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Rethinking Portfolio Analysis

Living Standard Risk and Reward Over the Life Cycle

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Abstract:

Each of us must decide how to build and invest our savings. People need to ensure that they have enough income and assets to maintain their living standard at a desired level through time. Traditional financial planning and portfolio management tools tend to focus on the tradeoff between expected returns and risk at a point in time. While these traditional tools provide important investing insights, we demonstrate that a more holistic life-cycle financial planning framework can help form better spending, saving and investment decisions and reduce living-standard risk through time. Investing and spending are not independent decisions. Spending too aggressively can be as risky, if not far more risky as investing aggressively in determining one's future living standard. Our focus on living standard risk helps to highlight what we believe should be the household's ultimate concern – namely, their ability to spend at their desired level in retirement. In this context, the paper also shows the significant advantages of diversifying one's investment within a life-cycle risk-reward framework based on the case of Canadian investors who must decide whether or not to invest globally and, importantly, whether or not to hedge the associated exchange rate risk. We found that maintaining an exposure to U.S. dollars may help to provide both insurance against unanticipated inflation and reduce portfolio risk – a finding that may provide guidance to investors currently grappling with how best to manage their foreign exchange rate risk.

Introduction

Each of us must decide how to build and invest our savings. Each of us knows that some investments are far riskier than others, and that putting all our eggs in one basket is likely to be a mistake. We also know that spending too much and not saving enough is probably going to turn out badly. But how exactly should these simple concepts inform how we think about investing? In this paper we link these concepts to the notion of “living standard risk”, which we argue should be the ultimate concern of investors.

Specifically, people need to ensure that they have enough income and assets through time to maintain their living standard at their desired level. Traditional financial planning and portfolio management tools focus on the tradeoff between expected returns and their volatility risk (i.e., absolute standard deviation) at a point in time. While these traditional tools provide important investing insights, we demonstrate that a more holistic life-cycle financial planning framework can help people form better spending, saving and investment decisions and reduce living-standard risk through time.

We begin by detailing our life-cycle financial and investment planning framework. Next, we make two key points. First, we use the framework to show quantitatively how both aggressive spending and investing behavior can combine to increase living standard risk. Second, we apply the framework to demonstrate how diversifying a portfolio globally reduces living standard risk but also creates exchange rate risk, leading to a difficult decision on the degree of currency hedging.

The second part of the paper shows that the costs of hedging currency risk – that is, the interest rate differential between currencies that is often referred to as “carry” – is an important component of longer run average returns, which is ignored by many investors. Historically, Canadian interest rates have been higher than U.S. rates, resulting in a drag on the performance of unhedged foreign assets. Looking ahead, the carry differential can shift if U.S. and Canadian interest rates diverge. This could boost the expected return from holding foreign currency assets.

In addition, foreign exchange exposure may help to hedge future living standards from unexpected inflation. The import content of many important Canadian consumer goods is high, including automobiles, computers and fresh fruits and vegetables. As a result, a persistently weak currency can pass through into consumer prices, leading to higher inflation. Holding assets denominated in foreign currency may help to hedge this risk to real living standards, particularly for retirees living on a fixed income.

Framework for life-cycle planning

Dial back to the 1950s and 1960s and you’ll find the underpinnings of modern investment planning in the seminal works of Nobel Laureates, such as Harry Markowitz and William Sharpe on risk and Paul Samuelson and Robert Merton on the interplay between spending and investing.

Markowitz and Sharpe proposed thinking about investment risk by considering the mean (i.e., average) return and the variance (i.e., variability) of the return on your portfolio. This mean-variance framework was important not just for knowing how your wealth would grow, but ultimately for your living standard – what you’d get to spend after you invested. A higher mean return would leave you with more money to spend, but at the cost of higher volatility along the way, while lower volatility suggests you might have to settle for a lower standard of living in retirement.

This early framework taught great lessons about portfolio diversification and how the riskiness of an asset should influence its price. Yet as time passed, the framework had what seemed a major flaw – it was static. It assumed investors would consider only one period. They’d invest at the beginning of the period and spend everything – their entire principal plus the return – at the end. Furthermore, since at the beginning of this one period they already had all their savings, the decision of how much to spend and, therefore, how much to save, was ignored.

In reality, people live for many years and have to consume and invest on an ongoing basis, so it makes sense to consider spending habits alongside investment strategy. Researchers asked: If we include spending behavior, does this change how people should invest? More specifically, should the investment strategy actually influence how much one should spend? Said differently, if someone invested aggressively, does that mean they could spend more and save less, since Markowitz and Sharpe told us more risk should mean more expected return? Or should that investor spend cautiously, just in case, to better protect their future living standard?

In 1969, two other Nobel Laureates – Paul Samuelson and Robert Merton – built theoretical frameworks to evaluate how saving and investing should be linked in a multi-period, non-static framework. Samuelson and Merton found that the problems of how to diversify one’s savings and how much to save in the first place could be separated under simple but very strong assumptions. Under these assumptions, people could stick with a single diversified portfolio through time and

just add money to it or take money from away it over time. Furthermore, spending could be reduced to consuming a fixed fraction of one's resources each year.

In this elegant theoretical framework, investment decisions can be made separately from spending behavior. As a result, investment decisions today can be based just on the traditional mean-variance frontier – the age-old diagram showing the tradeoff between investing safely, but earning a lower return on average, and investing at higher risk but earning a higher return on average. Key financial planning issues – like where one was in one's life cycle – are no big deal in this stylized framework.

Theory Meets Real World Behavior

But as highlighted above, the theoretical framework is only a special case that holds under strong assumptions. Specifically, the Samuelson-Merton framework assumes away many important real world issues and constraints, such as housing expenses and moving decisions, cash constraints, uncertain future labour earnings, retirement pensions, and taxes. It also assumes that people's willingness to take risk is independent of their wealth.

Separating saving and investment decisions could also raise living standard risk for many households. Indeed, working households that spend aggressively in expectation of high investment returns face greater living standard risk. Their investments could do poorly and they will have spent aggressively along the way, leaving a smaller asset base to support required spending in old age.

A more prudent approach, consistent with a life-cycle planning framework, would be to spend just a proportion of future expected returns. Of course, the degree of prudence depends on the amount of one's investable assets compared to one's overall resources.

If one looks closely at their model, the Samuelson-Merton framework also conveys this message. Households that are more risk averse will not only want to invest less aggressively, they will want to spend more cautiously as well. The reason is that a common factor – the degree of risk aversion – controls both behaviors.

Hence, both the Samuelson-Merton framework and more realistic versions of it suggest that households are best served by a holistic planning approach that shows how current spending and investing decisions impact future living standard outcomes. Indeed, this more holistic type of approach has, it seems, influenced leading pension funds and institutional investors as well. Consistent with the life-cycle framework,

institutional investors increasingly set portfolio weights and accumulate assets to achieve expected returns that match their future cash flow liabilities.

There seems to be few if any studies that look comprehensively at how current spending and investing behavior interact in determining future living standard risk. The life-cycle planning tool described in this paper provides a framework to fill that gap and supports households in making appropriate spending, saving and investment decisions given assumptions about future returns.

The life cycle planning approach has interesting implications for appropriate savings and investment decisions through time. It is commonly believed that as people approach retirement, their investable portfolio should have less equity and more fixed income. Interestingly, the exact opposite conclusion is possible under a more holistic approach that considers the person's total wealth and known income streams! For example, a retired person with ample pension and annuity income in relation to his desired spending has more scope to take on equity risk in their portfolio than someone with relatively few safe income sources. This highlights the importance of using a holistic approach that considers, for example, all the household's assets and income sources.

There is also the issue of 'time diversification' that is often misunderstood, as well as the risk related to different possible sequences of investment returns. These two concepts have important impacts on standard of living risk through time and warrant further study. Doing well on one's investing in the short run is no guarantee of future investment success. But if one spends as if the good times will continue to roll, the chances of a rude awakening will rise.

In sum, spending and investment decisions interact and should be decided jointly to choose the appropriate tradeoff between living standard risk and reward.

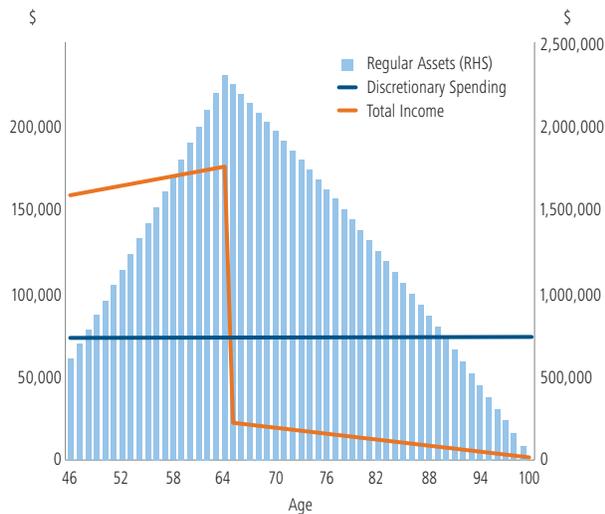
Deriving and Displaying the Life-Cycle Living Standard Risk-Reward Frontier

This paper uses a life-cycle financial planning framework to show something that many academic and financial planning models can't do, namely assume people can take into account complex interactions through time between current spending and investment decisions.¹ Spending too aggressively can be as risky, if not far more risky as investing aggressively in determining the level of one's future living standard. Our focus on living standard risk helps to highlight what should be the household's ultimate concern – namely, their ability to spend at their desired level in retirement.

The Living Standard Risk-Reward Frontier

To understand better the impact of spending decisions, ignore for the moment investing in risky assets.² In this case, we determine how much a household can spend each year such that it can keep spending the same amount through time. Economists call this *consumption smoothing*. (Consumption smoothing, by the way, dates back almost one hundred years to the seminal work of Yale economist, Irving Fisher. It lays at the heart of the work by Merton and Samuelson.) Figure 1 illustrates the case of a household that experiences a sharp decline in income upon retirement (red line), but spends only that amount consistent with smoothing consumption so that it continues to spend the same amount over time (blue line). The household's total assets grow until retirement at age 65, providing a cushion to finance a constant level of consumption as income falls. The blue "spending line" can be considered to depict the household's living standard.

Figure 1. Life-Cycle Consumption Smoothing Absent Investment Risk

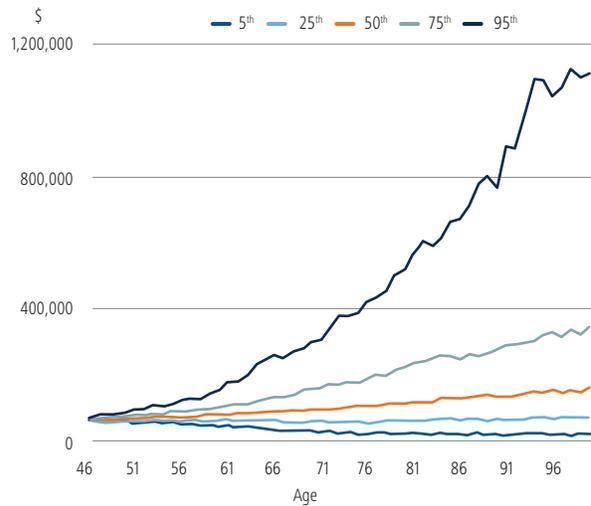


Source: Based on authors' calculations using the ESPlanner life-cycle planning framework. Calculations are based on an individual who saves and accumulates assets from ages 46 to 65 and then draws down on savings until the person reaches 100 years old.

Next consider how the household's living standard will change through time when it invests in risky assets. The example in Figure 2 shows a set of living standard curves predicated on investing in risky assets, but spending through time in a

cautious manner. By "cautious manner", we mean consuming a constant amount through time, but at a level consistent with the assumption that the investment portfolio earns only *half* the average historical return on risky securities in which one is investing. The curves show the percentile distribution of the household's future living standard.

Figure 2. Living Standard Risk and Reward Frontier Through Time



Source: Based on authors' calculations using the ESPlanner life-cycle framework. Figure 2 shows the level and spread of a household's living standard as it ages from, in this case, 45 to 100. The five curves show 95th, 75th, 50th, 25th, and 5th percentile values for what the household will spend at any given age. For example, the value at the point at the intersection of age 66 and the curve marked 75th percentile is \$132,000. This means that the household has a 75 percent chance of being able to spend \$132,000 or less at that age.

Note that the curves fan out. This is a key point in understanding living standard risk. From the perspective of one's current age, future living standard risk increases with age. The reason is simple. With a longer time horizon, there is a higher chance of putting together a string of very good (or very bad) returns. This reflects the random nature of asset returns over time. The top curve (95th percentile) shows how living standards rise if the household earns a fantastic cumulative return, but spends very cautiously. Clearly, this path results in excess saving relative to spending by the time the household enters its 90s. When we shorten the time horizon, the likelihood and frequency of a long string of positive returns declines.

The second key point about Figure 2 is how it depicts both downside and upside living standard risk. The spread between

¹ This paper uses the ESPlanner as a life-cycle financial planning tool. To see how these calculations work, please visit canada.esplanner.com to run a simple Canadian version of ESPlanner that is sponsored by the University of Calgary's School of Public Policy. See <http://www.canada.esplanner.com/>

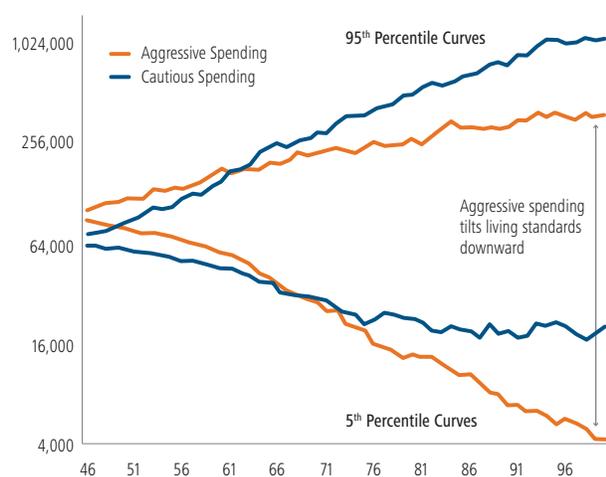
² In forming these calculations, we consider all regular and retirement account assets, current and future labour earnings, housing expenses, taxes, special expenses, pensions, and other factors including the rate of return received on investments. Consumption smoothing is calculated subject to borrowing or cash constraints, i.e., it finds the smoothest spending path subject to never having the household go into debt or incur greater amounts of debt than it currently has.

the downside and the upside curves (e.g., the 5th and 95th percentile curves) is controlled by how aggressively one invests.

What if households don't spend cautiously (i.e., if they don't spend assuming they will always earn half the mean rate of return) – the assumption underlying Figure 2? What if, instead, they spend aggressively – as if they will always earn the mean return on their investment? Figure 3 provides the answers. In forming these diagrams, our calculations involve drawing 500 sequences (from the household's current age till the last year it can live) of returns on regular assets as well as retirement accounts. The percentile curves are formed by considering all 500 paths of spending and finding in each year the percentile cut-off values for that year.³

Figure 3's blue curves show the impact of aggressive spending. The red curves are based on cautious spending from Figure 2. Aggressive spending means spending more in a given situation than one might otherwise spend. This raises initial spending, but also tilts all the curves downward. This too makes sense. If you spend more early on, you'll have less to spend in the future for any given path of returns you receive.

Figure 3. Impact of Spending Behaviour
(range of possible living standards in dollars, log scale)



Source: Based on authors' calculations using the ESPlanner life-cycle planning framework. The red curves correspond to the spending profile of an individual who spends aggressively from age 46. The blue lines correspond to the living standard possibilities of a cautious spender. The wide range between the 95th and 5th percentiles of possible spending capacity reflects the random nature of financial returns over time. Initially, the aggressive spender has higher spending compared to a cautious spender, but faces a lower living standard as the cautious spender accumulates assets over time.

An important result in Figure 3 is that the impact on the curves from different spending decisions is larger than the impact on the difference in the 5th and 95th percentile curves from different investment decisions. This finding highlights that spending decisions are ultimately more impactful on future living standard risk than investing decisions. The result also reinforces what most people already know: spending too much and not saving is probably a bad idea. But this framework allows us to know exactly *how bad* an idea that is!

Illustrating How International Diversification Can Affect Living Standard Risk

In this section we adopt a stylized example to evaluate and quantify how diversification away from Canadian assets can help reduce investment risk, and hence produce a more stable living standard over the life cycle, regardless of spending behaviour.

As is well understood by most investors, diversification is one of the few 'free lunches' in investing. Spreading risk across different stock markets can reduce concentrated exposures in a portfolio, such as Canada's high share of resource and financial sector stocks, while also reducing investment risk related to political surprises, natural disasters or other unexpected factors. But despite the advantages of diversification, many investors still have significant "home bias" in their portfolio with large allocations to Canadian equities even though the Canadian stock market only accounts for about 2% of the global stock market.⁴

We consider a simple example to illustrate the potential gains from reducing home bias by diversifying from a portfolio of Canadian stocks to include holdings in the U.S. stock market. The example demonstrates the well-known result that Canadians can improve portfolio performance in terms of higher expected returns and lower risk by holding diversified portfolios, including U.S. equities. But while greater international diversification can enhance risk-adjusted returns, investing abroad also introduces exchange rate risk that needs to be carefully managed. Currencies can dramatically alter the return from holding foreign assets. For example, the depreciation of the Canadian dollar in the year to 2015 boosted the return to owning U.S. stocks by almost 20%. While the currency impact on stock returns is not always so stark, many investors are now rethinking how best to manage their foreign exchange risk given recent experience.

³ Each Monte Carlo simulation in ESPlanner is based on a random draw of the sequence of returns that households could receive each year on regular and retirement accounts. In the initial period, the program consider the household's inputs and its chosen spending behavior and then determines, based on its consumption-smoothing algorithm, what to spend this year. In the next year, the household learns the actual return (given by the drawn path of returns being used) it received, which makes its assets either larger or smaller than it had expected. It then makes its new spending decision based on the same spending behavior but knowing its assets are larger or smaller than hoped.

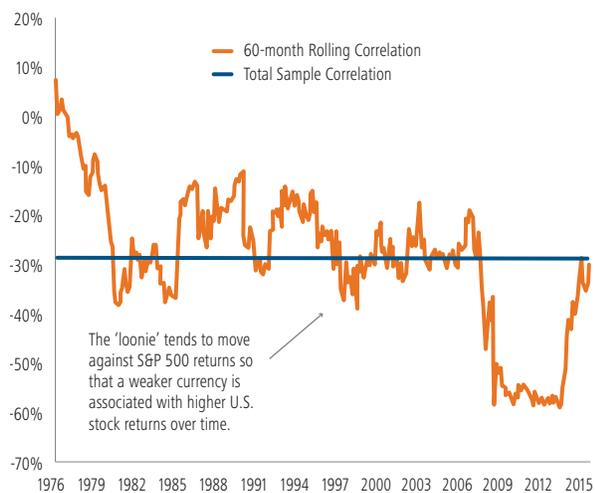
⁴ As of February 16, 2016, the Canadian stock market accounted for about 2.7% of world stock market capitalization based on Bloomberg calculations.

To address this concern, we demonstrate below that a set of deliberate foreign currency exposures may also provide an opportunity to enhance risk-adjusted returns for Canadians, through two channels. First, as a “commodity currency”, the Canadian dollar tends to decline when commodity prices are soft. Diversification with holdings in U.S. stocks provides exposure to the stronger U.S. dollar in these environments, providing a boost in portfolio value just when it is needed most. Figure 4 illustrates this diversification benefit as the negative correlation between the value of the Canadian dollar and U.S. stock market returns. In this paper, we call this effect the ‘portfolio diversification channel’.

Foreign currency exposure can also reduce living standard risk through a second channel. Unexpected inflation can erode the living standard of fixed income earners by reducing the purchasing power of their savings. A sustained drop in the exchange rate as we experienced in the 1990s can eventually pass through into higher prices of imported goods and services. Consequently, holding foreign currencies in a portfolio can reduce future living standard risk from the impact of unexpected inflation and exchange rate movements. In the paper, we refer to this effect as the ‘inflation insurance channel’. We explore these channels in more detail below.

Figure 4. Exchange Rate Diversifies U.S. Stock Market Returns, 1976M1 – 2015M12

(rolling correlation between monthly returns of S&P 500 and U.S.-Canada exchange rate)



Sources: Canada-US dollar exchange rate and S&P500 composite index provided via Datastream. Changes in the Canadian dollar are calculated based on the market convention so that a positive monthly change corresponds to a weaker currency. Based on authors’ calculations.

Portfolio diversification channel

We begin by illustrating the potential diversification benefits of owning U.S. equities for a Canadian investor (in this study, U.S. equities are used as an illustration of the effects of international diversification; the results also apply more generally). To calculate the effects of international diversification on living standard risk, we calculated historical returns over the 1995-2014 period under a variety of diversification and currency hedging assumptions, and used these historical return patterns to project future levels of household living standards to 2050.⁵ The point here is not to assess the specific path of returns (and whether history will repeat – in our view, it will not), but rather to assess the impact of various diversification and currency hedging decisions on living standard risk.

The potential gains and risks to living standards are examined based on different hypothetical portfolios that reflect how much an investor allocates to the U.S. stock market, and how much the investor chooses to hedge the exchange rate risk. Canadians can invest in the U.S. stock market on a hedged basis to eliminate exchange rate risk or on an unhedged basis so that the total return of owning U.S. stocks also reflects changes in the Canadian dollar. Investing in a combination of hedged and unhedged products allows the investor to vary his or her portfolio to be fully hedged, partially hedged or fully unhedged. In this way, we can consider the following portfolio allocations to assess the impact of hedging on living standard risk:

- A. 100% invested in the Canadian S&P TSX 60
- B. 50% invested in the S&P TSX 60 and 50% in the currency-hedged S&P 500
- C. 50% invested in the S&P TSX 60 and 50% in the unhedged S&P 500

In the case of portfolio B, the investor receives the return of the S&P 500 but pays the hedging cost to eliminate exchange rate risk. For portfolio C, the investor is exposed to exchange rate risk but does not pay hedging costs.⁶ In addition, we look at the returns and living standard risk of these different portfolios through time based on the aggressiveness of the household’s spending behavior. As noted above, living standard risk increases through time especially if a household has an aggressive spending path in anticipation of high investment returns.

⁵ We also looked at the historical experience over the 1971-2014 period but opted to begin the analysis from 1995 because of structural change in the Canadian economy related to energy production, which may have affected exchange rate movements. However, the qualitative findings are consistent in both sample periods.

⁶ We define hedging costs in this paper as the U.S.-Canada interest rate differential. Note that the hedging cost could be positive or negative. If the Canadian interest rate is higher than U.S. rates, then the Canadian investor pays the differential or spread between these rates. Similarly, if U.S. rates are lower then the Canadian investor receives the carry as an additional source of return.

Table 1 summarizes the main results when we evaluate these portfolios using our life cycle planning framework.⁷ The key findings include:

- **Diversifying with U.S. stocks improves portfolio performance (Table 1).** Table 1 highlights that limiting oneself to 100% in Canadian stocks generally underperformed a diversified portfolio that includes U.S. equities, regardless of the amount of currency hedging or aggressiveness of spending.
- **Portfolio performance is one important determinant of living standard risk.** The range in the distribution of possible market returns is a useful way to measure living standard risk. Specifically, the spread between the 5th and 95th percentiles reflects the inflation-adjusted living standard available to a household around the highest and lowest levels of likely investment outcomes. By the year 2050, the living standard level at the 95th percentile ranges from 10 to 20 times greater than the 5th percentile depending on hedging and spending decisions (Table 1 – compare portfolios in 2050 in the 95th percentile and the 5th percentile).
- **Holding U.S. dollars lowered portfolio risk.** The ranges or dispersion between real incomes between the 95th and 5th percentile levels provide a measure of living standard risk (Table 1 – compare the difference in median living standards between the 5th and 95th percentiles. For every portfolio, the range of differences was smallest for the unhedged portfolio). Based on this measure, unhedged U.S. stocks have the lowest risk for every portfolio that we examined, underlining the diversifying impact of holding U.S. currency in Canadian portfolios.
- **Hedging currency exposure increased portfolio returns historically.** When we compare hedged and unhedged portfolio values, in each case, the hedged portfolio delivered higher returns than the unhedged portfolio, albeit at an increased level of risk. (Table 1 – compare the difference in median living standards between the hedged and unhedged portfolios at every year and spending level).

Summing up, a Canadian investor would have outperformed by allocating a portion of their portfolio to foreign equities. In this case, the benefits were maximized by investing in hedged U.S. equities to completely eliminate exchange rate exposure. This was mainly because over this period in history the diversification benefit of U.S. currency exposure was outweighed by the hedging costs for a Canadian investor – that is to say, the carry costs were important.⁸

Looking ahead, hedged equity returns may not consistently outperform unhedged returns given considerable uncertainty about future U.S. and Canadian interest rates. But our findings suggest that portfolio risk can still be reduced by holding U.S. currency (i.e., maintaining U.S. currency exposure and not being fully hedged). The Canadian dollar tends to weaken with U.S. stocks, providing a boost to a Canadian’s portfolio value when it is needed most.

Hedging costs also play an important role in the average return of foreign investments. In theory, high interest rates currencies should depreciate by the interest rate differential. This theory is called Uncovered Interest Rate Parity.⁹ In practice, however, high interest rate currencies tend to appreciate instead, at least in the short run. As average interest rates were higher in Canada during the sample period, Canadian investors who hedged their currency risk on U.S. equities effectively received an additional carry return, which lifted their total foreign asset returns.

The consistent failure of Uncovered Interest Rate Parity in the foreign exchange market has allowed many sophisticated investors to add value to their portfolios by taking advantage of this opportunity often referred to as ‘currency carry’. Historically, the return to currency carry has been broadly uncorrelated with other risk premiums, such as global stock and bond market returns, providing scope to boost risk-adjusted returns.¹⁰

⁷ The findings are based on data during 1995-2014 but remain generally unchanged based on data extending back to 1973. We focus on returns beginning in 1995 because of a possible structural break in the Canadian economy related to oil production.

⁸ The average annual rate of U.S. dollar appreciation was modest at about 0.5% during 1973-2015. But the cost of hedging, which we define as the U.S.-Canada interest rate differential, was almost 1.2%. This benefited hedged U.S. equities.

⁹ The uncovered interest rate parity condition implies that the expected currency depreciation is equal to the interest rate differential. In practice, the exact opposite pattern is observed. The gap between theory and practice could be related to an infrequent but large depreciation (i.e., the “peso problem”), a risk premium to compensate investors for skew in the distribution of currency returns, or the time horizon since high interest rate currencies tend to be weak over longer horizons.

¹⁰ See Burnside, Eichenbaum, Kleshchelski and Rebelo, “Do peso problems explain the returns to the carry trade?”, 2011, *Review of Financial Studies*, Vol. 24, Issue 3, page 853.

Separating carry and diversification

There is significant uncertainty about the future carry costs of hedging foreign assets, and they may even go in the opposite direction going forward, i.e., becoming a benefit rather than a cost for Canadian investors. Given that, we consider an alternative scenario in which we assume no cost of hedging. By assuming the same average return in both cases, we can focus just on the pure diversification benefit of the exchange rate provided by holding unhedged U.S. stocks.¹¹

The main finding is that U.S. currency exposure provides strong diversification benefits in a Canadian investor's portfolio (Table 2). In virtually every hypothetical portfolio summarized in Table 2, real unhedged performance exceeds the comparable portfolio with hedged returns. This scenario highlights the potentially beneficial diversifying impact that the exchange rate can play for a Canadian investing in the U.S. stock market.

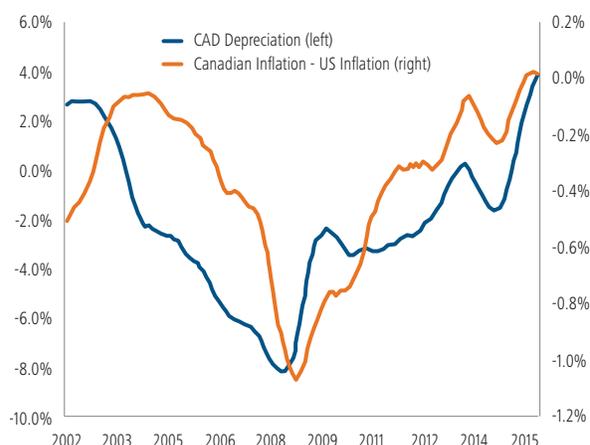
The above framework focuses on selecting appropriate currency exposures for a longer run investment horizon that potentially spans decades. Active currency management can also potentially add value beyond longer run diversification benefits. However, additional considerations extending beyond the scope of this paper are needed to calculate optimal currency exposures at shorter horizons. Key considerations include valuation, market sentiment, carry, growth prospects and central bank policies. For instance, the interest rate differential that traditionally favoured hedged holdings of U.S. stocks may shift if the U.S. Federal Reserve begins tightening monetary policy before the Bank of Canada.

Inflation insurance channel

An important risk for households living on a fixed income is a persistently weak Canadian dollar that 'passes through' into higher prices for goods and services with a high import content, eroding the purchasing power of savings and leading to diminished living standards. In that context, the large decline in energy and commodity prices since mid-2014 has weakened the Canadian terms of trade and contributed to a sharp decline in the Canadian dollar, raising concerns about the implications for Canadian inflation. Weak currencies tend to be associated with higher relative inflation rates in the longer run as illustrated in Figure 5.

Figure 5. Canadian Dollar Tracks Relative Canada-U.S. Inflation

(rolling 5-year exchange rate changes versus relative Canada-U.S. inflation rate)



Sources: Exchange rate relative to the US dollar and CPI (all items) provided via Datastream. Calculations are based on 5-year rolling averages of annual exchange-rate changes. Based on authors' calculations using data during 2002M1 to 2015M11.

A large share of Canadian consumer goods has a high import component, especially direct U.S.-dollar related content. Examples of important consumer goods with a high U.S.-dollar component include automobiles, computers, household equipment and tools, and fruits and vegetables.¹² Recent analysis at the Bank of Canada estimates that a currency depreciation by 10% boosts total inflation by 0.6 percentage points in the longer run while the rate of pass through is closer to zero in the shorter run.¹³ The rate of pass through is also higher for energy and commodity intensive goods, and perishable food that is traded and invoiced at a higher frequency. These findings are broadly consistent with other studies.¹⁴

The risk of unexpected currency depreciations and higher-than-expected inflation should not be ignored by investors in investment planning. Investors may benefit from the potential 'insurance' provided by foreign currency exposure in their portfolio since a depreciating currency implies a boost in the value of foreign assets, providing a hedge against the risk of higher consumer prices when the currency is persistently weak. In this way, Canadian investors may reduce their future living standard risk.

¹¹ Technically, we equalize the average real return of hedged and unhedged returns by subtracting the historical difference in the average real hedged and unhedged return.

¹² See Statistics Canada data at <http://www.statcan.gc.ca/pub/11-621-m/2004014/tbl/4144440-eng.htm>.

¹³ See *Exchange Rate Pass-Through to Consumer Prices: Theory and Recent Evidence*. Laurence Savoie-Chabot and Mikael Khan, 2015, Bank of Canada Discussion Paper 2015-9. <http://www.bankofcanada.ca/wp-content/uploads/2015/10/dp2015-91.pdf>

¹⁴ See *Exchange Rates and Trade Flows: Disconnected?* World Economic Outlook, Chapter 3, October 2015, International Monetary Fund. <http://www.imf.org/external/pubs/ft/weo/2015/02/pdf/c3.pdf>

Conclusion

The paper introduces a new framework to Canadian investors for planning and assessing their investments based on reducing living standard risk over time. The paper presented two key findings. First, we applied a life-cycle financial planning framework to quantify and distinguish the impact on living standard risk from aggressive spending decisions and inadequate portfolio diversification. Second, the paper demonstrated that greater portfolio diversification, which is important to reduce living standard risk over time, leads to difficult decisions on the degree of currency hedging to maximize risk-adjusted returns. The paper shows that the costs of hedging currency risk – that is, the interest rate differential between currencies that is often referred to as “carry” – is an important component of long-run average returns that are not considered by many investors. Historically, Canadian interest rates have been higher than U.S. rates, providing a boost to hedged U.S. stock returns. Looking ahead, the carry differential could invert as U.S. and Canadian interest rates diverge, which could boost the expected return from holding unhedged assets in foreign currency. In addition, foreign exchange exposure may help to hedge future living standard from unexpected inflation.

Table 1. Simulation Based on Historical Real Returns, 1995 – 2014

Median Living Standards – Alternative Equity Portfolios

| Year | Age | 50%/50% Hedged U.S. and Canadian Stock | | 50%/50% Unhedged U.S. and Canadian Stock | | 100% Canadian Stock | |
|------|-----|--|---------------------|--|---------------------|---------------------|---------------------|
| | | Cautious Spending | Aggressive Spending | Cautious Spending | Aggressive Spending | Cautious Spending | Aggressive Spending |
| 2020 | 50 | \$79,753 | \$106,725 | \$75,920 | \$103,113 | \$75,545 | \$101,477 |
| 2035 | 65 | \$113,850 | \$96,770 | \$108,651 | \$94,888 | \$97,654 | \$93,852 |
| 2050 | 80 | \$184,722 | \$84,392 | \$163,594 | \$81,400 | \$144,693 | \$78,407 |

5th Percentile – Alternative Equity Portfolios

| Year | Age | 50%/50% Hedged U.S. and Canadian Stock | | 50%/50% Unhedged U.S. and Canadian Stock | | 100% Canadian Stock | |
|------|-----|--|---------------------|--|---------------------|---------------------|---------------------|
| | | Cautious Spending | Aggressive Spending | Cautious Spending | Aggressive Spending | Cautious Spending | Aggressive Spending |
| 2020 | 50 | \$69,282 | \$92,983 | \$66,828 | \$89,823 | \$63,967 | \$85,618 |
| 2035 | 65 | \$57,814 | \$54,076 | \$53,367 | \$53,518 | \$40,690 | \$45,106 |
| 2050 | 80 | \$56,826 | \$23,461 | \$55,413 | \$25,869 | \$32,337 | \$18,602 |

95th Percentile – Alternative Equity Portfolios

| Year | Age | 50%/50% Hedged U.S. and Canadian Stock | | 50%/50% Unhedged U.S. and Canadian Stock | | 100% Canadian Stock | |
|------|-----|--|---------------------|--|---------------------|---------------------|---------------------|
| | | Cautious Spending | Aggressive Spending | Cautious Spending | Aggressive Spending | Cautious Spending | Aggressive Spending |
| 2020 | 50 | \$98,009 | \$131,718 | \$90,389 | \$122,714 | \$94,500 | \$130,998 |
| 2035 | 65 | \$259,082 | \$195,387 | \$214,084 | \$173,810 | \$236,379 | \$211,384 |
| 2050 | 80 | \$723,296 | \$283,887 | \$509,331 | \$244,328 | \$639,015 | \$304,010 |

Note: Simulation is based on single male who is currently 46 years old with \$500 in initial assets and earns \$100,000 of employment income after inflation through time until retirement at age 65. We abstract in this analysis from taxes, other pension sources and retirement accounts.

Table 2. Scenario Assuming Equal Hedged and Unhedged Real U.S. Equity Returns

Median Living Standards – Alternative Equity Portfolios

| Year | Age | 50%/50% Hedged U.S. and Canadian Stock | | 50%/50% Unhedged U.S. and Canadian Stock | | 100% Canadian Stock | |
|------|-----|--|---------------------|--|---------------------|---------------------|---------------------|
| | | Cautious Spending | Aggressive Spending | Cautious Spending | Aggressive Spending | Cautious Spending | Aggressive Spending |
| 2020 | 50 | \$75,062 | \$102,240 | \$80,666 | \$106,878 | \$75,545 | \$101,477 |
| 2035 | 65 | \$102,804 | \$94,342 | \$114,199 | \$99,180 | \$97,654 | \$93,852 |
| 2050 | 80 | \$166,522 | \$75,201 | \$191,123 | \$89,078 | \$144,693 | \$78,407 |

5th Percentile – Alternative Equity Portfolios

| Year | Age | 50%/50% Hedged U.S. and Canadian Stock | | 50%/50% Unhedged U.S. and Canadian Stock | | 100% Canadian Stock | |
|------|-----|--|---------------------|--|---------------------|---------------------|---------------------|
| | | Cautious Spending | Aggressive Spending | Cautious Spending | Aggressive Spending | Cautious Spending | Aggressive Spending |
| 2020 | 50 | \$64,841 | \$88,678 | \$69,565 | \$94,271 | \$63,967 | \$85,618 |
| 2035 | 65 | \$50,605 | \$48,789 | \$59,641 | \$55,273 | \$40,690 | \$45,106 |
| 2050 | 80 | \$44,411 | \$21,042 | \$68,462 | \$28,286 | \$32,337 | \$18,602 |

95th Percentile – Alternative Equity Portfolios

| Year | Age | 50%/50% Hedged U.S. and Canadian Stock | | 50%/50% Unhedged U.S. and Canadian Stock | | 100% Canadian Stock | |
|------|-----|--|---------------------|--|---------------------|---------------------|---------------------|
| | | Cautious Spending | Aggressive Spending | Cautious Spending | Aggressive Spending | Cautious Spending | Aggressive Spending |
| 2020 | 50 | \$97,213 | \$125,325 | \$95,069 | \$130,105 | \$94,500 | \$130,998 |
| 2035 | 65 | \$247,440 | \$189,738 | \$243,085 | \$186,558 | \$236,379 | \$211,384 |
| 2050 | 80 | \$613,913 | \$282,221 | \$634,854 | \$255,422 | \$639,015 | \$304,010 |

Note: Simulation is based on single male who is currently 46 years old with \$500 in initial assets and earns \$100,000 of employment income after inflation through time until retirement at age 65. We abstract in this analysis from taxes, other pension sources and retirement accounts. We assume that the average real hedged and unhedged return for a Canadian investor in the U.S. stock market is equal to the historical average real unhedged return during 1995-2014. In this way, the scenario isolates the pure diversification benefit from investing in the U.S. stock market by abstracting from differences in the historical average return, which was mainly due to hedging costs.

GENERAL INQUIRIES

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