



CFA Societies
Canada

INVESTMENT PRINCIPLES

INFORMATION SHEET FOR CFA PROFESSIONALS

EVALUATING YOUR FINANCIAL NEEDS

THE ROLE OF ADVISORS



5A

IMPORTANT NOTICE

The term "financial advisor" is used here in a general and generic way to refer to any duly authorized person who works in the field of financial services, including the following:

- Investment brokers
- Mutual fund brokers
- Scholarship plan dealers
- Exempt market dealers
- Portfolio managers
- Investment fund managers
- Life insurance agents
- Financial planners (F.Pl.)



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THE ROLE OF ADVISORS

Individual investors face many obstacles when confronted with investing. Most lack the knowledge to evaluate their future financial needs and how to achieve them. Furthermore, they are prone to emotional reactions and rash decisions. Even though advisors have a better understanding of the subject matter than most investors, their primary role is not to forecast expected returns in financial markets (securities, indexes, asset classes, or factors) or to make calls on tactical asset allocation. Rather, it is to help investors establish an appropriate financial plan, communicate reasonable expectations, facilitate efficient implementation, and, most important, help maintain greater discipline.

ADVISORS ARE NOT FORECASTERS

We have already made the argument that investing is a zero-sum game before fees and that fewer than 30% of managers and products are likely to outperform a plain vanilla cap-weighted index after fees over longer horizons. Of this ratio of successful managers, some may even have outperformed by chance. The fact that some investors attempt to forecast expected returns and economic variables in order to outperform does not change these facts.

Forecasting is difficult. In fact, there is very little evidence that investors, managers, or advisors can, on average, appropriately forecast expected returns or significant economic transitions. For example, in a survey completed among economic forecasters by the Federal Reserve Bank of Philadelphia in November 2007, only 3% forecast an economic growth rate below 0% in 2008. Furthermore, some individuals were credited with forecasting the financial crisis, but their overall forecasting track record (before and after the financial crisis) is usually far from unblemished. Finally, in an industry where potentially tens of thousands of individuals will publicly express their financial and economic views, a few will always appear to have forecast some specific events. The more important question is: "Can we identify who, among

thousands of forecasters, will forecast the next significant event?" The evidence appears to indicate that it is unlikely for most.

Furthermore, numerous studies indicate that the average performance of individual investors is much lower than the passive return offered by a balanced indexed portfolio. According to the 2015 release of Dalbar's Quantitative Analysis of Investor Behaviour (QAIB), the average investor in fixed income and equities had an annualized performance of 3.51% over a 10-year period while the performance of the S&P 500 was 7.67% and that of the Barclays Aggregate Bond Index was 4.71%. Although everyone agrees with the principle of buying low and selling high, many investors convince themselves to invest in the market after a run-up and to run away after a crash. Having a realistic financial plan, implemented with discipline with the support of a trusted financial advisor, significantly increases the odds of success.

THE COMPONENTS OF SOUND

FINANCIAL PLANNING

A good financial planner helps investors understand the relevance of:

- starting an investment plan early;
- setting reasonable objectives;
- maintaining savings discipline;
- building an appropriate portfolio at a reasonable cost;
- making maximum use of tax-efficient opportunities;
- establishing a rebalancing strategy (because forecasting is not the key to success);
- evaluating the role that life insurance and annuities can play in overall retirement planning;
- appropriately reviewing where the investor stands against his objective as time goes on; and
- making appropriate portfolio adjustments as the investor's situation and objectives change.

The advisor should have access to tools (software) and documentation to facilitate these tasks. The advisor must also help the investor understand that the choice of a portfolio allocation is the result of a compromise between:

- the asset allocation that is appropriate for the investor's objectives and time horizon; and
- his own ability to withstand short-term losses both financially or emotionally.

For example, some investors may have the ability to withstand financial losses and yet have emotional difficulties dealing with these losses when they occur. As such, the role of advisors is to educate investors in order to achieve, over time, a more appropriate balance between the rational and emotional acts of making investment decisions. Educating investors is also important because advisors will find that some investors may second-guess their advice as soon as the next market downturn occurs. This behaviour makes it difficult for investors to achieve personal investment goals and financial independence.

Investing is a tremendous challenge for individual investors. Investors who are capable of managing their emotions and have some expertise could do well on their own. But for the majority of investors, an advisor is required. Advisory services are not free but they help many investors avoid costly mistakes. We will attempt to evaluate the cost of poor decision making in document 5c. This will help support the value of paying for proper advisory services. The role of advisors is to educate investors, coach them through the process of putting in place an investment plan, encourage greater discipline, and communicate rational expectations of what investors should expect. It is a tremendous challenge because many investors believe investing successfully is all about timing the market and finding the next Alphabet.



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EVALUATING YOUR FINANCIAL NEEDS

UNDERSTANDING MY RISK PROFILE



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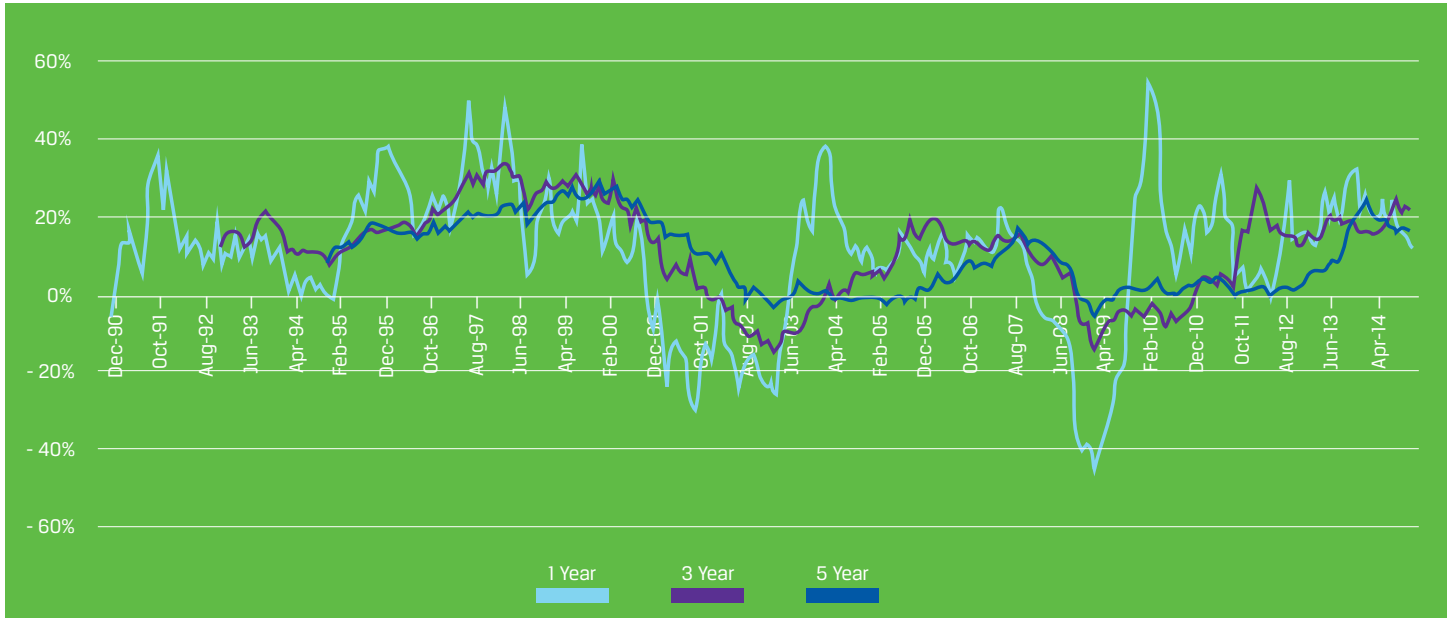
UNDERSTANDING MY RISK PROFILE

Riskier portfolios are usually associated with greater expected long-term returns but a higher likelihood of significant short-term losses, whereas lower-risk portfolios are associated with lower long-term expected returns but a lesser likelihood of short-term or even longer-term losses. Most investors are risk-averse and fear losses at any point. But how do we define losses? Most of the time we refer to the level of nominal losses achieved in a portfolio over a given period, such as losing 15% to 20% in 2008 on a balanced portfolio of equities and fixed income. On the other hand, a portfolio with a lower risk and a lower expected return can lead to a different type of risk: insufficient returns to provide an adequate income at retirement. Investors face a "fear compromise" between potential shorter-term losses (assuming a riskier portfolio) and insufficient income at retirement (assuming a portfolio with a low risk and a low expected return), and we can understand our own risk profile only by understanding both sides of this compromise.

THE FEAR OF FINANCIAL LOSSES

From January 1990 to December 2014, the annualized performance of the U.S. equity market as represented by the Russell 1000 equity index was 9.82% before fees. All investors would be pleased with such a performance. But this performance was not achieved in a straight line. The figure below shows the annualized performance using one-, three-, and five-year rolling windows. When a one-year rolling window is used, several periods of very low returns are identified. But when a five-year window is used, the pattern of performance is much more tolerable although we can still observe periods of low, but not necessarily negative, returns. Unfortunately, investors do not look at their portfolios every five years nor do they look solely at their average performance for the past five years. They are emotionally affected by shorter-term performances and are exposed to market commentaries that cause anxiety on a daily basis.

ROLLING EQUITY PERFORMANCE



This is why a well-diversified portfolio is so important. The following figure shows the same information for a portfolio consisting of 60% equities and 40% fixed income, using 10-year U.S. Treasury bonds for investing in fixed income. Although the fixed-income component had a lower but still impressive return of 7.61% (because of declining interest rates), the 60/40 blend generated a return almost as high as equities (9.54% - assuming yearly rebalancing) because of the effect of diversification (lower volatility) on compounded returns. In this case, the one-year rolling window still shows substantial losses during some periods, but these losses are much lower than for an all-equity portfolio. The five-year rolling window is even more stable than in the previous chart.

Investors should understand that, although such events are rare, an equity portfolio can lose 40% or more in a single year, and a 60/40 portfolio can lose more than 20%. Fortunately, the historical evidence also shows that large losses tend to be followed by large gains, assuming the investor has not panicked and liquidated his portfolio. That being said, these observations apply only to well-diversified portfolios of securities and asset classes. The 2008 crisis showed that substantial price declines can be observed even on highly rated financial assets. Whether you own a lower-risk or higher-risk portfolio, you should be well diversified.

ROLLING 60/40 PERFORMANCE



Of course, investors can still decide to hold very-low-risk portfolios. The following shows the rolling performance for an investment in five-year Treasury bonds. The average compounded return was 5.54% and the performance was relatively stable. Unfortunately, this historical performance was possible only because of declining interest rates. The yield on such an instrument was below 2% as of December 2014, making it impossible to achieve over the coming decade the returns realized in previous decades.

ROLLING FIXED INCOME PERFORMANCE



THE FEAR OF INADEQUATE

INVESTMENT RETURNS

Let's assume a 35-year-old investor is able to allocate 30% of his savings to tax-exempt or tax-deferred accounts and 70% to his taxable account. Let's further assume that each year this investor will have "X" dollars of after-tax savings in real terms and will therefore adjust his nominal savings annually by the rate of inflation, which is assumed to be 2%.

This investor will retire at age 65 with a life expectancy of 90 years. Let's also assume he can choose between two portfolios. One portfolio has an annual expected return of about 2% after fees and taxes (most likely a bond-centric portfolio), whereas the other has an expected return of about 4.5% (most likely a riskier portfolio, such as a 60/40 allocation to equities and fixed income). For now, let's not pay too much attention to how these returns have been determined. Our objective is solely to establish the impact of a 2.5% return difference when the investment horizon is as long as 55 years, with 30 years of accumulation and 25 years of decumulation.

Under these assumptions, how much real income after tax can the investor expect to receive annually during his retirement before exhausting all his assets? Assuming for the sake of simplicity that the real (inflation-adjusted) amount of yearly savings is \$1,000, the real (inflation-adjusted) retirement income will be about \$1,200 annually if the average return is 2% but \$2,442 if the return is 4.5%. So, in the first scenario, the investor can expect to cash annually after tax about 120% of his annual savings whereas in the second, it can be as much as 245%. In other words, it would require twice as much savings under a 2% return scenario to match the income to be received under the 4.5% return scenario.

WHAT SHOULD INVESTORS DO?

There are many reasons why large professionally managed pension plans have allocations of 60% to 70% to equities, real estate, infrastructure, and other riskier assets (that is, riskier than high-quality bonds). First, diversification combined with an effective rebalancing process works in the long run. Second, the cost of delivering adequate pensions to retirees under a near all-bond allocation would be tremendously

prohibitive. It would require employees, employers, and governments to substantially increase their contributions to these plans. Yet, many individuals find a 60% to 70% equity allocation difficult to consider for their personal portfolios.

Research has found a high correlation between risk aversion and anxiety. It has also found that risk-averse individuals are prone to believe, on average, that bad outcomes are more likely to occur and are worse than they really are. But these observations are confined to our own individual situation. In other words, anxiety, risk aversion, and the belief that bad outcomes are more likely to occur have less impact on our decision process when we analyze the same situation in the context of another person, not us. Thus individuals are often much more emotionally involved when investing their own personal savings than are pension fund managers managing the assets of others (not their own). That is one reason why many individuals need an advisor and moral support to help them manage their emotions and stay on a stable path.

Investors are usually asked few questions to evaluate which portfolio is appropriate for them. These questions usually fall into three categories:

- *Personal and financial situation.* It is often assumed that younger individuals with higher current income and some wealth have a greater ability to take some risk;
- *Objectives and risk tolerance.* A long-term objective may justify a riskier portfolio but no matter what your personal and financial situation is, no matter what your objective is, some individuals may have anxieties about the possibility of sustaining a financial loss even over a short period. Furthermore, when asked questions to probe tolerance to losses, the same individual may answer the questions differently if asked during a financial crisis, such as in 2008, or during a bull market, such as in 2013. He may also answer differently depending on how the question is framed. For example, will someone answer similarly if asked: "How do you feel about losing 10% of your assets over 12 months?" or "How do you feel about losing \$100,000 over 12 months?" That is why more recent research finds that we can better evaluate risk tolerance by considering the investor's past behaviour and actions, career path, and sources of social influences rather than by asking hypothetical questions about expected behaviour in specific circumstances. It may be a more efficient investigation of risk tolerance but not necessarily easier.

- *Investment knowledge and experience.* It is important to set appropriate goals and have appropriate expectations. But there is nothing worse than believing that we know more than we actually do. This is often the greatest obstacle to the implementation of a long-term financial plan. For example, some investors believe they can time the market or identify the next Alphabet (formerly Google).

Some of these questions refer to the investor's risk capacity: the level of portfolio risk that is appropriate, considering the personal and financial characteristics of the investor and his goals. Others refer to how the investor's risk tolerance may be affected by other factors. Nevertheless, education and guidance are key to help investors understand what is appropriate for them and perhaps help them manage their anxieties.

An investor's risk aversion can be influenced by his personal situation. All else being equal, a wealthier and younger investor may be more comfortable taking risks. An individual surrounded by family members and friends who have been consistent investors will benefit from a positive and reassuring influence. But some investors have greater anxieties about investing. We all have our own personalities; but one way of improving our abilities to make rational decisions is a better understanding of the investment world and a greater understanding of the implications of the decisions we make today. Thus the objective of this education effort is to support more appropriate and rational investment decisions by investors and help manage their fears. As Warren Buffett said, "Investing is simple, but not easy."



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EVALUATING YOUR FINANCIAL NEEDS

BUILDING A PORTFOLIO



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BUILDING A PORTFOLIO

We are far enough into our discussions to start building complete portfolios that investors could adopt. Even though many different approaches could be used, we have decided to design portfolios that include numerous asset classes and provide geographic diversification and also different investment styles (such as value, growth, and size) without making use of leverage or short positions. Even though ignoring leverage and short positions limits the efficiency of what could be achieved, it provides a more realistic environment for the great majority of investors. Furthermore, we will compare both simple and more comprehensive portfolios. We will also evaluate the portfolios of investors who react emotionally to rising or falling markets (investors who buy high and sell low) or simply fear investing, in order to evaluate the potential cost of poor decision making and the value of advisory services.

We will build portfolios from different points of view. The first is that of investors who have different risk profiles, to illustrate the drawdowns (worst cumulative losses) that can be observed in each case. And the second is that of investors who live in two very different countries:

- U.S. investors who have a diversified equity market and a countercyclical currency; and
- Canadian investors who have a more resource-centric equity market and a procyclical currency.

This is also the last time we will work with historical returns. In the following documents, we will be working with forward returns. History helps us understand financial markets and illustrate portfolio concepts, but the future is rarely like the past.

THE HISTORICAL PERFORMANCE OF ASSET CLASSES

The portfolios are built from 10 assets. The period analyzed starts in August 1992 because all the data are not available before this period. It ends in October 2015 for a period of 23 years and two months. We could also have used a wider range of products, such as factor-based equity products, or even other asset classes, such as commodities. Nevertheless, this is sufficient for the purpose of illustrating the different portfolio concepts.

But before we build our portfolios, let's analyze the performance data of each asset from the point of view of U.S. investors (in U.S. currency) and Canadian investors (in Canadian currency). The following table presents all 10 assets as well as the annual compounded return and volatility (standard deviation) for each component in both currencies. Fees are ignored to concentrate on the portfolio construction and diversification aspects.¹

¹ We have assumed, for the sake of simplicity, that a Canadian investor would have purchased U.S. fixed income hedged against currency risk.

AUGUST 1992 – OCTOBER 2015		US\$		C\$	
Asset	Description	Return	Volatility	Return	Volatility
Russell 1000	US Equity Large CAP	9.2%	14.7%	9.7%	12.6%
Russell 1000 Value	US Equity Value Style	9.5%	14.6%	10.0%	12.6%
Russell 1000 Growth	US Equity Growth Style	8.5%	17.0%	8.9%	15.4%
Russell 2000	US Small CAP	9.5%	18.9%	9.9%	16.3%
MSCI EAFE	International Large CAP Equity	6.2%	16.5%	6.6%	13.8%
MSCI Emerging	Emerging Markets Equity	7.0%	23.0%	7.4%	19.5%
S&P/TSX	Canadian Equity	8.1%	19.9%	8.5%	14.7%
Treasury 10 Year	US Fixed Income Government	6.2%	6.3%	6.7%	6.3%
Barclays Aggregate Credit	US Fixed Income Gov. and Corp.	7.3%	7.5%	7.8%	7.5%
Barclays High Yield	US Fixed Income Corp. Lower Quality	7.6%	8.6%	8.1%	8.6%

Several observations can be made from these data:

- The returns were slightly higher (in local currency) from the point of view of Canadian investors. This is attributed to the fact that the dollar depreciated against the U.S. dollar by an average of 0.39% a year during the period.
- All equity assets had a lower volatility from a Canadian-dollar point of view. This is consistent with the fact that the Canadian dollar is a procyclical currency (see document 3d). U.S. investors looking to reduce the volatility of their non-U.S. equity exposure should hedge at least part of their currency risk.
- The U.S. equity market had among the lowest volatility from a U.S.-dollar or Canadian-dollar standpoint. The U.S. has a more diversified and integrated economy, resulting in more-diversified equity markets than any other country or region.
- Americans had the most profitable equity markets over this period. Investors diversify internationally partly out of concern that their own financial market may generate disappointing performances, but unfortunately foreign markets may produce lower returns even though some have greater risks than the Canadian or U.S. markets.
- U.S. small-caps equity did not outperform U.S. large-caps significantly despite higher volatility.
- Fixed income did well during this period. It even outperformed global equity markets (international and emerging).

There are three more takeaways from this information. First, Canadian and U.S. investors most likely did not receive the returns in international markets that they expected because greater risks led to smaller returns. As discussed in document 3a, risk is always about the possibility that rational expectations will not be met. In other words, we could say that investors were (relatively) compensated less than expected for the global equity risk they assumed or they were (relatively) compensated more than expected for the fixed-income risk they assumed. Most likely, it is a combination of both.

Second, as discussed in document 3b, although fixed income generated high nominal and real returns historically, it cannot maintain such high nominal returns when starting from a low-yield environment. Thus if fixed income outperforms equities over the next 10 years, it could be because equities perform poorly. We hope this will not be the case.

Third, we cannot easily forecast whether the risk we take today will be adequately compensated in the future. That is why diversification makes sense when we look forward (to the future). When we look backward, we can be duped into over- or under-diversifying, depending on the historical performances of specific assets. We must have common sense. As stated in document 3d, an investor in a country that has a countercyclical currency and a diversified economy can be more domestic-centric, but an investor in a country with a procyclical currency and a less diversified economy should maintain more exposure to global markets.

BUILDING PORTFOLIOS

We will now evaluate the historical performance of portfolios from both U.S. and Canadian perspectives. Two risk levels will be used, 70/30 (equities/fixed income) and 30/70. For each risk level, two portfolio structures will be used: a basic structure with two or three assets and a more complete structure using more components. The U.S. portfolios will be more U.S.-centric. Lower-risk portfolios will also have larger allocations to domestic equities. In total there are eight portfolios. The two following tables summarize this information.

U.S. INVESTORS					
		SIMPLE PORTFOLIO		COMPREHENSIVE PORTFOLIO	
Asset	Description	Low Risk	High Risk	Low Risk	High Risk
Russell 1000	US Equity Large CAP	30.0%	70.0%		
Russell 1000 Value	US Equity Value Style			10.0%	20.0%
Russell 1000 Growth	US Equity Growth Style			10.0%	20.0%
Russell 2000	US Small CAP			10.0%	10.0%
MSCI EAFE	International Large CAP Equity				15.0%
MSCI Emerging	Emerging Markets Equity				5.0%
S&P/TSX	Canadian Equity				
Treasury 10 Year	Fixed Income Government	70.0%	30.0%	20.0%	
Barclays Aggregate Credit	Fixed Income Gov. and Corp.			42.5%	25.0%
Barclays High Yield	Fixed Income Corp. Lower Quality			7.5%	5.0%

CANADIAN INVESTORS					
		SIMPLE PORTFOLIO		COMPREHENSIVE PORTFOLIO	
Asset	Description	Low Risk	High Risk	Low Risk	High Risk
Russell 1000	US Equity Large CAP	10.0%	30.0%		
Russell 1000 Value	US Equity Value Style			5.0%	12.5%
Russell 1000 Growth	US Equity Growth Style			5.0%	12.5%
Russell 2000	US Small CAP			5.0%	5.0%
MSCI EAFE	International Large CAP Equity				15.0%
MSCI Emerging	Emerging Markets Equity				5.0%
S&P/TSX	Canadian Equity	20.0%	40.0%	15.0%	20.0%
Treasury 10 Year	Fixed Income Government	70.0%	30.0%	20.0%	
Barclays Aggregate Credit	Fixed Income Gov. and Corp.			42.5%	25.0%
Barclays High Yield	Fixed Income Corp. Lower Quality			7.5%	5.0%

We are not likely to be impressed by the performance results we will achieve when comparing simple and comprehensive portfolios. As indicated previously, global markets did not outperform the local markets of U.S. and Canadian investors. Sometimes, even when we diversify, our own market could be among the ones that perform better on a risk-adjusted basis. Thus it will seem as if it was not worthwhile to diversify; but we get this result only because we are looking in the rear view mirror. For example, in the case of Canada, the favourable local

performance during this period is explained by the strong commodity cycle and the greater resistance of the Canadian financial sector to the financial crisis. Again, we cannot count on the future to resemble the past.

The following table presents the performances and some risk statistics of all eight portfolios, assuming initially a monthly rebalancing. Some of the results are puzzling but understandable.

Portfolio	Return	Volatility	Worst Month	Worst Drawdown	Date Worst Drawdown Ends
US 30/70 Simple	7.4%	5.9%	-5.7%	-10.4%	February 2009
US 30/70 Comprehensive	8.1%	6.6%	-8.3%	-21.0%	February 2009
US 70/30 Simple	8.6%	10.3%	-12.4%	-35.2%	February 2009
US 70/30 Comprehensive	8.6%	11.1%	-14.9%	-42.9%	February 2009
CAN 30/70 Simple	7.6%	5.5%	-4.3%	-8.0%	November 1994
CAN 30/70 Comprehensive	8.3%	5.9%	-7.0%	-16.1%	February 2009
CAN 70/30 Simple	8.8%	8.5%	-10.4%	-24.8%	September 2002
CAN 70/30 Comprehensive	8.8%	9.0%	-9.9%	-32.3%	February 2009

- First, Canadian portfolios outperformed U.S. portfolios. Part of the reason could be a different portfolio allocation, but part is also the 0.39% average annual depreciation of the Canadian dollar during this period.
- As we could have expected, Canadian portfolios also have lower volatility and lower drawdowns because of the procyclical nature of the currency.
- Riskier portfolios outperformed less-risky portfolios. As discussed previously, there will always be exceptions (such as Japan) but, over a long period, such outperformance is more likely than not.
- Substantially greater risks were required to increase returns. For example, to increase returns by 1.2% over this period on a U.S. 70/30 simple portfolio versus a U.S. simple 30/70 portfolio, significantly higher drawdowns had to be sustained. Of course, adding 1.2% of return over more than 23 years will improve the wealth of a consistent saver by more than 15%.
- The worst drawdown did not necessarily occur at the same time in Canada and in the United States. For riskier

portfolios, the period of the financial crisis often represents the worst period in this history. But, in the case of Canada, comprehensive portfolios sustained worse performances during other periods. Part of the explanation is the fact that simple portfolios from a Canadian point of view have exposure solely to the U.S. market. Because the Canadian dollar depreciated strongly against the U.S. dollar during the financial crisis, nominal losses in Canada were significantly softened by the depreciating dollar. Furthermore, 1994 was a particularly difficult period for fixed-income investors, which affected portfolios with a significant fixed-income content.

What is more disturbing is the fact that comprehensive portfolios have bigger drawdowns and greater volatility and did not necessarily perform better in the case of riskier portfolios. First, we must recognize that we are looking at this issue from the point of view of investors in two countries whose equity markets outperformed global markets during this period. Again, we do not know what the future holds for us. Secondly, risk, in the long run, is not solely about volatility.

It is about the possibility that some markets may simply underperform significantly. It should be a concern, especially for those investors who operate in a less diversified economy, such as Canada's.

The previous example assumed a monthly rebalancing. We stated in document 3f that rebalancing less frequently may actually be more profitable. The following table presents the same information as above for U.S. investors but the rebalancing frequency was changed from monthly to annual at year-end.

Portfolio	Return	Volatility	Worst Month	Worst Drawdown	Date Worst Drawdown Ends
US 30/70 Simple	7.6%	5.9%	-4.9%	-9.0%	February 2009
US 30/70 Comprehensive	8.2%	6.5%	-8.1%	-19.0%	February 2009
US 70/30 Simple	8.9%	10.1%	-11.3%	-32.7%	February 2009
US 70/30 Comprehensive	8.8%	10.9%	-13.9%	-41.5%	February 2009

The analysis confirms the intuition presented in document 3f. Less frequent rebalancing can increase returns while reducing volatility and drawdowns. When a calendar methodology is used, rebalancing every six to 12 months is fairly optimal. But it remains essential to rebalance.

THE COST OF BEING AFRAID AND OF INCONSISTENT INVESTMENT BEHAVIOUR

Some investors simply want to avoid all risks. For the purpose of evaluating the cost of extremely conservative behaviour, we have assumed a rolling investment in five-year Treasuries and monthly rebalancing in both cases. Such an investment would have provided a return of less than 5% over the same period as the previous analysis. The following table indicates the cumulative value of an annual investment of \$1,000 since 1992 (\$24,000 in total) for a U.S. investor for all four investment scenarios.

	5-Year Treasury	30/70 Simple	30/70 Comp.	70/30 Simple	70/30 Comp.
Cumulative value	\$40,858	\$57,658	\$67,109	\$63,830	\$66,314
Gains in excess of \$24K	\$16,858	\$33,658	\$43,109	\$39,830	\$42,614
Gains in excess of 24K if away from the market for one year (from Dec. 2008 to Nov. 2009)		\$27,151	\$29,693	\$31,425	\$27,935
Decline in gains (%)		-19.3%	-25.4%	-27.1%	-34.4%

Even though we have not incorporated fees into the analysis, there is a high price to pay for extreme conservatism even against a low-risk 30/70 portfolio. Furthermore, the nearly 5% return on Treasury bonds was achieved only because of significantly higher interest rates back in the 1990s. Rates, as of the end of 2015, were below 2%, making it impossible to achieve similar returns in the future.

Other investors do not necessarily shy away from investing in equities but are inconsistent. They will invest in, or take their capital out of, the market at the worst possible time. One way we can understand the cost of inconsistency is to recalculate the compounded return on a portfolio simply by eliminating the very best months, one at the time. Let's use the example of the U.S. 70/30 simple portfolio. Its compounded return over the entire period was 8.63% (using monthly rebalancing). If we eliminate the best months, we take away about 0.30% to 0.33% of total compounded return over this 23 year-period for each such month. For example, the top three months since August 1992 account for nearly 1% of the total performance of 8.63%.

Let's now consider a more specific scenario. An investor panicked during the financial crisis and got out of the market at the end of November 2008 only to start investing again one year later. On the basis of the results presented in the previous table, such an investor would have given-up between 19% and 25% of the return gains accumulated on a 30/70 portfolio and 27% to 34% of the gains accumulated on a 70/30 portfolio. A single year can wipe out a fifth to a third of all gains generated over more than 22 years.

Risk pays off in the long run, assuming we diversify smartly, remain consistent, and can tolerate the volatility and drawdowns associated with a riskier portfolio. This exercise did confirm some of our previous statements. Investors living in countries with procyclical currencies benefit from a natural hedge on the international exposure, at least on average. Furthermore, rebalancing more efficiently does have return and risk benefits, and we can do even better by adopting smarter rebalancing methodologies. We also found that it does take proportionally more risk to increase returns. Twice as much volatility will not deliver twice the returns. That is why it is important to have a long-term investment plan and to pay reasonable fees. By lowering fees, investors can tolerate a lower-risk/lower-return portfolio without affecting their expected investment income.



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INVESTMENT PRINCIPLES

INFORMATION SHEET FOR CFA PROFESSIONALS

EVALUATING YOUR FINANCIAL NEEDS

HOW MUCH MUST BE SAVED TO RETIRE WELL



5D

IMPORTANT NOTICE

The term "financial advisor" is used here in a general and generic way to refer to any duly authorized person who works in the field of financial services, including the following:

- Investment brokers
- Mutual fund brokers
- Scholarship plan dealers
- Exempt market dealers
- Portfolio managers
- Investment fund managers
- Life insurance agents
- Financial planners (F.Pl.)



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HOW MUCH MUST BE SAVED TO RETIRE WELL

How much must an investor save periodically to fund a comfortable retirement? This is not a simple question. There are many relevant variables to consider, but it is possible to develop a reasonable estimate that will give an indication of the scope of the savings effort that is required. Because there are so many unknowns, it must be periodically re-evaluated, especially when the investor's profile changes significantly. Unfortunately, the amount required is often much more than most individuals expect.

THE MOST RELEVANT VARIABLES

The following are the most important variables that must be considered to answer this question:

- What is the current amount of accumulated savings and how is it distributed between taxable and non-taxable accounts?
- If the amount is nil, when will the savings effort start?
- What is the scope of the tax-exempt or tax-deferred opportunities that are available?
- How are the investor's income, lifestyle, and responsibilities expected to evolve? How will these changes affect his ability to save over time?
- Will the investor be able to combine his financial resources with those of a partner or spouse?
- What other sources of income are expected, apart from those resulting from personal savings?
- What is the average expected return on investment?
- What is the expected volatility and pattern of future returns?
- What is the planned retirement age?
- How much after-tax income is needed in retirement?
- What is the assumed life expectancy?

The situation of each individual is different. For example, some individuals may be on a career path that will lead to a significant increase in real (inflation-adjusted) income over time, whereas others may have a job with income that will simply keep pace with inflation. Some will have no children and have the benefit of a double income, whereas others may have several children whom they may put in private schools and help through college on a single income. Some may receive a substantial inheritance and benefit from an employer pension plan whereas others are entirely on their own and may have the responsibility of caring for a family member. Some may have been lucky enough to live in an environment where financial returns were very favourable and stable, whereas others may have planned to retire just before a market crash occurred. Finally, although our lifestyle certainly has an impact on our life expectancy and health, we certainly do not have full control over this aspect. Unfortunately, many retirement calculators oversimplify the challenge of estimating what must be done to fund a reasonable retirement, ignore performance uncertainty, and make implicit assumptions that are not transparent to the user. Thus their recommendations are difficult to take at face value.

How much income is required during retirement is clearly an issue of lifestyle and circumstances. Advisors often say that an income-replacement level of 70% is sufficient for a couple. Assuming the house is paid for (there are no rent payments), that there are no more contributions to children's education, and no further savings are required, it may even be possible to live on less than 70% of the previous income. Some research shows that most couples in such a situation are comfortable on less than 60% of their previous income. Furthermore, a retiree living alone will still need at least 70% of the income required for a retired couple. But these are only guidelines. Individuals approaching retirement should evaluate their financial needs on the basis of their own recent experience.

The following two tables present the input (assumptions) from the Excel tool.

SIMPLE RETIREMENT CALCULATOR

Assumes Identical Asset Class Allocation in Taxable and Non Taxable Accounts

	Tax Rates & Turnover
Interest / Foreign Dividends	40%
Domestic Dividends	20%
Capital Gains	20%
Equity Turnover	40%

THE LEVEL OF RETIREMENT INCOME MY SAVINGS WILL PROVIDE

A qualified advisor can help design a plan that takes into account the investor's specific characteristics and requirements. Because we cannot adapt this document to every situation, we will concentrate on the following question:

What level of income at retirement can be expected from each \$1,000 of yearly savings (in real terms)?

We will adjust this answer according to several parameters, including:

- the number of years of savings before retirement;
- the life expectancy after retirement;
- the asset allocation (the portfolio's expected return); and
- the efficiency of making full use of non-taxable programs.

Assuming the investor has already estimated the income he can expect at retirement from other sources (government and employer pension plans and even family support), this information will provide an estimate of the periodic savings required to reach the total amount of income needed during retirement and the importance of using non-taxable accounts to their full extent. This analysis can even be done on an Excel spreadsheet. In fact, we have built a simple Excel spreadsheet for illustration purposes. But a complete analysis would require investment planning software that can handle variable yearly contributions (for example, that will adjust contributions once the mortgage is fully paid or the kids have finished school), manage the asset location and asset allocation over time, integrate the impact of return uncertainty (not to be ignored), and consider different income alternatives (at retirement) and risk management features. The impact of uncertainty will be addressed in the next document.

Annual Savings Non-Taxable	\$1,000
Current Assets Non-Taxable	\$0
Annual Savings Taxable	\$1,000
Current Assets Taxable	\$0
Inflation Rate	2.0%

	Weight Investment Period	Weight Retirement Period	Income	Capital Gains	Fees	Return Before Tax Investment Period	Return Before Tax Retirement Period
Fixed Income	30%	30%	3.00%	0.00%	1.00%	2.00%	
Domestic Equities	40%	40%	2.00%	5.00%	1.00%	6.00%	
Foreign Equities	30%	30%	2.00%	5.00%	1.00%	6.00%	
Portfolio	100%	100%	2.30%	3.50%	1.00%	4.80%	4.80%
Adjustment for Diversification Impact and Rebalancing						0.25%	0.25%
Real Return (inflation-adjusted)						3.05%	3.05%
Overall Tax Drain						1.15%	1.15%
Total Real Return After Tax						1.90%	1.90%

The upper-left corner of the first table presents the assumed tax rates and equity turnover. In the upper-right section, the tool allows for the specification of annual contributions to taxable and non-taxable accounts and for the inflation-rate assumption. If it were a tax-deferred account instead of a non-taxable account, the contribution would have to be specified on an after-tax basis. For example, as we explained in 4b, a \$1,000 contribution to a tax-deferred account is equivalent to a \$600 contribution to a tax-exempt account, assuming a 40% tax rate. In this case, we have assumed two (after-tax) annual contributions of \$1,000 to each type of account. The contributions are assumed to match inflation over time.

The second table specifies the portfolio allocation during the accumulation period (savings) and the decumulation period (retirement) using three assets: domestic fixed income, domestic equities, and foreign equities. A standard allocation of 70% equities and 30% fixed income is used initially for both. As explained before, a Canadian investor would likely benefit from a lower domestic equity component than suggested in this example, but the proposed allocation may be appropriate for a U.S. investor. This document also allows us to specify the expected income, capital gains, and fees for each asset class.

The portfolio could be more diversified but the principles would remain the same.

Because this analysis extends over several decades, we have used simple but reasonable assumptions for expected returns:¹

- 3% for fixed income, assuming a blended portfolio of government and investment-grade corporate bonds. This return is consistent with a 2% inflation rate.
- 7% for equities, assuming 2% from dividends, 2% from inflation, and 3% from long-term growth.

The nominal return before tax but after fees (assuming total all-in fees of 1%) is 4.8%, considering the 70/30 split. An excess return of 0.25% is added to take into account the benefits of diversification and of the rebalancing process (see document 4f). We assume that the investor does in fact have the discipline to do strict periodic rebalancing. But, after inflation, the portfolio's real return before tax is only 3.05%.² Finally, the tax drain is estimated and takes into account the portfolio turnover.³ The expected real return after tax is 1.90%.

¹ These forecasts, especially for equities, implicitly assume (as discussed in document 3b) that current market valuations are fair, neither grossly overoptimistic nor pessimistic.

² In this document and the next, we use the term "portfolio real return" to represent the return that a portfolio generates in excess of inflation.

³ Although the impact of portfolio turnover on the effective tax rate is a function of return on investment and duration of the investment period, it remains in a fairly narrow range unless the investment period is very short. Furthermore, it is significant only for a very low portfolio turnover rate.

The spreadsheet presents the results for four scenarios of investment duration (20 to 35 years) and four identical scenarios of longevity after retirement. Assuming retirement at 65, a 25-year longevity assumption corresponds to a 90-year life expectancy.⁴ At age 65, Canadians and Americans have a life expectancy of about another 25 years. But a large proportion, perhaps 30% of them, will live past the age of 90. Thus it makes sense to assume we may live longer than the average life expectancy may indicate.

The following table presents the amount of savings (second column) that will have been accumulated in real terms (in terms of current dollar value) in the taxable and non-taxable accounts and the total of both accounts. These calculations assume that the asset allocation is identical in both accounts. Although it is possible to achieve a more efficient asset location from the tax point of view, we have shown in document 4b that this approach still leads to a fairly efficient portfolio. We do not recommend this approach but it does simplify the illustration.

Non-Taxable	Real Savings	Longevity After Retirement				4% Rule
Years of Savings		20	25	30	35	
20	\$27,831	\$1,879	\$1,607	\$1,429	\$1,305	\$1,113
25	\$37,819	\$2,554	\$2,184	\$1,942	\$1,773	\$1,513
30	\$49,426	\$3,338	\$2,854	\$2,538	\$2,317	\$1,977
35	\$62,913	\$4,248	\$3,633	\$3,231	\$2,949	\$2,517

Taxable	Real Savings	Longevity After Retirement				4% Rule
Years of Savings		20	25	30	35	
20	\$24,504	\$1,484	\$1,240	\$1,079	\$964	\$980
25	\$32,209	\$1,950	\$1,630	\$1,418	\$1,268	\$1,288
30	\$40,673	\$2,463	\$2,058	\$1,790	\$1,601	\$1,627
35	\$49,970	\$3,025	\$2,528	\$2,199	\$1,967	\$1,999

Total	Real Savings	Longevity After Retirement				4% Rule
Years of Savings		20	25	30	35	
20	\$52,335	\$3,363	\$2,847	\$2,508	\$2,269	\$2,093
25	\$70,028	\$4,504	\$3,814	\$3,360	\$3,041	\$2,801
30	\$90,098	\$5,800	\$4,912	\$4,328	\$3,918	\$3,604
35	\$112,883	\$7,274	\$6,162	\$5,430	\$4,916	\$4,515

The next four columns present the annual income the investor can expect, assuming different levels of longevity. A comparison of the results for taxable and non-taxable accounts shows that making full use of the non-taxable account creates tremendous value. The calculations assume the investor maintains the same asset allocation during

retirement. This assumption may not be appropriate if these portfolios are the sole source of expected income at retirement. But a retiree who had a defined-benefit retirement plan at work could most likely afford to maintain a higher level of risk during retirement. The last column presents the annual income resulting from applying the 4% income rule.

⁴ For information on life expectancy see: <http://www.worldlifeexpectancy.com/your-life-expectancy-by-age>

The 4% rule is a simple rule of thumb used by some advisors to guide people planning for retirement: withdraw 4% of the initial capital balance each year (adjusted for inflation) and you have excellent odds of having enough money for 30 golden years.

The 4% rule has been criticized in recent years as being too generous in a low-interest-rate environment. But the examples we provide indicate that the income level for the 35-year horizon is very similar to those resulting from the 4% rule. But, as stated previously, our analysis does not incorporate the uncertainty of future returns, among other factors. This may explain our favourable results. In document 5e, we will relax this assumption, but for now let's accept the assumption of stable returns.

**THE AMOUNT OF SAVINGS REQUIRED
TO GENERATE \$30,000 OF REAL
AFTER-TAX INCOME**

The following table presents the annual income resulting from investing \$5,000 a year in a non-taxable account and \$7,500 in a taxable account. First, it is interesting to note that the real annual income is very similar in both accounts, despite the lower contributions to the non-taxable account. Tax-free return compounding is very profitable in the long run.

Non-Taxable	Real Savings	Longevity After Retirement				4% Rule
Years of Savings		20	25	30	35	
20	\$139,156	\$9,397	\$8,036	\$7,146	\$6,524	\$5,566
25	\$189,094	\$12,769	\$10,920	\$9,710	\$8,865	\$7,564
30	\$247,128	\$16,688	\$14,271	\$12,690	\$11,585	\$9,885
35	\$314,567	\$21,242	\$18,166	\$16,153	\$14,747	\$12,583

Taxable	Real Savings	Longevity After Retirement				4% Rule
Years of Savings		20	25	30	35	
20	\$183,780	\$11,127	\$9,299	\$8,089	\$7,233	\$7,351
25	\$241,567	\$14,626	\$12,223	\$10,633	\$9,507	\$9,663
30	\$305,044	\$18,469	\$15,435	\$13,427	\$12,005	\$12,202
35	\$374,773	\$22,691	\$18,963	\$16,496	\$14,749	\$14,991

Total	Real Savings	Longevity After Retirement				4% Rule
Years of Savings		20	25	30	35	
20	\$322,936	\$20,524	\$17,335	\$15,235	\$13,756	\$12,917
25	\$430,661	\$27,395	\$23,143	\$20,343	\$18,371	\$17,226
30	\$552,172	\$35,157	\$29,706	\$26,117	\$23,590	\$22,087
35	\$689,340	\$43,933	\$37,129	\$32,649	\$29,496	\$27,574

We may also be disappointed to realize that, to achieve this target of \$30,000 of real annual income, we must save for 35 years unless we expect a lower life expectancy. Furthermore, these results are based on a portfolio that generates stable yearly returns and has a 70% allocation to equities, even during retirement. The income penalty resulting from investing in a low-risk portfolio can be substantial over decades. For example, we could illustrate that an investor allocating his entire portfolio to fixed income during the accumulation and decumulation periods would, under the same scenarios as above, extract a yearly income that would be only 35% to 55% of the income stated above. Furthermore, a single-asset-class portfolio cannot extract any excess return from the rebalancing process. Thus the assumption of a 0.25% long-term return linked to rebalancing must be removed. As we explained in the section "Why Saving Is Important", retirement is, for most individuals, the most expensive objective and it requires the most planning. Investing in an excessively conservative portfolio for decades simply compounds the challenge.

Planning for retirement is complex and involves incorporating many variables into the analysis. This document concentrates on some of these variables but many more must be considered. For example, we have ignored potential access to other sources of retirement income, the possibility of receiving an inheritance, pooling financial resources with a partner, the existence of a current pool of savings, and more effective tax management. An actual portfolio should also have more style diversification in order to better balance risks and increase the effectiveness of the rebalancing process. Finally, we have also ignored the fact that there is tremendous market uncertainty. Returns on assets are not achieved in a straight line (financial crises do occur), and retirees may need some risk-mitigating strategies to avoid outliving their savings, especially if they have no access to other financial resources. This is the topic of the next document, and it is a vital issue.



CFA Societies
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INVESTMENT PRINCIPLES

INFORMATION SHEET FOR CFA PROFESSIONALS

EVALUATING YOUR FINANCIAL NEEDS

FINANCIAL RISKS, RISK MITIGATION, AND COMMON SENSE



5E

IMPORTANT NOTICE

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- Investment brokers
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- Scholarship plan dealers
- Exempt market dealers
- Portfolio managers
- Investment fund managers
- Life insurance agents
- Financial planners (F.Pl.)



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FINANCIAL RISKS, RISK MITIGATION, AND COMMON SENSE

It is much easier to build a retirement program on the assumption that real portfolio returns will be stable. The reality is somewhat more complex, as both the level of long-term portfolio return and its volatility are unknown. Moreover, the risks investors face during the accumulation and decumulation periods vary: financial risks have greater consequences toward the end of the accumulation period and during the retirement period.

For example, the impact on total financial wealth of an economic and financial crisis that occurs 15 years before retirement can most likely be reversed by the time retirement occurs. Furthermore, an individual may still have the option of working a few more years to make up for any losses if the projected wealth accumulation is not met. It is not a happy prospect but the opportunity may still be available. But imagine the situation of an individual who, in 2007, had

planned to retire two years later and was setting the process in motion. Would the 2008 financial crisis have forced him to reconsider his entire plan at this crucial moment? Was it even too late to reconsider? Also, consider an individual facing the same financial crisis at the beginning of his retirement. Would this investor have panicked and sold part of his equity exposure just before the equity markets reversed course?

The financial environment toward the end of the accumulation period and especially during the first 10 years of the retirement period has a tremendous influence on the sustainable level of retirement income. Fortunately, part of this uncertainty can be managed with common sense, appropriate risk-mitigating methodologies, and the use of other financial products, such as annuities and life insurance.

THE TWO CHALLENGES FACED

BY RETIREES

Retirees face two significant challenges. First, real returns on government bonds are currently low by historical standards. For example, the 4% rule, which consists of cashing-in an income amount indexed to inflation equal to 4% of original wealth, was established when real returns on Treasury bonds were as high as 2.6% on average.¹ But in recent years real returns on Treasury bonds have been much lower. Periods of negative real returns have even been observed. Lower real returns on safe assets affect expected fixed-income and equity performance alike. In the case of bonds, this situation leads to lower income yield. In the case of equities, it affects the expected capital gains. Finally, we cannot, with any

certainty, make the argument that real returns on Treasury bonds will eventually rise to long-term historical levels. In fact, recent research indicates that structural forces may have reduced real returns for the foreseeable future.

Second, even if we are right about long-term return expectations, market volatility significantly reduces our ability to maintain a stable income during retirement. Consider the two following scenarios. An investor has \$1 million in assets and expects to receive a stable real income (inflation adjusted) each year for 30 years. The compounded portfolio returns are 6% in each case but the patterns of performance are different. Yearly inflation is stable at 2%. The following table presents the return assumptions and the real annual investment income that the investor could expect from his portfolio.

	Scenario 1	Scenario 2
Nominal Return Year 1	-40%	6%
Nominal Return Years 2 and 3	29.1%	6%
Nominal Return Years 4-30	6.7%	6%
Compounded Return	6%	6%
Sustainable Real annual Income	\$49,195	\$57,280

In scenario 1, a financial crisis leads to a 40% loss in the first year. A performance of 29.1% is recorded in each of the following two years, allowing the portfolio to regain the 40% loss on a compounded basis at the end of the third year. Performances of 6.69% are recorded in the following years, leading to a 6% compounded return over 30 years. In scenario 2, the return was stable each year. Despite the fact that both scenarios have identical long-term compounded returns, the higher-volatility scenario leads to a 14% lower level of income. Retiring at the start of a bear market can be a catastrophic scenario. As we will see, the consequences can be even worse.

The analyses that follow concentrate on the decumulation period. We assume a new retiree has accumulated \$1 million, divided equally between non-taxable and taxable accounts. His income plan assumes a life expectancy of 30 years after retirement. Three portfolio allocations are considered: 30-40-30 (fixed income, domestic equities, and foreign equities); 50-30-20; and 70-20-10.² We will refer to these portfolios as Growth, Balanced, and Conservative. Assumptions about long-term expected returns, total fees (1.0%), and taxes are as specified in document 5d. But we also consider the uncertainty of returns. The following table presents the annualized expected long-term real return after fees and taxes and the expected volatility for each portfolio allocation.³ Volatilities are based on actual experience since the late 1970s.

	Growth	Balanced	Conservative
Expected Real Return	2.5%	1.7%	0.9%
Expected Volatility	11%	9%	8%

¹ Finke, M., Pfau, W.D., and Blanchett, D., "The 4% Rule is Not Safe in a Low-Yield World", 2013.

² Actual portfolios should include a diversity of styles to reduce risk and improve the efficiency of the rebalancing process.

³ To simplify, the real-return estimate is a blended rate combining the expected after-tax return for the taxable portfolio and the untaxed return for the non-taxable portfolio.

EVALUATING YOUR FINANCIAL NEEDS

Financial Risks, Risk Mitigation, and Common Sense

5E

The analyses are based on a series of Monte-Carlo simulations (10,000 runs for each situation). Thus each simulation is based on 10,000 scenarios of 30 annual portfolio returns obtained from a distribution having the expected returns and volatilities specified in the table.⁴ Our objectives are simple. First, we calculate the expected annual real income that can be sustained for 30 years, assuming a stable real return of 2.5%. Then we integrate return uncertainty to determine:

- the likelihood that the expected income derived from a stable real return cannot be sustained;
- the probability that the 4% income rule cannot be sustained; and
- the specific impact of the return pattern on the level of sustainable income.

Assuming a constant real rate of return of about 2.5% (resulting from the Growth allocation), an individual with a \$1 million

portfolio (half untaxed) could extract a real after-tax income (inflation-adjusted) of about \$47,000 a year for 30 years before running out of money (or 4.7% of the initial wealth). Therefore, let's assume this is the income the retiree wishes to cash out every year. Let's also assume that the retiree maintains the same income amount whatever the asset allocation he has selected, in order to understand the consequences of running a low-risk portfolio while maintaining a high level of income.

The following figure presents the proportion of the targeted level of income of \$47,000 the retiree can expect to receive in the presence of return uncertainty in order of worst to best scenarios. We have excluded from the figure the worst 2.5% and the best 2.5% of scenarios (so 9,500 scenarios are left) in order to avoid discussing extreme tail circumstances. The same information is presented for all three portfolio allocations. We can conclude the following:

SUSTAINABLE INCOME (LEVEL AND PROBABILITY)



⁴ For the purpose of the simulation, the returns specified in the table (which are real compounded returns) are converted to nominal (inflation-adjusted) periodic returns.

Assuming a Growth allocation, there is about a 50% probability (see B in the figure) that an income level greater than the target amount (100% of \$47,000 or more) can be sustained, hence a 50% probability that it cannot. There is also substantial downside risk. Although unlikely, some return scenarios could lead to a sustainable level of income that would be only half as much. Similarly, there is about a 25% probability (see A) that the sustainable level of income would be 80% or less than the targeted level. In these situations, if the retiree were to maintain the targeted level of income, he would run out of money well before the end of the 30-year period.

- If the portfolio is invested more conservatively while the income target is maintained, the probability of not meeting the target rises to 68% (see C) and 82% (see D) for the Balanced and Conservative portfolios, respectively. We must conclude that the target income amount must be coherent with the investment strategy.
- Even though the more conservative allocation lead to a more stable expected outcome, surprisingly, the worst-case results are not necessarily better. Although the Growth allocation is riskier, it offers better odds of achieving a specific level of lower income. We must conclude that the give-up in expected return resulting from a more conservative allocation has a significant impact on income over a period as long as 30 years. If risk is defined as the probability of not achieving a real retirement income of \$47,000, then the more conservative allocation is actually riskier.

Consequently, we must also conclude that a withdrawal rate of 4.7% is imprudent, whatever the risk of the portfolio. We also tested the failure rates that would result from applying the 4% income rule. They are respectively 32%, 43%, and 59% for the Growth, Balanced, and Conservative allocations. Even a 4% withdrawal rate appears too high if the objective is to have a low probability of running out of assets.

As discussed previously, we are also interested in understanding the role played by the pattern of returns in explaining the sustainable level of yearly income. When a

simulation is used, the results are affected by at least two factors:

- The compounded return realized over the entire horizon. Is it more or less than was expected?
- The pattern of returns that leads to each compounded return. How many return shocks occurred and when did they occur?

In other words, we could be right about the long-term compounded return of the portfolio but still fare miserably because of the specific pattern of return, or we could benefit from a more stable return pattern but be wrong about the long-term compounded return.

To isolate the importance of the pattern of returns, we ran the simulation for the Growth portfolio a second time but forced each set of return scenario to produce a real return of exactly 2.5%. Thus, whatever the volatility and pattern of returns generated by the simulation, the average compounded real return after fees and taxes over 30 years was 2.5%. We then compared these results with the unconstrained simulation.

The results (not given) show that the pattern of returns is more important than the level of long-term return. On average, 40% of the income gaps of unfavourable scenarios is explained by lower-than-expected real rates of return while 60% of the deficiencies can be attributed to the patterns of returns.

The simulations also show that the average portfolio returns observed during the first 10 years for the worst 25% of scenarios are a full 2% below those of the final 20 years for the same scenarios, thus illustrating that performances during those first 10 years have a significant influence on financial well-being.

A complete financial planning exercise needs to account for both the level of compounded annual return as well as its pattern. Moreover, our analysis demonstrates the importance of managing the possibility of unfavourable patterns.

HOW TO APPROACH THE UNCERTAINTY ISSUE?

To answer this question, let's clarify one aspect. In theory, there is a way not to ever run out of income but the approach may not be pleasing to retirees or implementable in real life. But the explanation will help the discussion that follows. Let's assume we invest according to the Growth portfolio allocation and use the assumption of a long-term 4.5% compounded nominal return (2.5% real return net of fees and

taxes + 2% inflation). As stated previously, if the real rate of return were constant, a real income level of \$47,000 could be sustained. But we cannot count on real returns to be stable or on the expected long-term real return to be exactly met. The following table illustrates two series of returns for five years. The first series assumes a stable nominal return of 4.5% while the second assumes a financial crisis followed by a recovery. The cumulative value of a \$1 investment is also presented in both cases and the two values are equal after five years.

	Stable Return		Crash Scenario		Ratio	Income Amount
	Real Return	Cumulative Value	Real Return	Cumulative Value		
Year One	4.5%	\$1.045	-20.0%	\$0.800	77%	\$36,220
Year Two	4.5%	\$1.091	-15.0%	\$0.680	62%	\$29,470
Year Three	4.5%	\$1.141	25.0%	\$0.850	75%	\$35,261
Year Four	4.5%	\$1.193	25.0%	\$1.063	89%	\$42,190
Year Five	4.5%	\$1.246	17.2%	\$1.245	100%	\$47,291

The table shows that, after one year, the markets delivered only 77% of the cumulative value that was expected. After two years it was 62%. Only after five years did the cumulative value match the long-term return expectation. A way to avoid ever running out of income would be to cash-in annually a level of income equal to the targeted amount times the ratio of targeted cumulative value that was achieved. Obviously, not all retirees have the flexibility of accepting a lower level of income. Furthermore, reducing income by more than 30% may simply not be feasible. But a combination of three approaches could be used to reduce the likelihood of running out of income in our lifetime.

First – Common Sense

It is impossible to accurately forecast expected returns and patterns of returns no matter how hard we try. What we know is that today's low real rates of return on Treasury securities are a good indication that asset returns are likely to be less than they have been historically. Investors in today's financial markets may find they need a greater allocation to corporate bonds and equities to achieve the returns they need to meet their income objective. Furthermore, we have to remain realistic both in terms of risk and expected returns. We should

not overstate what can reasonably be expected in terms of retirement income.

Thus, the expected long-term real return on our investment portfolio must be reasonable and account for current market conditions. If the real rate of return on Treasury bonds is low and if the price-earnings ratio on equities is abnormally high (see document 3b), it would be difficult to foresee high average long-term returns for these assets. Furthermore, the impact of fees and taxes must be incorporated.

Second, as with any financial project, a reasonable buffer should be considered from the start. The real income target must be less than what is derived from an estimated average real return. For example, being able to tolerate a 20% decline in income during difficult periods will reduce the likelihood of exhausting the portfolio by about half. Hence a 50% likelihood of exhausting all assets is reduced to 25%. It may seem like 20% is a lot, and it is, but nevertheless we should plan our expenses to account for such possibilities. But if adverse financial conditions reverse themselves, the reduction in income could be re-evaluated.

Second – Alternatives to an Investment Portfolio Only

Investors who wish to reduce the impact of worst-case scenarios should consider income alternatives other than their investment portfolio. These alternatives imply taking advantage of instruments whose pricing is based on expected longevity, such as annuities and specific types of life insurance.

Pfau (2015) has done interesting work on the role that the Single Premium Immediate Annuity (SPIA) and Whole Life Insurance can play in a retirement strategy.⁵ In his analyses, he compares three options:⁶

- Option 1: Investment Portfolio + Term Life
- Option 2: Investment Portfolio + Joint Life (couple) SPIA + Term Life
- Option 3: Investment Portfolio + Single Life SPIA + Whole Life.

Using a Monte Carlo simulation, he presents the expected wealth distribution at retirement (age 65) for individuals currently aged 35 and 50, although the discussion that follows is limited to the first case. He then estimates the distribution of total income from all sources at age 66 as well as the legacy wealth at age 66 and 100. As should be obvious, purchasing insurance reduces the ability to grow the investment portfolio during the accumulation period and purchasing an annuity reduces the size of the investment portfolio during the decumulation period.

Option 2 or option 1 – which is better? Because the payout on an SPIA is largely dependent on expected longevity, the contractual payout rate per dollar of purchased annuity is fairly high at 6.7% for a single life and 5.6% for both.⁷ But part of the high payout is explained by the fact that it is not inflation-adjusted. For example, in our previous example, we assumed that the real income payout rate on the investment portfolio would be 4.7% if we assumed a stable 2.5% real return. If we remove the inflation adjustment, the nominal income payout rate will be 6.1%. Assuming that the insurance company stays in business (government guarantees on annuity contracts are usually not offered), the payout received under the annuity contract will be as specified for as long as the individual or both spouses live, whereas the one expected under the investment portfolio remains uncertain and lower in most cases. But the drawback is that an annuity leaves no legacy wealth.

The results show that a strategy that combines an investment portfolio and an SPIA can improve the total income during retirement at the expense of less legacy wealth. This may help create the return buffer that was discussed in the previous document.

Option 3 or option 2 – which is better? Option 3 replaces the joint-life SPIA by a single-life SPIA because of the existence of a Whole Life policy purchased when the retiree is 35 years old. Thus the payout ratio on the annuity is higher, and the spouse is protected and compensated against adverse events through the Whole Life policy. The Whole Life policy offers a minimum death benefit that will grow over time, its premium is eventually covered by the policy dividends, and its cash value also increases over time. Since the Whole Life policy acts as a sort of fixed-income asset, the asset allocation integrates this aspect, meaning the investment portfolio is more heavily weighted with equities.

The results show that option 3 has income benefits similar to those of option 2 but the legacy impact is much more significant. In some cases, it is even greater than with option 1.

Financial innovation may give rise to other insurance-type products that could be more appropriate. The point we have tried to make is simply that introducing some insurance products in combination with an investment portfolio can help mitigate the risk of outliving one's savings.

Third – Risk Management

This is an aspect that is not well covered in the literature. We have long made the argument that it is difficult to forecast asset returns, but we also argued in document 3f that effective rebalancing approaches improve compounded returns. Some rebalancing approaches are risk-based. These approaches rely on forecasts of volatility and dependence (correlations) to manage total portfolio risk (allocation).

For example, some rebalancing approaches seek to maintain constant portfolio volatility, whereas others seek to cap portfolio volatility at a maximum level. Finally, unlike return forecasts, which have proved to be unreliable most of the time, risk forecasts have proved to be much more accurate. Eventually, these approaches could be used to help manage the risk of decumulation.

⁵ Pfau, W.D. (2015), "Optimizing Retirement Income by Combining Actuarial Science and Investments," One America Financial Partners.

⁶ Going through all the details of these analyses is beyond the scope of this document; interested parties should read the Pfau article.

⁷ It is worth noting that Pfau assumes in his analyses that the annuity payout rate is 1% above the rate available on average in early 2015 because he makes the assumption that the real rate on Treasury bonds will be at least 1% higher in 30 years when the 35-year-old individual retires.

The Role of Target-Date Funds

Target-date funds (TDFs) are investment funds that invest in a mix of assets and gradually shift the asset allocation to gradually reduce market risk as each individual approaches his target retirement date. For example, such funds may have an allocation to equities as high as 80% or more when the investor is 20 years from retirement, but the allocation may be reduced to about 50% as the investor approaches retirement, and it may be further reduced after retirement (in the case of TDFs that offer postretirement solutions). Thus these products assume that the main determinant of strategic asset allocation is the time to retirement or the time after retirement.

Of course, TDFs still leave the investor exposed to a significant financial crisis close to retirement (assuming the equity allocation is about 50% or perhaps more), and the expected return on the portfolio will decline over time and could become fairly low after retirement. These products usually

do not take into account the fluctuations in market risk over time nor do they usually incorporate investors' specific characteristics related to risk tolerance, life expectancy (which may vary according to lifestyle and current health situation, not only age and sex), and overall financial situation. For example, it remains to be proved that simply reducing equity exposure over time is the best long-term risk management approach for all investors. Nevertheless, some versions of these products have very low fees, and research has found that investors in such funds are less likely to react emotionally to market events. They are more likely to be stable investors and they tend to achieve much better performances than autonomous investors. Thus although it remains to be proved that target-date funds are the best solution to retirement planning from a structural point of view, they may be an appropriate solution for many average investors. They provide low-cost, diversified portfolios that are systematically and periodically rebalanced.

Retirement planning is complex because there are so many uncertain variables, such as long-term expected returns, pattern of returns, inflation, longevity, health and taxation. We need to make appropriate, intelligent, and cost-effective investment plans because we need as much income buffer as possible to face the many uncertainties that lie ahead. In the end, it is all about appropriate expertise, proper planning, and common sense. Our ambitions must be consistent with our means.

This document completes our educational effort. It may be useful in this context to go back to the 10 investment principles investors should live by, which were stated in the opening document. These principles should now have significant meaning for all of us as investors and advisors.