interest rate parity (UIP) predicts that differences in interest rates between countries have the power to predict future spot exchange rates. Before elevating readers' expectations, we should point out that short-term UIP has been almost universally rejected in studies of exchange rate movements.

The log forward exchange rate at time *t* for exchange at *t + 1* can be written as the expected spot rate at time *t + 1* plus an expected payoff at time *t + 1*.

$$f_t = E_t(s_{t+1}) + E_t(\text{Payoff}_{t+1})$$

Using covered interest parity (CIP), the difference between the log forward rate and the log spot rate equals the difference in log home and foreign nominal interest rates. This allows us to write the expected change in the exchange rate as:

$$E_t(s_{t+1} - s_t) = (i_t - i^*_t) - E_t(Payoff_{t+1})$$

In a risk-neutral world, $E_t(Payoff_{t+1}) = 0$, and the expected change in spot rates should equal the difference between the home and foreign interest rates. To test UIP, we can run the following regression:

$$\text{Regression: } s_{t+1} - s_t = a + b\,(i_t - i^*_t) + \text{error}$$

If UIP holds, the regression coefficient *b* should equal 1. Table 6 shows results for the eight major currency pairs examined in this paper. Using monthly data from 1985 to 2011, the average regression coefficient is -0.76, and the average $R^2$ is 0.4%. Table 6 implies there is very little predictive power in interest rates to forecast currency movements (low $R^2$) and that, in practice, high interest rate currencies have tended to appreciate with respect to low interest rate currencies (the negative regression coefficients).

**Table 6**

## Testing Short-Term UIP

**January 1985–June 2011**

| | AUSTRALIA | CANADA | GERMANY | JAPAN | NORWAY | SWEDEN | SWITZERLAND | UK |
|---|---|---|---|---|---|---|---|---|
| **b** | -0.80 | -1.00 | -0.12 | -2.27 | 0.09 | 0.22 | -1.10 | -1.07 |
| **b Standard Error** | 0.82 | 0.82 | 0.90 | 0.99 | 0.57 | 0.70 | 0.99 | 0.96 |
| ***b T-Stat w.r.t. 1*** | *2.21* | *2.43* | *1.25* | *3.30* | *1.59* | *1.11* | *2.12* | *2.17* |
| **$R^2$** | 0.3% | 0.5% | 0.0% | 1.6% | 0.0% | 0.0% | 0.4% | 0.4% |

See endnote for source information.

The results shown in Table 6 are a direct contradiction of UIP. It is likely the assumption that the world is risk neutral, $E_t(Payoff_{t+1}) = 0$, is not a good one. That is, the failure of UIP may be due to non-diversifiable, time-varying foreign exchange risk premiums. For example, Farhi and Gabaix (2008) postulate that countries that are sensitive to rare disasters have low exchange rates (higher risk implies lower price) and higher interest rates than countries that are not as sensitive to rare disasters. If such a country becomes less sensitive to rare disasters (less risky) its exchange rate should rise.

### Predicting Currency Returns

There have been numerous papers that test whether more sophisticated structural or time series models can predict currency movements. Structural models use macroeconomic variables such as growth, productivity, inflation, or the capital account as their explanatory variables. Time series models use auto-regressive models to predict currency movements. In a paper that examines exchange rate models of the 1970s, Meese and Rogoff (1983) conclude that a "random walk" model performs as well as any structural or time series model over short to medium horizons. Over twenty years later, Cheung, Chinn, and Pascual (2005) arrive at a similar conclusion.

Large volatility is one of the major reasons that forecasting exchange rates is so difficult. Further, there are not many good models of liquidity and currency risk premia. These appear to be important drivers of short-term exchange rate movements. In a 2008 interview, when asked to comment on the success of the ability of any current exchange rate model to predict exchange rate movements, Rogoff stated: ". . . the glass is 95 percent empty, 5 percent full. But that is better than a decade ago. Maybe we'll get it up to 10 percent over the next five to 10 years."

What's the lesson in this? Accurately predicting currency movements remains an extremely challenging task despite decades of academic work.

### What Can We Say about Expected Unhedged versus Hedged Returns?

Short-term currency returns are difficult to predict, and long-term currency returns are not statistically different from zero. Thus, we will assume that the expected single-period currency return is 0; $E(R_C) = 0$. We can rewrite equations (3) and (4) as:

$$E(UHR) = E(R_L) + COV(R_L,R_C), \tag{7}$$

$$E(HR) = E(R_L) + COV(R_L,R_C) + FCP \tag{8}$$

*The hedged return equals the unhedged return plus the forward currency premium. If expected returns are the driving factor behind your hedging decision, all you need to look at are forward rates.*

### The Covariance of Asset and Currency Returns

Table 7 shows the covariance (displayed in basis points) of currency returns and local equity and fixed income returns from the perspective of a US investor. For example, when the local Australian equity market's return has been positive, the currency return has also been positive. Stated differently, on average, when Australian equities appreciate, the Australian dollar appreciates with respect to the US dollar. Over this time period, the correlations for only five of the sixteen pairs in Table 7 are significant at the 95% level.

**Table 7**
## $COV(R_L, R_C)$—Monthly Covariance of Local Equity and Fixed Income Returns with Currency Returns
**January 1985–June 2011**

Covariance of local equity return with currency return—basis points

| | AUSTRALIA | CANADA | GERMANY | JAPAN | NORWAY | SWEDEN | SWITZERLAND | UK |
|---|---|---|---|---|---|---|---|---|
| **Home Market: US** | **5.4** | **3.8** | -2.2 | -1.2 | 1.1 | -1.8 | **-4.9** | -1.4 |

Covariance of local fixed income return with currency return—basis points

| | AUSTRALIA | CANADA | GERMANY | JAPAN | NORWAY | SWEDEN | SWITZERLAND | UK |
|---|---|---|---|---|---|---|---|---|
| **Home Market: US** | 0.1 | 0.2 | 0.1 | **0.6** | -0.2 | **-0.8** | 0.1 | 0.1 |

Bold numbers indicate where the corresponding correlation is significant at the 95% level.
See endnote for source information.

From the perspective of Australian and Canadian investors, historical monthly currency returns have been predominately negatively correlated with local equity returns (not shown here). That is, when local equity returns are positive ($R_L > 0$), on average, the Australian and Canadian dollar appreciates ($R_C < 0$ for Australian and Canadian investors). While this observation is interesting in its own right, equations (7) and (8) show this has equal effect on expected unhedged and hedged returns and therefore plays no part in determining which is greater.

### The Final Layer—Variance

Three components contribute to the variance of an asset denominated in a foreign currency: (1) the variance of the asset's return, (2) the variance of the currency's return, and (3) the covariance of the asset and currency's return. For a portfolio, the relative magnitude of these components for each asset held decides their importance in determining total portfolio variance. For the currencies and countries examined in this paper, Tables 2 and 3 show that the monthly variances of currencies (the square of the standard deviation) have averaged 5—10 basis points, stock indices 20—50 basis points, and bond indices between 1—3 basis points. From Table 7, we see that, on average, the covariances of country-level stock indices and currencies have been much smaller than the variances of the stock indices. The covariances of bonds with currencies have been small.

This implies that, for an unhedged equity portfolio, its standard deviation is generally dominated by the standard deviation of the equities it holds. Because of this, *unhedged and hedged equity portfolios have had similar standard deviations*. Conversely, the standard deviation of an unhedged fixed income portfolio is generally dominated by the currencies it holds. Because of this, *unhedged fixed income returns have had significantly greater standard deviations than hedged fixed income returns*. Figures 1 and 2 illustrate this result for equal-weighted equity and fixed income portfolios.

**Figure 1**

## Hedged vs. Unhedged Equal-Weighted International Stock Returns

**(1990–2011)**

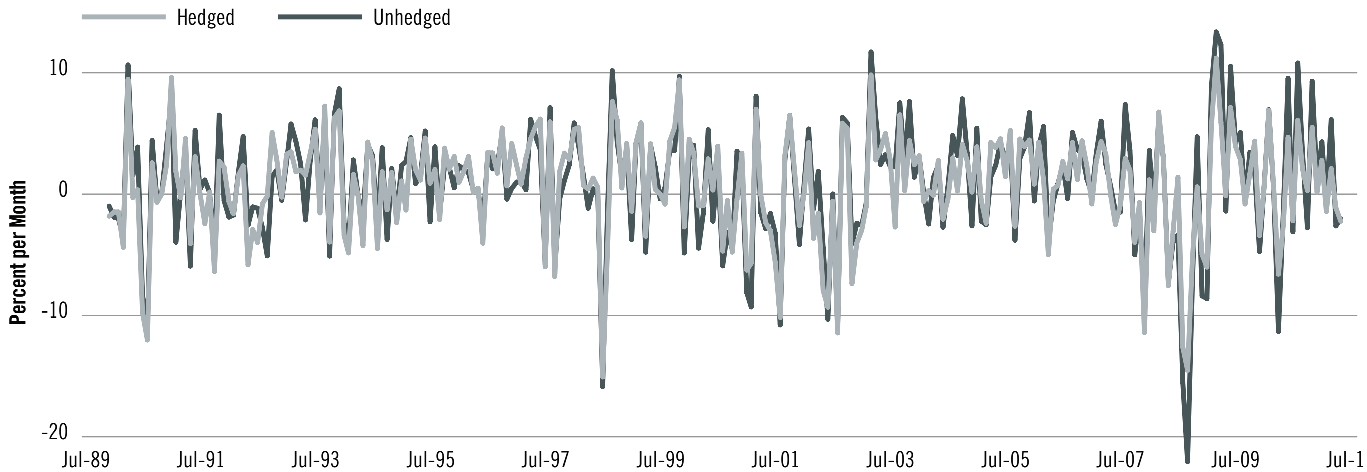
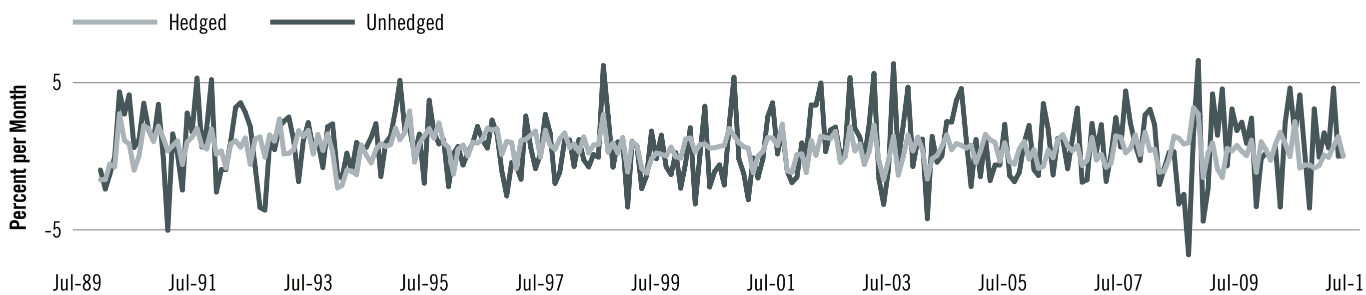



**Figure 2**

## Hedged vs. Unhedged Equal-Weighted International Bond Returns

**(1990–2011)**



## Lessons Learned

1. *Forward premiums may inform hedging decisions.* Assuming expected currency returns are zero, the expected hedged return is equal to the expected unhedged return plus the forward currency premium.
2. *As it relates to expected returns, covariance should not play a role in deciding to hedge a currency.* The covariance between the currency's return and local market's return affect the expected unhedged and hedged returns equally.
3. *For high-quality fixed income investments, if low volatility is desired, the currency exposure should be hedged.* The volatility of unhedged fixed income returns will be dominated by the currency's volatility and, in general, will be much larger than the volatility of the hedged investment.
4. *For equities, currency exposure should not be hedged with the purpose of reducing volatility.* Unhedged and hedged volatilities for equity portfolios are similar.

## Putting It All Together

For equities, we can use currency hedging decisions to add value without increasing portfolio volatility. To demonstrate this, we use equity returns for Australia, Canada, Germany, Japan, Norway, Sweden, Switzerland, the UK, and the US. These markets represent the nine major currencies we consider in this paper. We construct three market-cap weighted portfolios: a hedged portfolio, an unhedged portfolio, and a selectively hedged portfolio. The three portfolios have identical country exposures (market cap weights across countries).

Each month, we compute the forward currency premium for the US dollar with respect to the other eight currencies. In the selectively hedged portfolio, we hedge the currency exposure in those markets where the annualized forward premium is greater than 25 basis points. Table 8 shows the returns of the strategies using data from 1990 to 2011.

For the US investor, the average hedged position in the selectively hedged strategy would have been 19%. This is because interest rates in the US have generally been similar to or lower than the other countries used in these simulations. The selectively hedged strategy outperforms both the hedged and unhedged equity strategies. Why? Equations (7) and (8) imply that, when the home interest rate is larger than the foreign interest rate, the expected hedged return is larger. Thus, we use information in current forward prices about difference in expected unhedged and hedged returns to add value. This hedging strategy does NOT require us to forecast currency returns.

**Table 8**
## Equity—Selectively Hedged Strategy
**1990–2011**

| Average Monthly Return | | | Monthly Standard Deviation | | | Annualized Difference | |
|---|---|---|---|---|---|---|---|
| Hedged | Unhedged | Selectively Hedged | Hedged | Unhedged | Selectively Hedged | Selectively Hedged – Hedged | Selectively Hedged – Unhedged |
| 0.57% | 0.64% | 0.67% | 4.14% | 4.37% | 4.29% | 1.18% | 0.39% |

Simulations are for illustrative purposes and do not represent actual investment strategies.
See endnote for source information.

### SUMMARY

In the absence of the ability to predict exchange rate movements, this paper provides a framework for making currency hedging decisions. We develop single-period equations for the expected return and variance of unhedged and hedged portfolios. We show how interest rate differentials implied by forward exchange rates may influence currency hedging decisions. We also discuss how the impact of hedging on a portfolio's volatility may influence the decision. Finally, we use the results of this analysis to construct a selectively hedged strategy that uses the information in forward exchange rates to add value.

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Spot exchange rate data from Bloomberg. Forward exchange rate data from Bloomberg and Datastream. Equity country returns from MSCI. Fixed income country returns from Citigroup World Government Bond Index 1 – 30. Local fixed income returns for Norway begin in January 1995. Local fixed income returns for Sweden begin in January 1991. Short-term fixed income local country returns from Citigroup WGBI 1 – 3 Years. Monthly CPI data are sourced from (a) Ibbotson and Sinquefield, (b) Bloomberg, (c) Deutsche Bundesbank, (d) Statistics Sweden: http://www.ssd.scb.se/, (e) www.statistics.gov.uk, and (f) www.inflation.eu.

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