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Understanding the 'hedge return': The impact of currency hedging in foreign bonds

Vanguard research

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- Hedging the currency risk of an international bond allocation is an effective way to reduce the volatility of the asset class, since the embedded currency exposure can introduce significant risk to the relatively stable underlying bonds.
- However, hedging does not merely produce an investment without currency return. Rather, hedging provides investors with an alternative stream of returns that is distinct from both the currency return being hedged and the return of the underlying bonds.
- By hedging currency risk, this "hedge return" becomes a component of an investor's total return. International bond investors implementing a hedging program should therefore adjust their long-term return expectations accordingly.
- Similar to the long-term return of currency, the long-term impact of the hedge return adjusts for fundamental differences across markets—such as inflation and interest rate levels. This makes the interpretation of the yield to maturity for a hedged bond investment rather nuanced. Therefore, comparisons of yields across domestic and international markets are not meaningful.

Although fixed income securities make up a significant portion of the global investable capital markets, most of an investor's home-country bond market represents only a portion of the fixed income securities available for investment. Because of this, investors seeking the benefits of diversification may look to international (or foreign) bonds to play a role in their portfolio.¹ International bonds expose investors to fixed income risk factors—that is, interest rate fluctuations, inflation and economic cycles, and issues associated with changing or unstable political regimes—that are relatively uncorrelated to the same factors in their domestic bond market. Hence, a diversification benefit has generally resulted. Of course, investors are also exposed to currency movements, which have an important role in determining the risk and return of international bonds. On average, currency volatility can overwhelm any diversification advantage that international bonds might bring to a portfolio, but when currency risk is hedged, international bonds have the potential to reduce average portfolio volatility over time and allow investors to achieve maximum diversification by owning a larger portion of the investable market.² Although the volatility implications of hedging are generally well-understood, many investors may be unclear about hedging's potential effect on longer-term returns. This paper describes the return impact of hedging currency and discusses the implications of this return stream when forming long-term return expectations for international bonds.

How is it done? The hedging equation and role of forward exchange rates

Currency transactions are one of the most frequent and largest investment activities in the financial world.³ The currency markets are liquid, and costs have declined significantly over the last 20 years.⁴ Recent Vanguard research has estimated that the transaction cost to hedge an international bond portfolio is less than 0.20% a year for investors hedging back to a liquid, developed-market currency, such as the US dollar, euro, Japanese yen, UK pound sterling, Canadian dollar, Australian dollar, or Swiss franc.⁵

Currency hedging often involves the use of forward contracts, in which two parties agree to exchange a set amount of one currency for another at a predetermined exchange rate at some future date, typically one week or one month ahead. These contracts allow investors to trade the risk that a currency will move in the future, effectively "locking in" a set exchange rate today and eliminating the volatility of currency movement from their portfolio.

Notes on risk: All investing is subject to risk, including the possible loss of the money you invest. Bond funds are subject to interest rate risk, which is the chance that bond prices overall will decline because of rising interest rates, and credit risk, which is the chance that a bond issuer will fail to pay interest and principal in a timely manner or that negative perceptions of the issuer's ability to make such payments will cause the price of that bond to decline. In a diversified portfolio, gains from some investments may help offset losses from others. However, diversification does not ensure a profit or protect against a loss. Past performance is no guarantee of future results.

1 Throughout this paper we use the term *global* to refer to the aggregate, global capitalization-weighted fixed income marketplace. We use the term *domestic* to refer to an investor's home-region fixed income market. The terms *international* and *foreign* are used here to refer to the global fixed income market, excluding an investor's domestic market. In our definition of the fixed income asset class, we focus on investment-grade securities issued in liquid, hedgeable currencies.

2 Notably, although earlier Vanguard research (LaBarge, 2010) found that the correlation between currency and an equity investment is crucial for the hedging decision in an equity portfolio, for fixed income investors, more recent Vanguard research by Philips et al. (2014) has found that any potential diversification effect from low or negative correlation of currency has been overwhelmed by the overall volatility of currency relative to a diversified high-quality international bond portfolio.

3 For example, according to Bank for International Settlements data, average daily currency trading volume was more than \$5 trillion in 2013, roughly 50 times the average daily volume of equities traded in 2013 on the New York Stock Exchange.

4 See Philips et al. (2014) for a discussion from the perspective of a US investor.

5 See Philips et al. (2014).

Figure 1. Forward exchange rates are priced based on interest rate differentials and cause a 'hedge return'

a. Covered interest parity relationship in pricing forward currency

$$F = S \times \frac{(1 + R_{USD})}{(1 + R_{EUR})}$$

F	=	forward price of euro (\$ per €)
S	=	spot price of euro (\$ per €)
R _{USD}	=	interest rate in dollar market
R _{EUR}	=	interest rate in euro market

b. Return component of hedging currency

$$H = \frac{F}{S} - 1 = \frac{(1 + R_{USD})}{(1 + R_{EUR})} - 1$$

H	=	return of hedging from US perspective
F	=	forward price of euro (\$ per €)
S	=	spot price of euro (\$ per €)
R _{USD}	=	interest rate in dollar market
R _{EUR}	=	interest rate in euro market

Note: These are hypothetical examples using the US dollar and euro, from the perspective of a US investor.

Source: Vanguard.

As shown in **Figure 1a**, the key driver of the agreed forward exchange rate (F) relative to the spot exchange rate (S) will be the difference in the prevailing local interest rates. This relationship is known as covered interest parity, and ensures that there is a no-arbitrage relationship in investing in assets with similar risk profiles but denominated in different currencies. If the foreign market has a higher interest rate than the domestic market, the forward price of the foreign market's currency will be lower than its spot price, reflecting a depreciation to offset the higher interest rate earned in that market. For foreign markets with a lower interest rate than the domestic market, the opposite will be true.

By locking in a set forward rate, investors are also locking in a set return from hedging activity: No matter which direction a currency moves over the course of the hedge, the investor will receive (or pay) the difference between the purchased forward exchange rate and the spot exchange rate at the time the hedge was initiated, as shown in **Figure 1b**. This "hedge return" (H) is a component of an investor's total return, effectively replacing the currency return that an investor would otherwise receive.⁶ In other words, a hedged investor earns not only the price and income returns of the underlying foreign bond investment but also a return due to hedging activity.⁷

⁶ Throughout this paper, we define *hedge return* as the currency contribution to return in a hedged international bond investment. Although the return impact of forward exchange rates relative to spot exchange rates accounts for the overwhelming majority of this return, a small component is due to currency fluctuation. A portfolio can never be perfectly hedged without an investor's knowing what the portfolio value will be in the future, so this reality therefore results in a small amount of "overhedging" and "underhedging." This impact is small and tends to wash out over time.

⁷ Note that the return due to hedging activity is distinct from the change in value of the forward contract that offsets the movement of the spot exchange rate over the course of a given trade horizon. Because these two components effectively cancel each other out, the investor is left with the difference between the forward rate and the beginning spot exchange rate. However, depending on the accounting and tax treatment of forward currency transactions in various tax regimes around the world, the realized change in the value of forward contracts can potentially affect the distributions of a fund implementing a hedging program. This will not affect (pre-tax) total returns, but merely their composition.

Figure 2. Hedge return can be either positive or negative

Spot exchange rates, forward exchange rates, and implied return of hedging for a US investor: 30 June 2014

	Australian dollar 	Canadian dollar 	Euro 	Japanese yen 	Swiss franc 	UK pound 
 Spot price in US dollars	\$0.943850	\$0.938835	\$1.369150	\$0.009871	\$1.127650	\$1.709840
 1-month forward price in US dollars	\$0.941560	\$0.938060	\$1.369320	\$0.009874	\$1.127968	\$1.709420
 Annualised "hedge return" of hedging to US dollars	-2.87%	-0.99%	0.15%	0.30%	0.34%	-0.29%

Sources: Vanguard calculations, based on data from Thomson Reuters.

Since hedging is typically implemented over shorter time horizons, the relevant interest rates for hedging are short-term rates. Across most developed markets, short-term interest rates are targeted by central banks with the aim of managing inflation and economic output.⁸ As these rates shift across markets over time, the impact of the hedge return will also shift, and both positive and negative contributions to an investor's return are possible. **Figure 2** displays spot and forward exchange rates relative to the US dollar and the implied annualised hedge return for a US investor, as at 30 June 2014. This demonstrates that, even in today's interest rate environment, the return from hedging can be either positive or negative, depending on the investor's perspective and the differences in interest rates across countries.

Impact of the hedge return: To hedge or not to hedge

An investor seeking international exposure has two options: to hedge currency risk or to remain unhedged. Therefore any international bond investment will always have some additional return component beyond that of the underlying bonds themselves, from either the return of foreign currency or the return of hedging currency (see the box below defining types of global bond investments).

Defining the types of global bond investments

Domestic bond. A bond investment in an investor's home currency region.

International bond in local terms. A foreign bond, measured in that bond's home currency (not an accessible investment for investors located outside of that bond's home region).

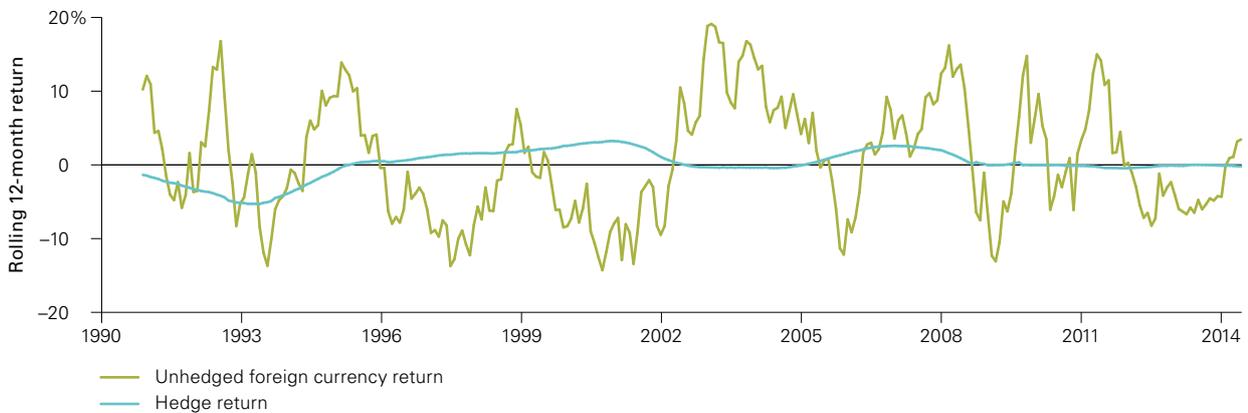
International bond in hedged terms. A foreign bond hedged back to an investor's home currency.

International bond in unhedged terms: A foreign bond, including the currency return of translating back to an investor's home currency.

⁸ Broadly, short-term interest rates in developed markets are highly influenced by central bank policy. However, other factors are at work as well. For example, forward exchange rates are priced based on interbank rates, which contain risk premiums related to counterparty risk.

Figure 3. Hedge return has varied over time, but has been less volatile than results of owning foreign currency

Rolling 12-month return contribution of hedging and foreign currency in an international bond portfolio for a US investor: 1990 through 30 June 2014



Notes: “Hedge return” is defined here as the currency return for the Barclays Global Aggregate ex-USD index, hedged to US dollars. “Unhedged foreign currency return” is defined here as the currency return for the Barclays Global Aggregate ex-USD index, unhedged, in US dollars.

Sources: Vanguard calculations, based on data from Barclays.

Figure 3 clarifies these return contributions relative to the underlying international bonds measured in local terms. The figure displays the return contribution of hedging an international bond portfolio versus the currency return from remaining unhedged, from the perspective of a US investor. The figure demonstrates that a foreign investor can never access only the underlying international bond returns in local terms; there will always be an additional return component. Thus, investors have a choice between the hedge return and the currency return. Since 1990, the hedge return has ranged between -5.3% and 3.25% in annual terms and has tended to be much smaller in magnitude than currency return that remains unhedged, confirming prior Vanguard research regarding the merits of hedging currency in an international bond investment to reduce portfolio volatility (Philips et al., 2014).

Currently (as at 30 June 2014), with most major countries having similarly low short-term interest rates, the hedge return is near zero from the perspective of US investors. However, if past is prologue, deviations are likely to arise again as interest rates normalise and the hedge return once again becomes a factor in returns. Although it

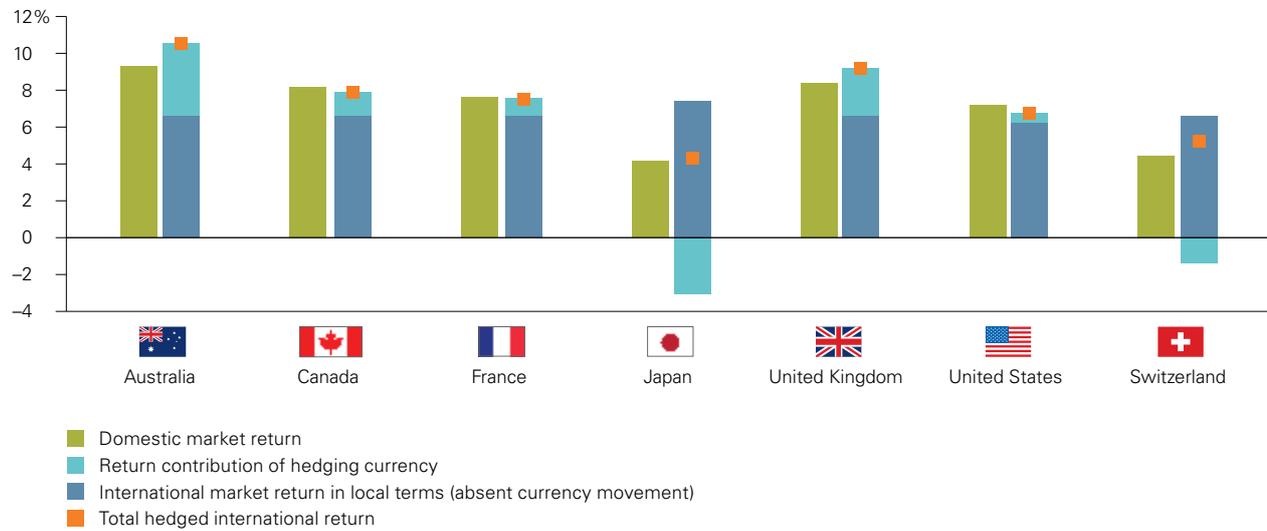
seems reasonable over shorter time horizons to expect the hedge return to have a modest impact relative to the alternative of simply keeping the currency return, it’s important to understand the role of this return stream in a portfolio over all time frames.

In examining the outlook for the hedge return, we note that short-term interest rates are very difficult to forecast for a single country, let alone the multiple countries that would be needed to forecast the hedge return for an international bond fund. Investors should therefore be less concerned about predicting the return impact of hedging and focus, instead, on understanding that the hedge return is one component of a bond fund’s return, both in the short term and long term.

Over short time horizons, the impact of hedging has been relatively small—as shown in Figure 3—and not a significant factor in the diversification decision (see Philips et al., 2014). However, over longer time horizons, it can add up. Given the relationship discussed earlier between the hedge return and interest rate differentials, a key consideration is that the long-term impact of hedging

Figure 4. Hedging has tended to equalise long-term returns between an investor’s domestic and international market

Returns of domestic and international bond markets from perspective of investors in the stated country, 1985–2013



Notes: “Domestic market return” is defined here as each country’s respective component of the Citigroup World Government Bond Index, with returns measured in that country’s currency. “International market return in local terms (absent currency movement)” is defined as the Citigroup World Government Bond Index (excluding the stated country), measured in local terms. “Return contribution of hedging currency” is the difference in return between the international index measured in hedged terms versus local terms. We used France as a proxy for euro-area investors, because of a lack of history for the broad monetary area.

Sources: Vanguard calculations, based on data from Citigroup.

simply reflects the difference in average interest rate levels across countries. Effectively, the hedge return has tended to push international bond returns closer to an investor’s domestic market return, adjusting for the differences in yield between markets over long time periods. This has reduced the differences in long-term average returns between those of international bonds and an investor’s local bond market. As a result, long-term returns of international bonds, when accounting for currency hedging, become more local in character.⁹

This result is seen in **Figure 4**, which shows that the impact of hedging across markets has resulted in a hedged international government bond investment with an average annualised return that is closer to the experience in an investor’s domestic market.¹⁰

For each country in the figure, the orange box—which represents the return of the international bonds themselves plus the impact of the hedge return—tends to be closer to the return of the investor’s domestic market (in green) than to the return of the underlying international bonds (in dark blue). Previous Vanguard research has demonstrated that investors might expect a similar result when remaining unhedged over the long run, with currency returns producing a similar adjustment for underlying fundamental differences across markets.¹¹ This suggests that the long-run return impact of the hedge return and currency return may be similar, meaning investors should focus on the short-term volatility impact in selecting which exposure they want.

⁹ This is a result of aggregating the covered interest parity relationship in Figure 1, resulting in a hedged investment tending to have a long-term return that is more similar to an investor’s domestic market than to the international market in local terms. In our view, it is reasonable to expect this finding to also apply to the currency return of unhedged international bonds, assuming uncovered interest rate parity holds over long horizons. If this is the case, then the foreign currency return should tend to have the same effect as the hedge return, pushing the return closer to that of the investor’s domestic market. See Chinn and Quayyum (2012) for an examination of long-horizon uncovered interest rate parity. A related point, which we do not formally address here, is that of whether the forward currency rate is an unbiased predictor of the future spot rate.

¹⁰ We used government bond indexes for this analysis, to ensure fairly similar credit quality across the countries we examined.

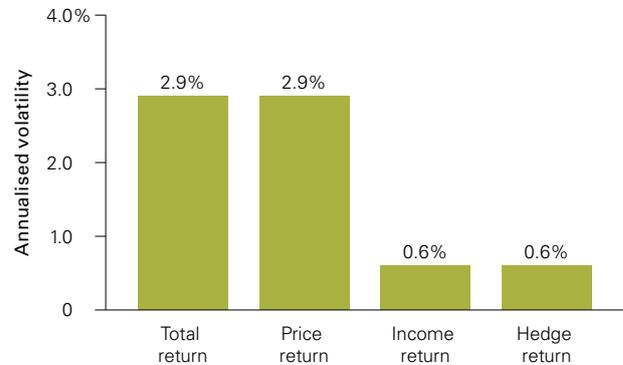
¹¹ See *The Outlook for Emerging Market Stocks in a Lower-Growth World* (Davis et al., 2013).

Should the hedge return affect the decision to diversify?

Some may argue that since currency hedging brings long-term international bond returns in line with local bond returns, then why bother with international bond diversification? Although this has been true over a very long horizon (see Figure 4), over shorter and intermediate horizons, the differences between bond markets can be significant, leading to a diversification benefit: a smoother and more preferable return profile for investors who own both international and local bonds. **Figure 5** shows that the primary factor affecting the short-term volatility of a hedged international bond investment is the price movement of the underlying bonds themselves, driven by the interest rate movement in the international markets.¹² Although not shown in the figure because of considerations of scale, the volatility of currency return (for unhedged investors) over the same time period (1990–2013) was 7.9%; again, this demonstrates that, relative to the alternative of remaining unhedged, hedging has produced lower-volatility outcomes for bond investors. The hedge return is a limited component of volatility, and so has limited impact on the diversification potential of international bonds.

Figure 5. Small relative volatility of hedge return is unlikely to affect diversification potential

Annualised volatility of monthly return components of hedged international bonds for US investors, 1990–2013



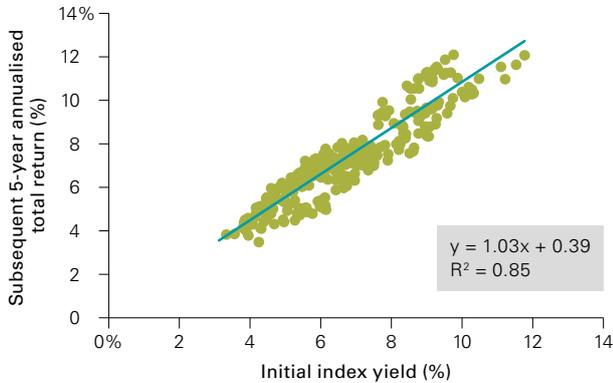
Note: Figure displays the annualised volatility of monthly return components for the Barclays Global Aggregate ex-USD index, hedged to US dollars.

Sources: Vanguard calculations, based on data from Barclays.

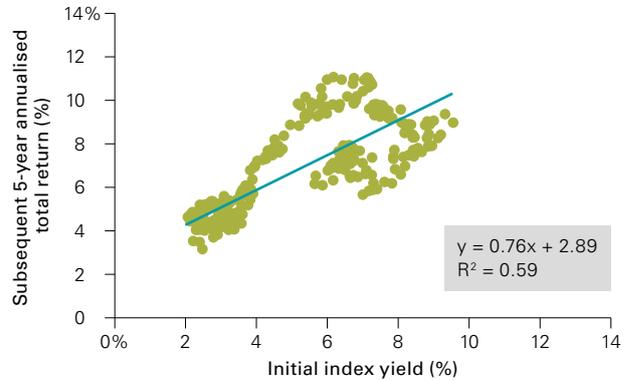
¹² See Philips and Thomas (2013) for a discussion of the relative movement of interest rates across developed markets.

Figure 6. Relationship between yield and future returns for US and hedged international bond portfolios

a. Yield versus future return for US bonds, 1985–2013



b. Yield versus future return for hedged international bonds, 1985–2013



Notes: Figure displays initial yield to maturity and subsequent five-year annualised total return. US bonds are represented by Barclays US Aggregate Bond Index, measured in US dollars. International bonds are represented by Citigroup World Government Bond ex-US Index, hedged to US dollars.

Sources: Vanguard calculations, based on data from Citigroup.

The hedge return and yield to maturity

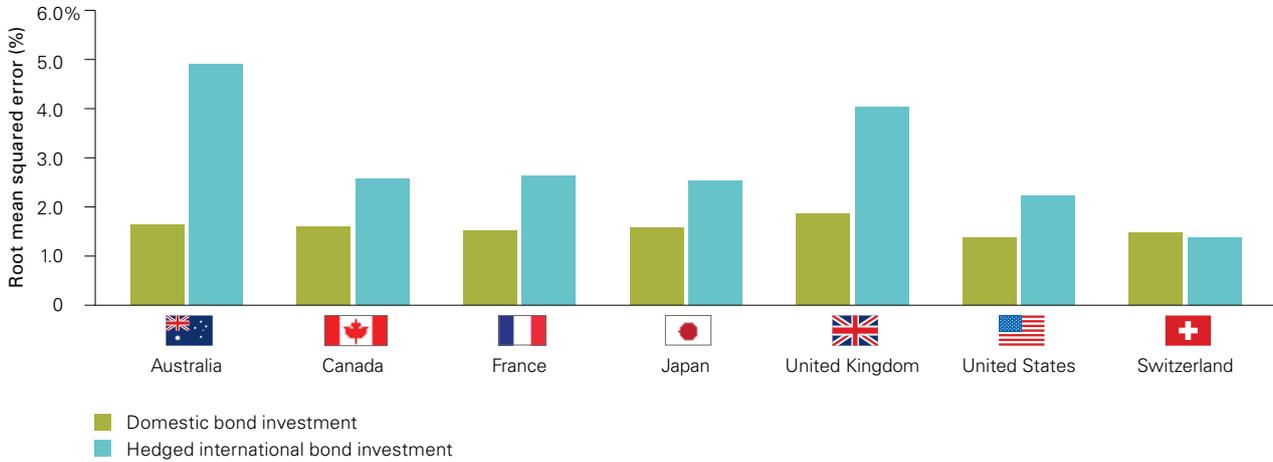
Although the short-term impact of hedging should not influence the decision to diversify into international bonds, the long-term return impact has implications for expectations about international bond investing. Namely, the hedge return may affect how an investor interprets the yield of an international bond portfolio, particularly compared with the yield of domestic bond portfolios. On a long-term basis, the yield to maturity of a domestic bond allocation serves as a reasonable guide for predicting the subsequent total return of that bond investment. We demonstrate this in **Figure 6a** by comparing the initial yield of a US bond investment with the return realised over the following five years. Although not perfect, the initial yield is a useful metric: It has explained about 85% of the variation in future returns, and the yield–return relationship is very close to 1:1 (an initial yield of 1% indicates a future return of roughly 1%, plus error).

For hedged international bonds, however, the predictability of the initial yield is reduced. **Figure 6b** repeats the comparison in **Figure 6a**, but this time for hedged international bonds from a US investor’s perspective. Not only is the best-fit relationship weaker than that for a domestic bond investment, with the initial yield explaining only 59% of the variation in future return, but the relationship itself differs from that of 1:1.¹³ This leads us to conclude that initial yield is a less useful metric for a hedged international bond portfolio than it is for domestic bonds, because of the impact of the hedge return over time.

¹³ A comparison of the fitted regressions displayed in **Figure 6a** and **6b** reveals that, for a US bond investment (**Figure 6a**), a 1:1 relationship between the initial yield and subsequent return is an apt description of the relationship that the data would suggest. Based on our estimates, the slope in the regression is not significantly different from 1.0, and the intercept not significantly different from 0 (both at the 99% confidence level). In contrast, the estimates in **Figure 6b** show that, for a hedged international bond investment, there is a notable difference from a 1:1 relationship. We estimate that the slope is significantly different from 1.0 and that the intercept is significantly different from 0.

Figure 7. Initial yield provides more information about future return for domestic bonds than for hedged international bonds across most markets

Forecast error of initial portfolio yield in predicting future five-year return of both a domestic and a hedged international bond investment, from perspective of investors in the stated country: 1985–2013



Notes: “Forecast error” is defined as the square root of the average squared difference (the root mean squared error) between the initial yield and the subsequent realised five-year return of an investment. “Domestic bond investment” is defined as each country’s respective component of the Citigroup World Government Bond Index, with returns measured in that country’s currency. “Hedged international bond investment” is defined as the Citigroup World Government Bond Index (excluding the stated country for the larger markets—United States and Japan), hedged back to that country’s currency. We used France as a proxy for euro-area investors, because of a lack of history for the broad monetary area.

Sources: Vanguard calculations, based on data from Citigroup.

These findings hold true for other local markets around the world. **Figure 7** tests the accuracy of the initial yield in predicting future returns across a number of markets, both within the domestic bond market and for a hedged international bond investment. Investors should be aware that, globally, use of the yield to maturity as a predictor of medium- to long-term returns for a hedged international bond investment could lead to inappropriate return expectations, unlike the experience in a domestic bond investment.

The weak relationship between initial yield and future return in hedged international bonds has implications for interpreting an international bond investment’s yield to maturity, the usual guidepost for a bond fund’s distribution yield. Given that currency hedging has an impact on return, investors should be aware of the hedge return, and they should take this into account when examining the overall distribution yield of an investment and forming long-term capital market return expectations. It’s important to keep in mind that this hedge return is based on short-term interest rates that can change quickly at the whim of the markets or central banks and is not a

long-run predictor of returns. The same can be said about any yield on a short-term basis (dividend yield, yield to maturity, REIT yields): Although these yields provide worthwhile information, they rarely are good predictors of returns in the short run.

As a consequence, Vanguard encourages investors to evaluate a hedged international bond fund’s hedge return as one component of the fund’s return drivers, realizing that it can have both positive and negative contributions and, over time, is likely to bring the average return of an international bond investment closer to that of the investor’s domestic market. An important conclusion to be derived from a close examination of the hedge return is that comparing the yield to maturity of domestic versus hedged international investments, no matter how similar the underlying investment characteristics might be, is not useful. Investors should thus avoid making allocation decisions based on yield differentials between a domestic and international investment and, rather, should focus on the potential for a diversification benefit.

Conclusion: For foreign bonds, reduce focus on yield; keep focus on diversification

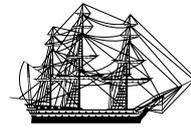
Earlier research has established that hedging an international bond portfolio is an important way to reduce the risk of currency movements. However, hedging introduces an additional return stream that a domestic bond investment does not have, namely a hedge return, which can be measured and estimated over the short term. This paper's discussion has highlighted four observations about the return impact of hedging:

- Hedging does not merely produce an investment without currency return; rather, it represents an alternative return stream to replace currency return.
- Over the short term, the contribution to return from hedging has tended to be much less than the contribution to return from foreign currency that is unhedged.
- The relative volatility of the hedge return has been small compared with the price movement of international bonds, meaning that the diversification benefits of international bonds should not be weakened by hedging activity.
- Over the medium to long term, hedging has the effect of adjusting for differences in market fundamentals, mainly differences in interest rates and inflation. This has tended to equalise returns across markets and has detracted from the usefulness of yield to maturity as a long-term return predictor.

Based on these observations, Vanguard urges investors to be aware of the impact that hedging can have on their international bond portfolios. It is likely that a reduced focus on the yield of a hedged international portfolio is warranted. Also of note: Comparisons between yields across domestic and international markets are not valid, and we discourage the use of yield differentials in setting bond allocations. Rather, investors should focus on the diversification benefits that international bonds can bring to a balanced, low-cost portfolio.

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