Executive summary. With Canadian bonds making up just a small fraction of the global fixed income marketplace, taking a global approach to fixed income investing allows investors the opportunity to invest in a much broader market. The theoretical diversification benefits of adding more markets and issuers to a portfolio are clear, yet currency risk presents a particular challenge in a fixed income investment. In this paper we examine global fixed income as an asset class, addressing potential diversification benefits, risks and hurdles to achieving this exposure, with a specific focus on the role of currency and the trade-offs involved in maintaining some amount of home bias. We conclude that, with currency risk hedged, global bonds represent an attractive investment that can provide risk reduction and diversification benefits in balanced portfolios.
Why not go global?

Global bonds allow an investor to achieve exposure to interest rates, inflation, economic cycles and political climate in a wide range of markets outside of Canada.\(^1\)\(^2\) Relative to a more Canadian-focused bond investment, some of these global risk factors might, at first glance, seem likely to add to the risk. After all, many would argue that Canada is a stable, wealthy, developed economy and therefore likely to provide quite a safe fixed income investment.

But investors should keep in mind that, to the extent that the events influencing the bond markets of other countries are different from those in Canada, a global allocation may have the ability to reduce the risk of an investor’s fixed income portfolio without necessarily decreasing expected return.\(^3\) Even though the bonds of any one issuer may be more volatile than comparable bonds in Canada, an investment that includes the bonds of all countries and issuers would benefit from any imperfect correlations across those issuers. In other words, rather than focus on each asset in isolation, we need to consider the interactions between assets in a portfolio setting. So even if individual markets appear volatile, if global bonds “zig” when the Canadian market “zags,” the end result may be to smooth out the combined returns over time, reducing total portfolio volatility.\(^4\)

The drivers of global diversification

The level and movement of interest rates within a country or currency area are the main drivers of its market’s bond returns over time. In most developed markets, short-term interest rates are influenced by central bank policy and will fluctuate over time according to policymakers’ views on medium-term inflation and economic growth. Longer-term interest rates can be considered the average of expected future short rates plus a term premium for bearing maturity risk. As such, long-term rates are set by market participants buying and selling bonds based on expectations for future central bank policy, driven by expectations for economic growth and inflation, plus time-varying risk premia driven by investors’ willingness to bear maturity and inflation risk.\(^5\)

Sovereign and credit risk premia may also cause variability in bond returns, depending on the country and sector being examined.

If these drivers of returns are sufficiently different across markets, exposure to global bonds has the potential to offer significant long-term diversification benefits. In Figure 1, we show evidence of this diversification effect: The interest rate movements within a group of the 12 largest government bond markets are less than perfectly correlated with Canadian interest rates.

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\(^1\) This paper expands upon previous Vanguard research (Philips, et al., 2012) on a global fixed income allocation from a Canadian investor’s perspective. For similar research from a U.S. investor’s perspective, see Philips, et al. (2014).

\(^2\) Throughout this paper, we use the term “global fixed income” to refer to the universe of investment grade fixed income securities available for purchase by international investors, issued in a liquid, hedge-able currency. We use the term “Canadian fixed income” to refer to the universe of investment grade bonds issued in Canadian dollars. See the appendix for specific index definitions.

\(^3\) Put in more technical terms, expanding one’s investment opportunity set can result in an upward shift to the efficient frontier, allowing one to achieve better risk-adjusted return outcomes.

\(^4\) Throughout this paper, we discuss global bonds in the context of an investor who pursues a total return objective.

\(^5\) More recently, some central banks have gone beyond traditional short-term interest rate targeting and also purchased longer-dated government bonds. We feel the above statement still applies, as the majority of yield movement is driven by market participants—the direct impact of central bank purchases is relatively small. For example, Hamilton and Wu (2011) find that purchases of longer-term U.S. Treasuries by the Federal Reserve totaling $400 billion would lower the 10-year treasury yield by 0.13%.
Implications of home bias

Despite the theoretical benefits of gaining exposure to different markets, many Canadian investors are inclined to just invest in their own domestic bond market, perhaps to avoid the perceived complexity, risks, or costs of a global allocation. Indeed, in 2012, the average Canadian fixed income investor had 87% of his or her portfolio invested in Canadian bonds, implying a 85 percentage point overweight beyond the 2% that Canada represented in the global bond market in 2012.6,7

At the extreme, an investor owning only Canadian bonds is ignoring 98% of the investment-grade fixed income securities in the world and owns a portfolio that is highly concentrated in the risk factors of a single market.8 One implication of this concentration is a bond market that has historically been more volatile than the broader global bond market. Figure 2 demonstrates the impact of home bias on the average volatility of a portfolio.9

Market composition matters

In large part, the higher historical risk of the Canadian market can be explained by structural differences in its composition. As we show in Figure 3a, relative to the global market, the Canadian market has greater exposure to long maturity bonds. These bonds have longer duration (Figure 3b), meaning they are more sensitive to interest rate changes and have more volatile prices.

On average, since 2003 Canada has been about 1.4 years longer duration than the global market, meaning that for a given 1% rise in interest rates, Canadian bonds prices would be expected to fall 1.4% more than the global market (and vice versa for a fall in interest rates), all else equal. This longer average duration is also a contributing factor to Canada having a higher average yield than the global bond market (Figure 3c) as the yield reflects compensation for higher sensitivity to interest rate movements (this is known as a “term premium”).

6 See Philips et al. (2012) for a discussion on home bias. Home bias data have been updated since the paper’s original publication using the most recent data from the IMF Coordinated Portfolio Investment Survey.
7 Also see Philips et al. (2014) for a discussion.
8 The market value of the Barclays Canadian Issues 300MM Index was 2.8% of the Barclays Global Aggregate as of November 29, 2013.
9 The implications of Figure 2 are not impacted by the choice to overweight the Canadian stock market in the equity allocation, nor are they impacted by the choice to use a hedged global equity allocation. In the case of overweighting Canadian equity, portfolio volatility actually increases at a faster rate across the figure, due to the higher correlation of Canadian bonds with Canadian stocks.
In addition to differences in maturity, duration and yield, the Canadian market has structural differences in the types of debt securities available to investors (Figure 3d). Different types of issuers have different risks associated with them and so can drive the risk profile of the Canadian relative to the global market. Over the past decade, Canada has had greater exposure to government-related debt and corporate bonds and less exposure to central government and securitized debt. In addition, Canadian bonds have been biased towards high quality Aaa-rated bonds and underweight the Baa market relative to global market weights.

Investors with embedded home bias, whether marginal or substantial, should consider the differences in market composition and the risks and trade-offs associated with such an allocation. Swapping sovereign risk for credit risk may or may not be in line with the original objective of the investor. Investors should consider the impact of these risk factor differences in the context of their overall portfolio. Examining investments in a portfolio context is important—an investment that may appear, in isolation, to add a certain type of risk to a portfolio can actually provide diversification through interactions with other investments. A global allocation provides maximum diversification across markets and issuers.

**Currency and global investing**

Of course, investing outside of one’s domestic market will entail owning bonds that pay interest and principal in other currencies, adding a wrinkle to the diversification benefit that might otherwise be expected. Not only can currency add volatility beyond that of the underlying fixed income investment, but the investment merits of currency are generally not as straightforward as those of other asset classes: currency itself does not generate any future cash flow, so its performance is entirely driven by changes in its relative value. Investors have the option of hedging away currency risk, through the use of forward contracts, but this adds cost and complexity to the investment process and assumes that currency adds no value in a portfolio setting. So we ask the question: Should we hedge the global bond allocation?

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**Figure 2.** Canadian home bias has on average led to a riskier portfolio relative to global bonds

Volatility change from adding Canadian bonds to the fixed income portion of a global equity / global bond portfolio, January 1985–November 2013

Notes: Displays the historical change in volatility from a global stock/bond allocation that results from overweighting the Canadian bond market within the fixed income allocation. The volatility change is relative to a global bond portfolio with currency exposure hedged. The hedging decision is discussed in subsequent sections.

Sources: Vanguard, based on the data described in the appendix.
Throughout this paper, we use market-weighted benchmarks as defined in the appendix to represent various asset classes. See Thomas and Bennyhoff (2011) for a discussion of the merits of market capitalization versus alternative weighting methods.

This is an important question, because currency movement is responsible for the majority of the volatility in a market-weighted unhedged global bond investment. In Figure 4 we show that the currency impact (as measured by the difference between unhedged and hedged global bond returns) is highly correlated to unhedged global bonds. Indeed, currency has explained 83% of the monthly variance in returns of a global bond allocation since 1985. Returns have been consistently more volatile throughout time than either Canadian bonds or hedged global bonds, approaching equity-like

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10 Throughout this paper, we use market-weighted benchmarks as defined in the appendix to represent various asset classes. See Thomas and Bennyhoff (2011) for a discussion of the merits of market capitalization versus alternative weighting methods.
“Random walk” indicates that an asset’s returns follow a random, unpredictable path through time, while “uncompensated risk” indicates that an investor would not expect to earn a positive return from an asset over the long-term. Based on this research, one could consider currency an asset with zero long-term expected return, yet positive volatility.

See LaBarge (2010) for a discussion of currency risk management in a global equity portfolio.

Currency in a portfolio setting

While the foreign currency exposure of global bonds has resulted in much higher volatility than a Canadian or hedged global bond allocation, we have to consider the impact of currency correlation when it is placed in a portfolio. We first examine the impact of unhedged bonds within a risk minimization framework. This framework implicitly assumes that investors are indifferent to the potential long-run return differential between owning currency and hedging it away, a point to which we will return later.

In Figure 5, we show historical volatility since 1985 for a range of global balanced portfolios, of varying asset allocations, rebalanced monthly. The portfolios are invested according to the stated allocation in a combination of unhedged global equity and either unhedged or hedged global bonds for the fixed income allocation. The results show that, no matter the stock/bond asset allocation, hedged bonds provided superior risk reduction and diversification benefits.

Importantly, the risk reduction benefits in Figure 5 have been more pronounced for portfolios with higher fixed income allocations. For the more conservative investors who would typically have this type of asset allocation, the volatility reduction is meaningful: a 20/80 portfolio invested in hedged global bonds had volatility about half that of a portfolio with unhedged bonds.
The results in Figure 3 are not impacted by the choice to overweight the Canadian market in either the equity or fixed income portfolio. Hedged global fixed income still produced a portfolio with lower volatility than when using unhedged global bonds across all stock/bond asset allocations.

Although the differences in volatility are less pronounced, the implications of Figure 3 are not impacted if we use a hedged global equity allocation. A hedged global bond allocation still provided lower or equal overall portfolio volatility relative to using unhedged global fixed income.

If we allow the currency exposure of a balanced portfolio to vary independently of the allocation to global bonds (in other words, treat currency as a separate asset class), it is quite possible that some allocation to currency will provide risk reduction benefits, depending on the specific stock/bond asset allocation of the portfolio. In this analysis, we focus on global bonds, treating the hedging decision as binary (not allowing partial hedging) and so consider the topic of ideal currency exposure to be beyond the scope of this paper.

We should note that, in practice, a hedging program will rarely achieve this result perfectly. To perfectly hedge a portfolio over a given time period, one must know with certainty the ending asset value. To the extent that the underlying securities change in value over the hedging horizon, a hedging program will result in some amount of unhedged (or over-hedged) risk exposure.

The trade-offs of currency hedging
As with every decision in investing, the choice to hedge a portfolio has trade-offs. While it lowers volatility and provides superior diversification, hedging global bonds requires an additional set of transactions that add cost to the portfolio. Currency forwards can be used to buy and sell currency at a forward date, eliminating currency volatility from the portfolio. The prices of these contracts tend to follow a no-arbitrage relationship according to short-term interest rate differentials across markets. This means that the return an investor earns when hedging a global bond investment will be impacted by his or her home currency short rate environment, relative to that of the rest of the world.

Although the actual impact will differ based on the size of the portfolio and specifics of the hedging program, in Figure 6 we show a historical estimate of the rolling annual transaction costs associated with the forward contracts that would be used to hedge various currencies back to the Canadian dollar. These five currencies currently comprise 95% of the global bond market excluding CAD exposure (we exclude the CAD exposure, as it would not need to be hedged).

While liquidity varies across currencies, the estimated bid/ask spread (an important component of transaction costs) of hedging based on current weights in the global bond market amounted to roughly 3 basis points (0.03%) annualized in 2013. Other operational costs may add to this marginally or significantly. While market disruptions can cause spikes in transaction costs over time (as was seen in 2008 and 2009), the weighted average cost has been less than 0.1% for the past decade and has averaged 0.03% annualized. Given the average total expense ratio of active global bond funds available for sale in

13 The results in Figure 3 are not impacted by the choice to overweight the Canadian market in either the equity or fixed income portfolio. Hedged global fixed income still produced a portfolio with lower volatility than when using unhedged global bonds across all stock/bond asset allocations.

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Canada of 1.6%,\textsuperscript{17} this does not seem like a significant hurdle to overcome, especially given the volatility reduction achieved relative to remaining unhedged.

When examining a currency hedging program, it is important to keep in mind that currency forwards will be impacted by market disruptions related to liquidity and counter-party risk. Currency forwards tend to reflect short-term interbank interest rates and so include time-varying risk premia relative to short-term government bill rates. This can cause deviations in the price of the forward contract relative to what would be implied by short-term “risk free” rates, especially during periods of market stress. However, even in 2008–2009, the volatility caused by these shifts was significantly less than the volatility of leaving the currency exposure unhedged.

Of course, a trade-off that many investors may consider to be more important than the modest transaction costs of hedging is the prospect of foregone return from currency. We should note that this cuts both ways: while hedging does reduce the upside return from foreign currency appreciation, it also limits the downside. As we previously stated, most academic research finds short-term currency movement at best very difficult to forecast correctly, with many researchers treating it as a random walk. While short-term movement inherently requires skill in market-timing and therefore is likely difficult to consistently benefit from, we address the issue of long-term currency return in the following section.

**The impact of long-run currency return**

Our analysis has shown that a hedged global bond investment makes sense for Canadian investors, from a risk-minimization perspective, relative to unhedged global bonds. However, this has ignored the possibility of long-run return from a foreign currency investment. To address this issue, we ask the question: How much foreign currency appreciation is needed before unhedged bonds start to become attractive in a long-term strategic portfolio?

\textsuperscript{17} Source: Morningstar, Inc. as of January 10, 2014.
An efficient frontier is the set of portfolios that combines the available assets to produce the lowest volatility portfolio for a given level of return.

As of November 2013, the yield on the Barclays Global Aggregate was 2.0% and the historical annualized return from January 1985 through November 2013 on the spliced global stock index in the appendix was 9.7%. Our simple mean return assumptions are certainly subject to criticism; however, for the specific purpose of evaluating the trade-offs between hedged and unhedged bonds, we feel the levels of returns are not as important. We are mainly concerned with the relative returns between unhedged and hedged global bonds that would make up for the volatility impact of currency.

Figure 7. Significant long-term unexpected Canadian dollar depreciation is needed to make unhedged bonds a viable strategic investment

Optimal allocation to hedged global bonds under various currency return scenarios

To answer this, we form a rough forward-looking efficient frontier to evaluate the trade-offs between risk and return in a portfolio setting. As risk inputs to this analysis, we take the historical volatilities and correlations between global stocks, unhedged global bonds and hedged global bonds (based on the data and time periods listed in the appendix). The current yield of the global bond market and the historical return for equities can be used to approximate forward-looking mean returns. Using these inputs, we generate the full range of efficient portfolios and then evaluate what amount of foreign currency appreciation, beyond the expected movement that might be captured in the forward premium through hedging, is needed for unhedged bonds to become a viable investment. We begin with the assumption that both hedged and unhedged global bonds generate the same long-run return (in other words, unexpected currency return is 0% and currency return equals the forward premium over the long-run). We then test the viability of unhedged bonds by successively adding an assumed “unexpected” currency return and examining whether unhedged bonds appear on the frontier in any meaningful allocation.

Figure 7 displays the results around the particular range of assumed foreign currency appreciation where unhedged bonds begin to appear as a viable investment. We find that, until one assumes greater than 0.5% average annual unexpected currency return (that is, greater than 0.5% average annual foreign currency appreciation beyond that which is realized through hedging), unhedged bonds do not appear to be an efficient asset class. For fixed income oriented investors, hedged bonds remain the more viable option under all of the currency scenarios we examined, with unhedged bonds appearing only in modest allocations under any assumed unexpected currency return. It takes

Notes: Figure displays the proportion of the global bond allocation that is allocated to hedged bonds versus unhedged bonds under several assumptions on long-term foreign currency return, based on the results from a portfolio optimization using the inputs described on page 9.

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19 As of November 2013, the yield on the Barclays Global Aggregate was 2.0% and the historical annualized return from January 1985 through November 2013 on the spliced global stock index in the appendix was 9.7%. Our simple mean return assumptions are certainly subject to criticism; however, for the specific purpose of evaluating the trade-offs between hedged and unhedged bonds, we feel the levels of returns are not as important. We are mainly concerned with the relative returns between unhedged and hedged global bonds that would make up for the volatility impact of currency.
very aggressive assumptions regarding unexpected Canadian dollar depreciation (greater than 15% over a 10-year horizon) for unhedged bonds to become a viable long-term investment under our framework, and even then only for more equity-oriented investors.

To put our assumptions in Figure 7 into context, we note that an unhedged global bond investment since 2000 has realized a return due to foreign currency depreciation that has averaged -1.5% per year (meaning that the CAD has appreciated over this period). Over this same time period, the return an investor would have realized from hedging this investment was 0.6% per year on average (adjusting for the upper range of transaction costs of hedging from Figure 4 brings this to roughly -0.5% per year). In other words, the “unexpected” currency return was -2.1% per year (-2.0% after hedging costs), due to the CAD moving differently from what forward market had been pricing. This value of -2.1% average unexpected currency return is off the scale (to the left) in Figure 5. While this result will certainly change as short-term interest rates and exchange rates move over time, it demonstrates the importance of accounting for the implicit expected currency return an investor receives when hedging.

If average volatility is not a factor justifying an overweight to Canadian bonds, perhaps diversification during particular periods of market stress is playing a role? In Figure 8, when we examine the worst 10% of monthly equity returns in the global equity market, we find that hedged global bonds have provided better median outcomes as well as a much tighter distribution of returns, meaning more consistency for investors during poor equity market returns. The traditional role of fixed income is to buffer a portfolio from short-term equity market declines, and a global hedged bond investment has provided superior results on this front.

**Other considerations for Canadian investors**

Our analysis thus far has shown that a global fixed income allocation with currency risk hedged back to the Canadian dollar has provided superior diversification and risk reduction when compared with an unhedged global allocation. In addition, we’ve shown that a global allocation generally provides superior diversification from the perspective of portfolio risk and sector/credit exposure when compared to an investment that is more concentrated in Canadian bonds. Given the fact that the average Canadian investor allocation does maintain a bias towards the domestic market, we outline additional considerations that may push an investor away from a pure global investment.

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20 The results in Figure 8 are nearly identical when examining down-side protection relative to a Canadian equity portfolio as opposed to the global equity portfolio shown in the figure.
• Complexity of hedging currency is likely a factor in holding investors back from global bonds. Particularly for those investors owning individual bonds or building laddered portfolios, the volatility of a foreign bond is intolerable, yet they likely do not have the capability or expertise to hedge currency. This can be addressed by adding a hedged global allocation through a mutual fund or ETF, thus ‘outsourcing’ currency management.

• Correlations across developed markets have displayed a persistent rising trend in both equity and fixed income markets. If this trend continues, the diversification benefits of global securities will likely decrease in magnitude (though not disappear).

• Global fixed income markets are still not as easily accessed as global equity markets, as demonstrated by generally higher transaction costs.

Conclusion: Consider going global

Global bonds allow Canadian investors to diversify their fixed income portfolio through exposure to interest rate movements influenced by a variety of international risk factors. We have shown that the currency exposure of unhedged global bonds adds volatility to a portfolio and, without aggressive assumptions regarding unexpected currency return, is unlikely to benefit investors over the long-term. With currency risk hedged back to Canadian dollars, the global fixed income market can fulfill the traditional role of bonds by providing risk-reduction and diversification benefits. In addition, differences in performance characteristics and market structure between Canadian bonds and the global market have supported the case for a more global allocation. For total return investors, there is little reason not to expand one’s investment set. Indeed, without a prior view on which bond market will produce superior performance, the global market can be considered the neutral forward-looking portfolio. With the Canadian market representing a small, concentrated portion of the world’s fixed income securities, we would encourage investors to consider how a global bond allocation may help them meet their broad investment objectives in a strategic asset allocation.
Appendix

Asset class sources:
All returns are expressed in Canadian dollars on a monthly basis, with income and dividends reinvested. Data covers the period January 1985 through November 2013.

Canadian stocks are defined as the S&P/TSX Composite Index.

Global stocks are defined as the MSCI World Index in Canadian dollars from January 1985 to December 1987; the MSCI All-Country World Index in Canadian dollars from January 1988 to January 1999; and the MSCI All-Country World Investable Market Index in Canadian dollars thereafter. In cases where we mention results on a currency-hedged basis, we are referring to the local return series of the stated indices, which will approximate the volatility characteristics of a hedged allocation.

Canadian bonds are defined as the Citigroup World Government Bond Index Canada All Maturities Index from January 1985 to September 2002, and the Barclay’s Capital Canadian Issues 300MM thereafter.

Global bonds (hedged and unhedged) are defined as hedged and unhedged versions of the Citigroup World Government Bond Index from January 1985 to January 1999, and the Barclay’s Capital Global Aggregate thereafter. Hedged returns are hedged back to Canadian dollars, and unhedged returns include the foreign currency return from translating back to Canadian dollars.

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