CFA Societies Canada

INVESTMENT PRINCIPLES

INFORMATION SHEET FOR CFA PROFESSIONALS

WHAT TRULY MATTERS

INTRODUCTION

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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:

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- Mutual fund brokers
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INTRODUCTION

5 Take full advantage of tax-saving opportunities and of any work program designed to match your savings. Nothing outperforms free money and untaxed returns.

6 Know yourself and do not assume more risk than you can emotionally handle. If you are extremely conservative, work with an advisor to try to overcome some of your fears. Being excessively conservative for 50 years will hurt you in the long run. By being too conservative and avoiding risk in the short term, you actually increase your long-term risk.

7 Have an understanding of the overall savings effort (in dollars) required to achieve your retirement goals. The estimate may not be as precise as you would like, especially if you are decades from retirement (there are so many unknowns), but it's a start and it will get more refined over time.

8 Do not assume that maintaining an investment portfolio and living on its income alone is your only income option. If you can live on less than 75% of your expected portfolio income, an income approach based solely on an investment portfolio may be acceptable; but otherwise you might want to consider other retirement products to help mitigate extreme risks.

9 Even if your strategy is well designed at the outset, it may need some adjustments to reflect lifestyle changes; but otherwise you should resist the temptation to invest in new products that performed well recently. It is preferable to plan rather than to react. As you will learn, past performance provides no indication of future performance. Good performances over a short horizon may be explained by nothing more than good luck.

10 Even though there is tremendous value in having a trusted and competent advisor, investors should avoid paying too much for investment products and advice. It is conceptually preferable to pay 0.25% instead of 2% in total fees, but in between these two alternatives there is an option that will confidently bring you closer to your goal of a well-advised and more comfortable retirement. Furthermore, you should understand that the role of an advisor is to help you plan your retirement and stay the course, not to make forecasts.

There is also an added consideration that is of the utmost importance. Research shows that our ability to benefit from learned skills and knowledge declines in our 60s, and our ability to solve new problems starts declining even before, as early as our 20s. Slightly more than 50% of individuals in their 50s had the right answer to the question "If five people all have the winning lottery numbers and the prize is two million dollars, how much will each of them get?" but fewer than 10% for individuals in their 90s did.[1] A degree of cognitive impairment without dementia affects nearly 30% of individuals in their 80s and 40% of those in their 90s. Cognitive changes explain why basic financial literacy skills decline, on average, when we are in our 60s. And this process worsens gradually in our 70s, 80s, and 90s. As we age, we are less likely to make rational and informed decisions and, unfortunately, more prone to be taken advantage of.

All these factors make a **trusted** credentialed advisor and proper planning while the investor is still cognitively healthy even more important as we age.

The Future of Finance starts with proper education and a relevant body of financial knowledge. These 17 documents are is meant to support this effort.

Jacques Lussier, CFA

[1] Agarwal, S., Driscoll, J. C., Gabaix, X., and Laibson, D. (2009), The Age of Reason: Financial Decisions over the Life Cycle with Implications for Regulation, Brookings Papers on Economic Activity.

WHAT TRULY MATTERS

A well designed retirement plan has an important and lasting impact on the standard of living of individuals at retirement. It improves the income they can expect from their accumulated savings by as much as a third or even more. Yet, it is a process fraught with difficulties and uncertainties. For example, even if we set specific income goals for retirement, it is difficult to estimate how savings capabilities will evolve and what investment returns financial markets will deliver. In addition, there are complexities related to the long-term impact of taxation of investment income, investment fees, asset allocation, risk, inflation, family obligations, and so on.

The purpose of this book is to demystify the most significant aspects of retirement planning. Even if all the concepts that will be discussed are understood, the task of implementing and integrating all this knowledge in the specific context of one individual (each of us is unique) is a tremendous challenge, even for experts. For that reason, appropriate tools (software) are normally required to support advisors and investors.

The relevant material is covered in 17 documents. These documents explain the 10 principles investors should live by:

1. Start early and understand the power of compound returns. Waiting is extremely costly.

2. Understand the mechanics of asset returns. Low current yields indicate low future returns. We should not be fooled by historical performances.

3. Build a portfolio that is diversified in terms of asset classes (and risk factors), geographic regions, and management styles. Understand the impact of your own currency on diversification benefits and portfolio allocation.

4. Implement a rebalancing strategy and remain consistent and disciplined. Consider more effective rebalancing strategies as you become more knowledgeable and confident.

THE AGENDA OF ALL 17 DOCUMENTS

SECTION 1 - WHY SAVING IS IMPORTANT

SECTION 2 - THE POWER OF COMPOUNDED RETURNS

2A - THE IMPACT OF TIME AND PERFORMANCE

2B - THE IMPACT OF VOLATILITY

SECTION 3 - THE BENEFITS OF DIVERSIFICATION

3A - HOW DIVERSIFICATION REDUCES RISK AND ENHANCES COMPOUNDED RETURNS

3B - THE FACTORS THAT DRIVE ASSET RETURNS AND THE EFFICIENCY OF DIVERSIFICATION

3C - DIFFERENT WAYS PORTFOLIOS CAN BE DIVERSIFIED

3D - THE IMPACT OF THE CURRENCY AND COUNTRY OF ORIGIN ON GLOBAL DIVERSIFICATION REQUIREMENTS

3E - THE ACTIVE-PASSIVE DEBATE

3F - HOW TO REBALANCE

SECTION 4 - ISSUES AFFECTING BENEFITS

4A - THE IMPACT OF FEES

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SECTION 5 - EVALUATING YOUR FINANCIAL NEEDS

5A - THE ROLE OF ADVISORS

5B - UNDERSTANDING MY RISK PROFILE

5C - BUILDING A PORTFOLIO

5D - HOW MUCH MUST BE SAVED TO RETIRE WELL

5E - FINANCIAL RISKS, RISK MITIGATION, AND COMMON SENSE

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WHY SAVING IS IMPORTANT

1

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WHY SAVING IS IMPORTANT

We save for two reasons. First, life is full of unpleasant uncertainties. For example, 80% of adults will struggle at some point in their lives with joblessness or near poverty issues. An emergency fund can make all the difference when a person is trying to live through a difficult situation and facilitate a transition. Second, we must plan for many circumstances. We may have important life goals that we want to achieve, such as funding our children's higher education or preparing for a comfortable retirement. In the end, saving is about managing current consumption to fund future consumption. It is a great challenge because our social environment constantly tempts us to spend as much as we earn and to take on more debt than necessary. Spending is easy but saving is hard; and, as with any good habit, getting started is the toughest part.

SAVING FOR EMERGENCIES

None of us want to think about the possibility that we could be out of a job, encounter a medical emergency or face unexpected expenses, such as helping a family member in need. Despite the social safety nets designed to help with some of these circumstances, such as unemployment insurance, they are often not enough and not timely enough. We should avoid having to borrow to cover living expenses. At a minimum we must have the ability to cover three to six months of living expenses to deal with life's unexpected and unfortunate challenges.

SAVING TO MEET IMPORTANT LIFE GOALS

Saving for emergencies is essential but it is still a minor part of our overall financial needs. We must also prepare for several life goals to enhance our future quality of life and that of our loved ones. This process is more complex than building an emergency fund because it requires a planning effort that can extend from several years to several decades. For example, we may save to accumulate a down payment on a house, fund our kids' higher education, or plan for a comfortable retirement. Saving for retirement requires the most extensive planning, for the following reasons:

- It is usually the most expensive goal to achieve;
- It is often the most distant goal. It can begin as much as 35 years before retirement. Furthermore, appropriate planning is still required after retirement, a period that can last more than 20 years;
- There is significant uncertainty in terms of investment returns on our capital during this entire period. Individuals who started saving in the early 1980s benefitted from a favourable return environment for nearly 20 years, but it has been more challenging for those who started saving in the 2000s;
- Life expectancy is uncertain. Retirement planning must account for the possibility that we may live much longer than the average life expectancy. Furthermore, the level of financial need will be affected significantly by our health, which is almost impossible to foresee;
- Other intermediate goals, such as funding higher education, compete for each dollar of savings.

Retirement is an expensive goal, so it requires a more aggressive investment portfolio than would usually be appropriate for short-term goals. Otherwise, the amount of savings required to achieve a comfortable retirement can be substantially and unnecessarily higher. That being said, because the planning horizon extends over several decades, a riskier portfolio is financially tolerable if the investor can sustain the anxieties caused by losses over the short or medium term, especially if risk mitigating strategies are incorporated. Without a doubt, a well-managed financial plan greatly improves the odds of achieving our goals and helps manage our anxieties.

We save partly because we cannot predict with certainty. We simply cannot forecast all future circumstances. Furthermore, we cannot save appropriately if we do not have the discipline to do so. A good step toward achieving the required discipline is to better understand the importance of planning for the future and the consequences of not doing so. Despite the importance of this matter, the great majority of individuals are ill-equipped to deal with financial issues. For many, retirement is such a faraway eventuality that they simply do not care enough. They are making a huge mistake. The documents that follow are meant to demystify the challenges of saving and investing for retirement and show how you can do it better while avoiding common mistakes.

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INVESTMENT PRINCIPLES
INFORMATION SHEET FOR CFA PROFESSIONALS

THE POWER OF COMPOUNDED RETURNS

THE IMPACT OF TIME AND PERFORMANCE

2A

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THE IMPACT OF TIME AND PERFORMANCE

We save and invest to accumulate wealth so as to achieve an appropriate standard of living in retirement. Many factors affect the accumulation of wealth. Three of these factors are discipline (saving consistently), time (how long we save), and investment performance (what periodic return is achieved on average). Einstein called compounded interest the "most powerful force in the universe" and with good reason. Wealth accumulation not only increases with time and with greater returns, but it also increases at an accelerating pace.

A Simple Example

Let's consider a single investment of $1,000 invested for four years at an annual rate of return of 3% or 6%. At this point, we do not care whether the return comes from interest, dividends, or capital gains. Let's assume it consists of interest. The following table shows how the value of the investment increases after each year.

	YEARLY RETURN = 3%		YEARLY RETURN = 6%	
Time	**Capital**	**Interests**	**Capital**	**Interests**
Now	$1,000		$1,000	
Year One	$1,030	$30	$1,060	$60
Year Two	$1,060.90	$30.90	$1,123.60	$63.30
Year Three	$1,092.73	$31.83	$1,191.02	$67.42
Year Four	$1,125.51	$32.78	$1,262.48	$71.46

The power of compounded returns implies that, as time passes, the investor not only collects interest income on the initial amount of capital invested but will also collect interest income on all interest payments accumulated in previous years. For example, when the investment return is 3%, the yearly interest income increases from $30 in year one to $30.90 in year two, $31.83 in year three and then $32.78 in year four. Not only does interest income increase with time but it also rises at an increasing pace. If the yearly return is 6%, the power of compounded interest is proportionally more significant. Twice as much return implies more than twice the accumulation of capital.

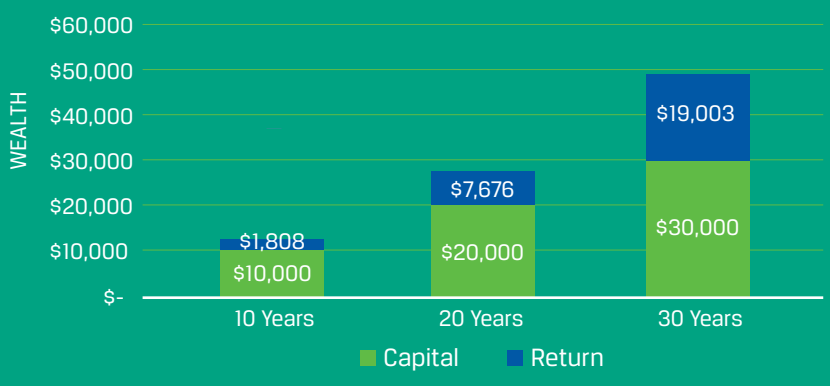
A MORE COMPLETE EXAMPLE

Let's now consider the more realistic example of a periodic investment of $1,000 a year (made at the beginning of the year) at an annual rate of 3% over 10 years. In this case, the final wealth would be $11,808 and it can be attributed to two components:

- $10,000 resulting from 10 capital contributions of $1,000 (84.7% of final wealth); and
- $1,808 resulting from the interest income accumulated over 10 years (15.3% of final wealth).

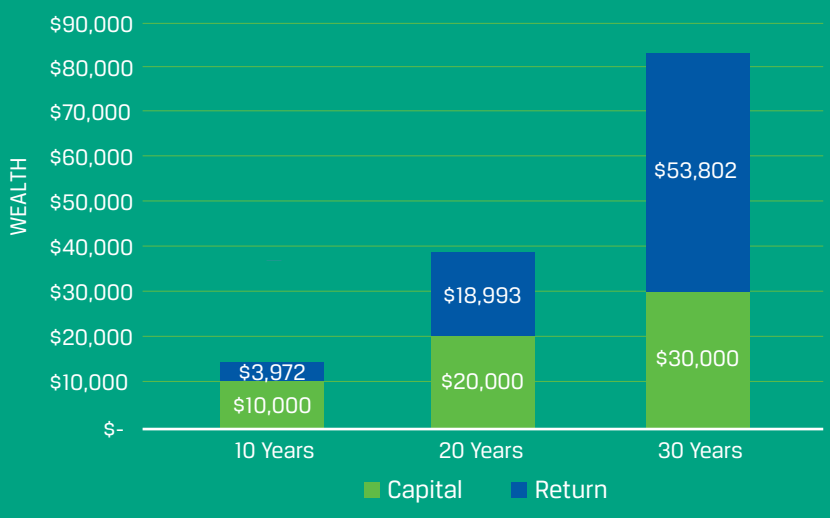
The power of compounded returns also implies that the share of total wealth accounted for by the accumulation of investment income will increase when returns are higher. Furthermore, this share will increase even faster with the passage of time. The two following figures illustrate the impact of compounded returns on final wealth for three horizons (10, 20, and 30 years) and two levels of investment returns (3% and 6%). We maintain our assumption of a $1,000 yearly investment.

SOURCES OF ACCUMULATED WEALTH AT 3% RETURN



The first bar chart shows that, if the annual investment return is 3%, the proportion of the final wealth provided by the accumulation of interest income increases from 15.3% ($1,808 over $11,808) when the investment horizon is 10 years to 38.8% ($19,003 over $49,003) when the investment horizon is 30 years.

SOURCES OF ACCUMULATED WEALTH AT 6% RETURN



The second bar chart shows that the effect of compounded returns is enhanced when returns are higher. For example, if the annual investment return is 6%, the final wealth provided by the accumulation of interest income increases from 28.4% ($3,972 over $13,972) when the investment horizon is 10 years to 64.2% ($53,802 over $83,802) when the investment horizon is 30 years.

There is also another important takeaway from these examples. We have shown that, when the investment horizon is 30 years, the investor will accumulate $49,003 if the investment return is 3%. If the investor starts the savings plan 10 years later (and reduces the investment horizon to only 20 years), she will need to invest $1,771 a year (instead of $1,000) to achieve the same final wealth of $49,003. If the investment return is 6%, the amount of annual savings required climbs to $2,149.

Saving early and regularly is paramount to achieve a better standard of living in retirement. The power of compounded returns increases with the average level of return on investment. Furthermore, this principle applies whether the source of return is interest, dividends, or capital gains. The saving effort required from investors increases significantly if saving starts later in life. Although realizing a greater rate of return on investment is desirable, the achievable return is determined by economic and market conditions but also by the investor's investment policy (how the portfolio is allocated and adjusted over time).

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THE POWER OF COMPOUNDED RETURNS

THE IMPACT OF VOLATILITY

2B

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THE IMPACT OF VOLATILITY

The power of compounded returns is often illustrated with the assumption of a stable periodic rate of return, such as 3% or 6%, every year. In reality, even if an investor realizes an average yearly rate of return of 3% or 6% during her investment horizon, this return is unlikely to be stable. We will show that the uncertainty of investment returns reduces the effectiveness of return compounding. Understanding this aspect will help explain, later on, the full benefits of diversification.

VOLATILITY AMPUTATES FINAL WEALTH

Given a choice, do investors prefer a rate of return of 10% each year for two years (scenario 1) or would they prefer a return of 20% followed by a return of 0% (scenario 2)? In both cases, the *average periodic return* (also called arithmetic return) is 10% ([10% + 10%] / 2 = [20% + 0%] / 2). But the final wealth at the end of the second year will not be the same under each scenario. It is $1,210 in scenario 1 for a total cumulative return of 21% while it is only $1,200 in scenario 2 for a total cumulative return of 20%.

	SCENARIO 1		SCENARIO 2	
Time	**Capital**	**Performance**	**Capital**	**Performance**
Now	$1,000		$1,000	
Year One	$1,100	10%	$1,200	20%
Year Two	$1,210	10%	$1,200	0%
Average Periodic Return		10%		10%
Total Cumulative Return		21%		20%
Average Compounded Return		10%		9.54%

Thus the *average periodic return* does not determine final wealth unless the variability of returns—usually referred to as volatility—is nil as in scenario 1. What determines final wealth is the *average compounded return* (also called the geometric return). For example, the total return in scenario 1 is 21% because:

$$(1 + 10\%) \times (1 + 10\%) - 1 = 21\%$$

In this example, 10% is both the periodic and the compounded return. But to achieve a total cumulative return of 20% in scenario 2, the average compounded return must be 9.54% because:

$$(1 + 9.54\%) \times (1 + 9.54\%) - 1 = 20\%$$

An important general principle of portfolio management is that "volatility drains the ability to compound returns and to accumulate greater final wealth." More specifically:

Average Compounded Return = Average Periodic Return – Adjustment for the Impact of Volatility

The greater the volatility of periodic returns the larger the performance drain. For example, the average periodic yearly return for the Russell 1000 Total Return Index from 1990 to 2014 was 11.50% whereas the compounded return was only 9.82%. The difference is due to the volatility of the Russell 1000s periodic returns.

The fact that volatility drains compounded returns has important implications for portfolio management. It will help us understand, later on, the benefits of diversification and why we often combine different asset classes, such as fixed income and equities, using target weights (for example, 60%/40%), the need to rebalance a portfolio allocation back toward the target when allocation deviations occur because of the relative performance of asset classes, and the benefits of managing and/or limiting volatility to avoid extreme scenarios of negative returns.

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THE BENEFITS OF DIVERSIFICATION

HOW DIVERSIFICATION REDUCES RISK AND ENHANCES COMPOUNDED RETURNS

3A

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HOW DIVERSIFICATION REDUCES RISK AND ENHANCES COMPOUNDED RETURNS

Advisors tell their clients they should own diversified portfolios. But why do we diversify and how does diversification help create better performing portfolios in terms of risk and performance? Diversification is not only about avoiding concentrated positions, which can lead to permanent losses, but it is also about achieving the highest average periodic return for a given level of volatility (or its flipside, which is achieving the lowest level of volatility for a given level of average periodic return). Diversification reduces the drain on compounded performance caused by the volatility of returns. But the benefits of diversification on risk and returns can be achieved only if diversification is used in combination with a rebalancing process.

THE CONCEPT OF DIVERSIFICATION

Diversification can be achieved on many different levels. Securities, sectors, asset classes, countries, portfolio characteristics, and even exposure to different types of risk factor (to be discussed in 3c) can be diversified. But the question we wish to answer in this document is not how to achieve an efficiently diversified portfolio in the real economy (that will come later) but rather, how does diversification reduce the risk of a portfolio while enhancing its expected return?

Of course, a basic tenet of diversification is not to put all your eggs in one basket. In recent decades, we have witnessed a large number of spectacular failures of what appeared to be well-established companies, such as Swissair, WorldCom/MCI, Tyco, Arthur Andersen, Enron, Nortel, and so on. But diversification is about much more than simply avoiding huge investment mistakes. To understand the benefits of diversification, it helps to characterize securities and portfolios according to two variables: average periodic

THE BENEFITS OF DIVERSIFICATION

How Diversification Reduces Risk and Enhances Compounded Returns

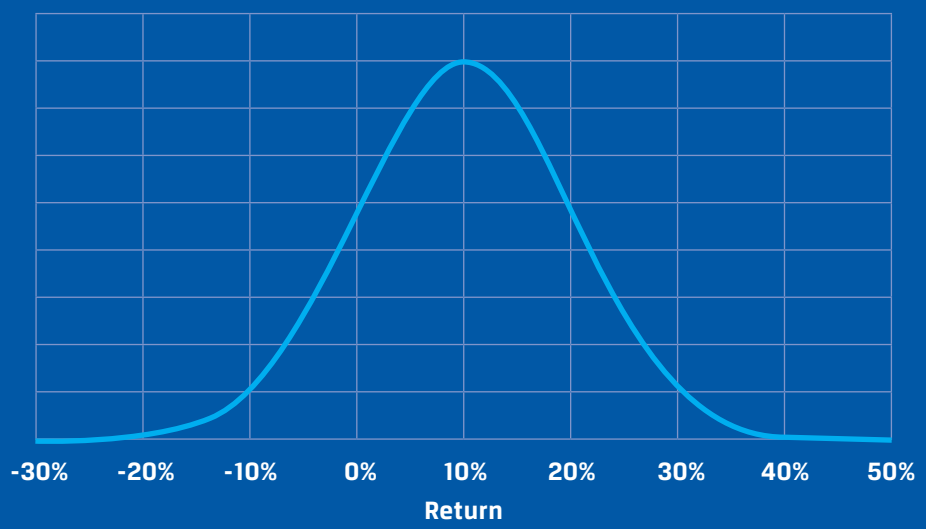
return and risk (as defined here by the standard deviation of periodic returns, which is referred to as volatility). Volatility is a simple measure of return dispersion around the average periodic return. It is computed with the following formula:

$$\sqrt{\frac{\sum_{t=1}^{T}(r_t - \bar{r}_t)^2}{T-1}}$$

where r_t, $\bar{r}_t$ and T represents respectively, the return observed during period t (in months, quarters, or years, etc.), the average of periodic returns, and the number of observations. But the equation is not as important as the implication of the results.

For example, let's assume the average return on a security is 10% a year and the volatility of the annual return is also 10%. If we assume that returns follow a normal distribution, a common simplifying assumption, then the measure of volatility captures all the risk, the distribution is centred at 10%, and the shape and density of the bell curve reflect the likelihood of observing specific periodic returns. As the shape of the distribution implies, we are much more likely to observe values that are closer to 10% than farther from it.

MORE SPECIFICALLY, THERE IS A:



- 68% probability that returns over a single period will be within one unit of volatility of the average (0% / 20%);
- 95% probability that returns over a single period will be within two units of volatility of the average (-10% / 30%);
- 99% probability that returns over a single period will be within three units of volatility of the average (-20% / 40%).

EXAMPLE WITH A BALANCED PORTFOLIO OF EQUITIES AND BONDS

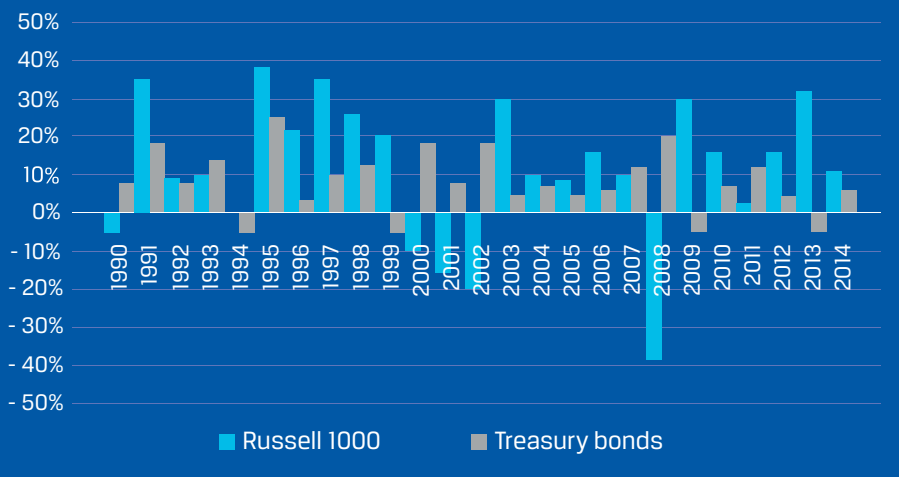
Let's illustrate the concept of diversification and its benefits using a portfolio of two assets over the period from 1990 to 2014. The first asset is an investment in the Russell 1000 Total Return Index and the second is an investment in a fixed-income portfolio consisting of 10-year U.S. Treasury bonds.

	ASSETS		PORTFOLIO
	RUSSELL 1000	TREASURY BONDS	60% RUSSELL / 40% BONDS
Periodic Return	11.50%	7.87%	10.05%
Compounded Return	9.82%	7.61%	9.54%
Volatility	18.49%	7.61%	10.63%

Equities being riskier than Treasury bonds, it is not surprising to observe that the volatility of equities is greater than that of Treasury bonds. In this case, investors were also rewarded for tolerating this greater volatility with a greater compounded return. But that is not always necessarily the case. Even though investors should normally be rewarded for assuming greater risks in the long run, accepting a higher level of risk offers no guarantee that greater returns will in fact be realized. Risk is always about the possibility that rational expectations will not be met. A greater average return on riskier assets is the investor's compensation for bad times. This matter will be discussed in document 3b.

Nevertheless, this example illustrates the benefits of diversification quite well. For example, although the periodic return on the portfolio (10.05%) is simply a weighted average of the periodic return on the two assets, the compounded return on the portfolio almost matches the compounded return on the Russell 1000 (9.54% versus 9.82%) despite having far less volatility (10.63% versus 18.49%). This raises two questions: why is the volatility of the 60/40 portfolio so low and its compounded return so high? The following figure presents the annual return for the Russell 1000 (in blue) and U.S. Treasury bonds (in grey) over this period. The greater volatility of equities is clearly apparent.

YEARLY RETURNS



The figure shows that equity and Treasury bond returns follow different patterns. Equity returns can be high (low) when Treasury bond returns are low (high). For example, in 2008, equity markets generated one of their worst yearly performances ever while Treasury bonds rallied substantially and had one of their best yearly performances. The reverse was observed in 2009.

These differences in return patterns are often expressed through a measure called correlation, which ranges from -1 to +1. A correlation of 1 implies that there is no diversification benefit because both assets move in tandem. The lower the correlation, the more efficient the diversification. In this example, the correlation between equities and fixed income is low at -0.28, which means it allowed diversification to be very effective at reducing portfolio volatility. Intuitively, we can understand that the correlation between equities and fixed income is likely to be lower than that observed between two bank stocks.

Furthermore, the volatility of a portfolio is less than the weighted average of the volatility of the two assets because of the imperfect correlation (less than 1). But why is the compounded return on the portfolio so high? In section 2b, we explained that volatility reduces an asset's compounded return. Although this is an approximation, we can show that it drains the compounded return by about half of the squared volatility (variance) of this asset. In other words:

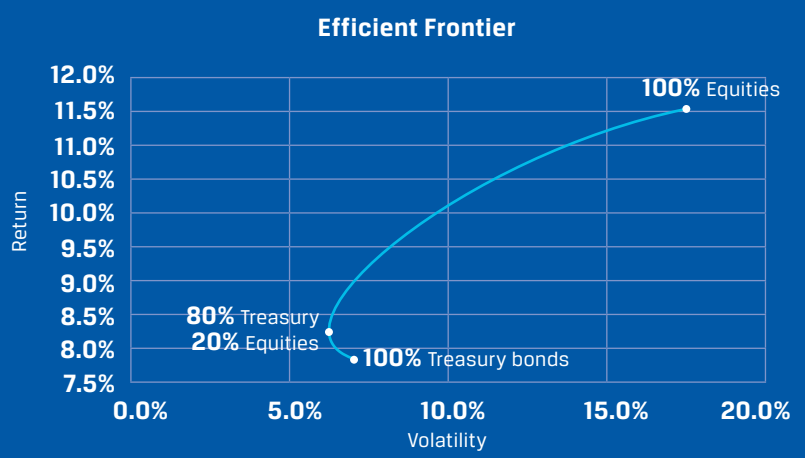
Average Compounded Return ≅ Average Periodic Return – Volatility^2/2

Let's consider the example of the Russell 1000. The difference between the periodic return and the compounded return is 1.68% and the square of the volatility (18.49%^{2}) divided by 2 is 1.71%, which is pretty close. If we do the same calculation for the 60/40 portfolio, we get 0.51% and 0.56%. The performance of the balanced portfolio benefits from the lower performance drain caused by its lower volatility. We now understand the full extent of the benefits of diversification. Diversification reduces risk and increases compounded returns per unit of periodic return because volatility has a direct negative impact on compounded returns. We now have two good reasons to diversify: to lower risk and to lessen the drain on compounded returns per unit of periodic return.

Finally, one crucial aspect of diversification is often overlooked: for diversification to reduce risk and to increase compounded returns as illustrated above, the portfolio has to be rebalanced. Without rebalancing, the benefits of diversification as a means of reducing volatility and increasing compounded returns are simply not fully realized in the long run. Although different rebalancing methodologies can be used, several are similarly efficient (to be discussed in 3f). In this example, we assume that the portfolio is rebalanced to its 60/40 target weight once a year. Thus, if equities outperform Treasury bonds during the year and their weighting increases beyond 60%, some equities will have to be sold and Treasury bonds purchased to bring the target weights back into line.

THE EFFICIENT FRONTIER AND ITS LIMITATIONS

The efficient frontier is a representation of the different portfolio allocations that allow investors to achieve the best returns for specific levels of risk. It is often used to show investors the benefit of diversifying assets. The following figure shows the different combinations of risks and returns that could have been achieved over the period from 1990 to 2014 if equities and Treasury bonds were combined in different proportions ranging from 0% to 100% equities.



The lowest point in the figure illustrates a portfolio with 0% equities while the highest point illustrates a portfolio with 100% equities. The figure also shows that some portfolios should conceptually not be owned. For example, a portfolio of 100% Treasury bonds had a lower return and a higher risk than a portfolio comprised of 80% Treasury Bonds and 20% equities. The investor's risk tolerance determines the appropriate allocation.

The concept of the efficient frontier is sound but its application in real life is difficult. Efficient frontiers are often built from historical returns and therefore from historical volatilities and historical correlations. Thus, the shape of the figure will be highly sensitive to the period used for the analysis. Investors are concerned with future returns, future volatilities, and future correlations, so efficient frontiers presented to investors can be misleading when it comes to selecting an optimal and appropriate portfolio mix. For example, even if the efficient frontier derived from the returns observed between 1990 and 2014 indicates that a 100% bond portfolio would have generated an average return of about 7.9% over this period, we can no longer expect such a performance in the coming years considering the current low level of interest rates. But this does not change the fact that diversification will reduce portfolio risk and contribute to higher compounded returns. Therefore, it remains essential to build portfolios that are as efficiently diversified as possible.

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THE BENEFITS OF DIVERSIFICATION

THE FACTORS THAT DRIVE ASSET RETURNS AND THE EFFICIENCY OF DIVERSIFICATION

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- Investment fund managers
- Life insurance agents
- Financial planners (F.Pl.)

CFA Montréal

THE FACTORS THAT DRIVE ASSET RETURNS AND THE EFFICIENCY OF DIVERSIFICATION

We often hear investors say that diversification failed to protect them during difficult circumstances. But to understand what makes diversification more or less successful, we must have a basic understanding of the factors that drive the return on assets. Even though this document only discusses the performance drivers of equities and fixed income, it can also help us understand what triggers low or high levels of correlations (co-movements) of returns between two assets and how to build more efficiently diversified portfolios.

WHAT DETERMINES EXPECTED RETURNS ON FIXED-INCOME ASSETS

Let's start by explaining what drives the performance of a bond if it is held to maturity. A traditional bond usually pays a fixed coupon (normally twice a year) and a principal amount at maturity. For example, how much would a marginal investor pay to own a corporate bond that pays a 5% coupon (let's say once a year, for the sake of simplicity) and a principal amount of $1,000 in 10 years? Asking what price the investor will pay for the bond is the same as asking what return the investor requires to own the bond. Conceptually, the investor should require a return that will compensate for:

- expected inflation, assuming 10-year inflation expectations are 2% on average;
- risks, such as credit risk (the risk that the coupons and the principal at maturity may not be fully paid if the issuer faces financial difficulties). There may also be other risks, such as liquidity risk (the risk that it may be difficult or expensive to sell the bond before maturity, if necessary) and duration risk (the fact that the price of a longer maturity asset is more sensitive to changes in the bond yield). Let's assume the bond risk premium is 1%; and
- real return, or the compensation that investors require in excess of inflation on a risk-free asset such as a Treasury bond. Let's assume the real rate is 1%.

In this example, the required rate of return would be 2%+1%+1%= 4%. Therefore, 4% is the rate used to discount all future cash flows on this bond. In this way, we can calculate the price at which this bond would trade in the market.

$$Price = \$1{,}081.11 = \sum_{i=1}^{10} \frac{\$50}{(1 + .04)^i} + \frac{\$1{,}000}{(1 + .04)^{10}}$$

The price is greater than the principal paid at maturity because the return demanded by investors is less than the coupon rate. 4% is also called the effective annual yield to maturity because, if an investor buys the bond at this price and holds it to maturity, he will realize an effective annual rate of return of 4% if all cash flows (coupons and principal) are paid fully and on time.[1] [2]

But what if the bond is not held to maturity? Let's assume the investor holds the bond for one year. In this case, the return is determined by the sale price.

$$Return = \frac{(\text{Sale Price} - \$1{,}081.11 + \$50)}{\$1{,}081.11}$$

The same factors that affected the current price will also determine the price a year from now. But a year from now:

- inflation expectations may have changed;
- the perception of the level of risk may have changed;
- the real return may have changed; and
- the maturity of the bond is now shorter by one year and this will affect pricing.

For all these reasons, the investor's return is unlikely to be the initial yield to maturity. The yield to maturity, a year from now, is likely to be driven up or down by higher/lower inflation expectations and/or risk premiums and/or real return.

Thus, returns over specific periods are largely dominated by changes in expectations, which will affect future prices. For example, let's assume inflation expectations are up or down by 1%, leaving all other factors constant. In this case, the yield to maturity of this particular bond after one year will be 3% or 5%. If the yield is 3% a year from now, the bond price will be $1,155.72. If it is 5%, it will be $1,000 because the yield is equal to the coupon rate. Assuming the investor sold his bond after one year on the basis of a 3% yield, his investment return will be:

$$11{,}53\% = \frac{(\$1{,}155.72 - \$1{,}081.11 + \$50)}{\$1{,}081.11}$$

But the return will be only -2.88% if the yield increases to 5%. Being wrong about future expectations can be costly.

These examples have shown that it is easy to forecast the return on a bond if it is held to maturity (assuming no default) but difficult to forecast its return if it is sold before maturity. But can we forecast the return of a bond fund or a bond index? To a certain degree we can. Let's assume a bond fund invests in Treasury securities with an average maturity of about 10 years. Each year, as the average maturity of the securities gets shorter, the manager sells some of the shorter-term securities to purchase longer maturity securities, thus keeping the average maturity of the bond fund fairly constant over time.

For example, between December 2004 and December 2014, the yield to maturity on 10-year Treasury bonds fell from 4.25% to 2.17%. If a manager had followed the strategy we just described, the yearly compounded return would have been 4.92%, somewhat higher than the initial yield to maturity. If, hypothetically, the yield to maturity had followed the opposite pattern over the same period (starting at 2.17% and ending at 4.25%), the yearly compounded return would have been 1.45%, somewhat lower than the initial yield to maturity. The reason is simple: if interest rates decline, bond coupons are invested at a lower rate of return but the price of the bonds we currently hold increases. The reverse occurs if interest rates increase.

[1] In reality, the industry standard is usually to express the yield to maturity as an effective semi-annual return (not annual) multiplied by two (to annualize). For example, the yield in this example is presented as a 4% annual effective yield. A 4% annual effective yield is equivalent to a 1.9804% semi-annual effective yield (taking into account the effect of interest compounding). Thus, according to the industry standard, the 4% effective annual yield presented in the example would in fact be expressed as a 3.9609% yield to maturity (1.9804% x 2).

[2] When the yield to maturity is used to express the return that will be realized, there is an implicit assumption that the coupons are reinvested at the yield to maturity itself.

In other words, the current yield to maturity of a bond fund or a bond index with an average maturity of about "X" years is a good indicator of the return (before fees) that will be realized over those "X" years. In a low-rate environment, this is an indication of low future returns.

WHAT DETERMINES EXPECTED RETURNS ON EQUITY ASSETS

Equities differ from bonds in the following ways:

- Common stocks have no maturity. For example, an equity index has implicitly an infinite maturity;
- Common stocks may or may not pay dividends, depending on a firm's profitability and dividend policy;
- Equity holders are paid dividends only after bondholders are compensated. Thus, equities are is riskier than bonds issued by the same firm.

But a rational investor looking at investing in equities would also require a return to compensate for expected inflation, real return, and various risk premiums related to investing in equities, such as market, value, momentum and liquidity (to be discussed later). Thus, with equities there are many more risk factors to consider, and the likelihood of being wrong about expectations is greater. It is also impossible to calculate a yield to maturity for a stock because there is no maturity and future dividends are not known. Therefore, investors often express the attractiveness of a stock by its price-to-earnings (PE) ratio, which is the ratio of price over corporate earnings. Several methods are used to calculate the PE ratio. For example, we may say that the S&P 500 Index trades at "X" times the earnings of the previous 12 months or the earnings projected over the next 12 months. When the PE multiple is high, it is likely that inflation expectations are low and/or that market risk is less of a concern for investors and/or that profit growth expectations are high. A low multiple would likely reflect opposite expectations for at least some of these factors. Thus, when market conditions appear good (bad), investors are willing to pay a higher (lower) multiple, which is the equivalent of requiring a lower (higher) yield.

To illustrate the role of changing expectations of equity returns, let's consider the following example, which explains the sources of the performance of the S&P 500 over two different but illustrative periods: 1979-1999 and 2000-2006.

RETURN ATTRIBUTED TO	1979-1999	2000-2006
Dividend	3.94%	1.63%
Growth in Earnings	5.71%	8.50%
Change in PE Multiple	8.23%	-9.00%
Total	**17.88%**	**1.13%**
PE Beginning and End	7.4-33.3	33.3-18.2
Dividend Growth rate	5.78%	5.53%

Equities had a tremendous performance from 1979 to 1999 and a dismal performance from 2000 to 2006. Surprisingly, the growth in earnings was greater after 2000 while the dividend growth rate was similar. Dividends did not explain much of the performance in either case. Much of the total performance was driven by a change in PE multiple.

In 1979, investors were willing to pay only $7.40 for each dollar of S&P 500 earnings whereas, in 1999, they were willing to pay $33.30, more than four times as much. This situation came to an abrupt end in 2006, when investors were willing to pay only $18.20. What happened? A change in PE multiples is the equivalent of a change in yield. It reflects changes in investor expectations. In 1979, investors were requiring a significant return to own equities because they were expecting high inflation and were concerned about market risk. In 1999, inflation expectations were very low and investors, rationally or irrationally, were less concerned about risk. Thus, the required return on equities was low, and equity prices (PEs) were very high. Prices came crashing down when investors became significantly concerned about risk as they reviewed the growth expectations for the information technology sector. Again, we see that future equity returns are largely affected by how right or wrong our current expectations are. When current market expectations are over optimistic (as in the late 1990s), they can lead to low future returns and vice-versa.

FACTORS THAT DRIVE HIGH AND LOW CORRELATIONS BETWEEN ASSETS

Now that we understand the main performance drivers of financial assets, it should become clear that two assets will have higher correlations if price fluctuations in both assets are caused by similar drivers. But correlations will be low if price fluctuations in either asset are explained by different drivers. For example, it is well known that returns on equities and fixed income were highly correlated in the 1970s, 1980s, and 1990s but that the correlation was low in the 2000s. The correlation of equities to Treasury bonds actually became significantly negative during the 2008 financial crisis. Why?

- In the 1970s, 1980s, and 1990s, changes in inflation expectations were significant and were a dominant performance driver. Equities and fixed income both benefitted from a decline in inflation expectations, which led to a strong correlation of returns between the two asset classes.
- In the early 2000s, PE multiples collapsed because investors required a significantly higher risk premium to invest in equities when they realized that the earnings expectations for the technology sector were unrealistic. Interest rates declined in response to monetary policy and growth concerns, so correlations were low.
- In 2008, almost all risky asset classes performed poorly, and diversification did not seem to work. A crisis of liquidity was triggered by significant global credit concerns. The contagion was widespread and led to a significant re-evaluation of economic growth around the world. As investors required higher compensation for risks in all regions of the world, all risky assets were hit at the same time. Only assets that were perceived as truly safe, such as Treasury bonds, emerged unscathed and provided diversification benefits. Treasury bonds rallied not only because inflation expectations declined but also because investors were so concerned about risky assets that they turned to Treasury bonds as a haven. This caused the real return to go down significantly, triggering a further rise in the price of Treasury bonds. Therefore, the correlation between risky assets and Treasury bonds was significantly negative during this period.

Diversification is about combining assets whose prices and required returns are driven by different sets of factors. Two bank stocks are more likely to be driven by a similar set of factors than are a bank stock and a technology stock. So are equities versus fixed income, commodities versus equities or bonds, and gold versus wheat.

Even so, in specific circumstances there are factors that will similarly affect many securities, asset classes, and even regions at the same time and reduce the effectiveness of diversification. Significant changes in inflation expectations and a large decline in global liquidity are two examples. It does not mean that we should not diversify but that we must do so wisely; but even then the effectiveness of diversification will vary over time.

Finally, some investors have unrealistic expectations of diversification. For example, we have just shown that equity returns are significantly more volatile than bond returns. They can easily be more than twice as volatile on average. But in a crisis, such as 2008, equity returns can temporarily be four or more times as volatile as bond returns. Therefore, if an investor owns a 60/40 equity-bond portfolio during a crisis, the volatility of the equity component will almost completely drive the portfolio's overall volatility. In such circumstances, more than 90% of total portfolio risk and return can be determined by what happens to the equity component. Therefore, investors must diversify wisely, consider their aversion to risk not only in normal times but also in bad times, and perhaps consider some of the risk mitigating strategies that will be discussed later.

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INVESTMENT PRINCIPLES

INFORMATION SHEET FOR CFA PROFESSIONALS

THE BENEFITS OF DIVERSIFICATION

DIFFERENT WAYS PORTFOLIOS CAN BE DIVERSIFIED

3C

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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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DIFFERENT WAYS PORTFOLIOS CAN BE DIVERSIFIED

A portfolio can be diversified in terms of securities, sectors, styles, asset classes, geography, currencies, levels of economic development, and even risk types (risk factors). This document explains diversification across asset classes, styles, and regions. It introduces the concept of diversifying across risk factors and explains the implementation challenges of such an approach. It also illustrates the importance of building broadly diversified portfolios.

DIVERSIFYING ACROSS ASSET CLASSES, STYLES, AND GEOGRAPHY

An asset class is generally defined as a broad group of securities or assets that offer similar characteristics, behave similarly in the marketplace, and are subject to the same laws and regulations. A more pragmatic definition would be a broad group of securities or assets that provide similar exposure to risk premiums and/or unique diversification benefits. The basic asset classes are equities, bonds, and cash equivalents. Commodities and real estate are often characterized as asset classes. Hedge funds are built around investment strategies that exploit risk premiums and diversification benefits often found in primary asset classes. Thus, many do not consider hedge funds to be an asset class.

Investment style refers to the general portfolio characteristics that are favoured by the manager's investment philosophy. Apart from indexing (replicating standard capitalization weighted market indexes), the most well-known styles in equity investing are based on firm size (small, mid, and large-caps) and fundamental attributes (value, blend, growth, and momentum). Value managers invest in securities that appear attractively priced, whereas growth managers look for firms that are likely to expand quickly. The blend style is a mix of the two styles. Managers who favour momentum try to ride the wave of securities that have risen in price recently. The approaches each have their risks and potential rewards, and their expected excess performances against the market are imperfectly correlated. Some investment styles actually refer to an approach akin to investing according to risk factors. We will come back to this aspect at the end of the document.

Geography usually refers to countries but more often to regions, such as the Americas, Europe and the Middle East, Asia, the United States or international (non U.S.). Level of economic

development may refer to developed, emerging, or frontier economies and markets. Diversification across geography and economic development seeks to benefit from the imperfect synchronization of economic growth, differences in valuation across financial markets, and exposure to different currencies, an aspect discussed specifically in document 3d.

An efficient diversification process should minimally incorporate diversification across asset classes and geography. How much should be allocated to different asset classes and how much geographic diversification is required are covered in document 5 and document 3d.

The following table shows why it is desirable to diversify across asset classes and regions. The table ranks five specific asset classes as well as a balanced portfolio according to their returns by two-year periods between January 1991 and December 2014. It also presents the average compounded return in U.S. dollars over the entire period. Each asset is colour-coded, which allows us to determine easily that no asset dominated each year.

The data for entire period show that riskier assets tend to be rewarded in the long run. But there were some unexpected results, even considering the full horizon. Among asset classes, emerging markets and U.S. equities dominated the performance but fixed income still outperformed international equities and commodities, which were dead last. The strong relative performance by fixed income can be explained by the deflationary environment of the past 15 years and the two equity market crises (2000-2001 and 2008). It is unlikely that fixed income can maintain this strong performance because low interest rates, as of 2016, make it mathematically impossible that the level of capital gains realized in the past can be sustained. Commodities did not do well but they should be considered a diversifier within a program that rebalances the asset allocation on a regular basis, because there is considerable uncertainty in terms of the level of risk premiums that commodities offer.[1] Finally, the balanced portfolio finished slightly below U.S. equities despite its much lower volatility. As we would expect, it never ranks at the top or at the bottom.

PERFORMANCE OF ASSET CLASSES IN DECLINING ORDER

TWO YEARS ENDING	1	2	3	4	5	6
Dec-92	33.5%	20.4%	12.9%	12.2%	2.9%	-9.3%
Dec-94	27.3%	19.0%	9.3%	5.2%	4.1%	-0.1%
Dec-96	29.9%	14.5%	14.3%	12.0%	9.1%	0.3%
Dec-98	29.9%	14.7%	10.9%	9.1%	-18.8%	-21.4%
Dec-00	36.2%	9.6%	7.5%	7.2%	5.9%	5.6%
Dec-02	12.2%	-2.4%	-2.7%	-4.2%	-17.2%	-17.9%
Dec-04	40.3%	30.1%	20.3%	17.4%	14.9%	4.4%
Dec-06	33.5%	21.8%	18.2%	13.0%	10.8%	3.1%
Dec-08	15.5%	-4.3%	-10.3%	-18.8%	-18.9%	-19.1%
Dec-10	46.1%	34.5%	22.2%	22.1%	17.9%	2.2%
Dec-12	8.7%	8.1%	5.9%	1.9%	1.2%	-1.5%
Dec-14	22.8%	7.1%	3.9%	1.0%	-2.0%	-19.6%
Average	9.9%	8.6%	8.3%	7.5%	7.0%	4.6%

Balanced portfolio consisting of 20% U.S. equities, 20% international equities, 10% emerging markets, 10% commodities, and 40% fixed income.

U.S. Equities | International Equities | Emerging Earket Equities | Commodities | Fixed Income | Balanced

[1] Commodities are accessed by futures contracts, as opposed to the purchase of the commodities themselves. A basic characteristics of the futures market is that there is always an equal amount of futures contracts bought and sold. If a gold producer sells a contract on gold, there has to be a gold investor to buy the contract. Thus, it is a zero-sum market, which makes it difficult not only to assume that commodities necessarily pay a risk premium but also to determine whether the risk premium is paid to the buyer or to the seller of the contract at any specific time. This complicated matter is beyond the objectives of this document, however.

DIVERSIFYING ACROSS RISK FACTORS

Diversifying across asset classes is the most prevalent approach to portfolio construction. Even so, many academics and practitioners argue that diversification should be based on risk factors. Interest rate risk and equity market risk are among the best-known risk factors.

Risk premiums are compensation paid to investors who expose themselves to risk factors. More specifically, they are compensation received over time and on average for the losses investors will sustain in the bad times when investors are penalized for exposing themselves to some of these risk factors. For example, investors expose themselves to equity market risk because they expect to be rewarded over time, even though we all know that equity investors can sustain significant losses during challenging periods.

Many risk factors have been documented, such as Market, Value, Momentum, Size, and Betting against Beta.

- Market – Investing in equities instead of cash;
- Value – Investing in value firms at the expense of growth firms;
- Size – Investing in smaller firms at the expense of large ones;
- Momentum – Investing in firms with a greater price momentum at the expense of firms with a lesser price momentum;
- Betting against Beta – Investing in low-beta firms at the expense of high-beta firms.

Normally, a risk factor should have an economic rationale for its existence. For example, value firms (usually characterized by their lower price-to-book ratios) have, on average and over the long-term, provided higher returns than growth firms. The rational explanation is that the excess return of value firms is compensation for the added risk related to the more costly and less flexible infrastructure required by value firms — think of Exxon versus Alphabet (formerly known as Google). This could also be the result of a behavioural bias; the possibility that over optimistic investors tend to bid the price of growth firms too high and consequently drive the price of value firms too low.

We will not argue the validity of the rational argument against that of the behavioural argument but simply accept the observation that the value premium has been significant and its existence well documented for a very long time. Furthermore, if we find that there is an economic rationale as well as a behavioural explanation for the existence of a factor, our confidence in its long-term profitability should be even stronger. Of course, there is no guarantee that the value premium will compensate investors in the short-term. For example, value firms performed poorly during the 1998-1999 and 2008-2009 periods, and we all know that Alphabet far outperformed Exxon.

Each security and asset class offer a different blend of exposure to risk factors. Andrew Ang of Columbia University believes that risk factors are to asset classes what nutrients are to different foods. A balanced diet seeks the appropriate mix of nutrients, and not all individuals need the same diet or will achieve their nutrient needs using the same mix of food. His argument is that investors should determine how much exposure their portfolio should have to specific risk factors and then establish the appropriate mix of assets that will deliver this exposure. This approach has the advantage of ensuring that the diversification of the investor's portfolio has all the desired risk-factor exposure. For example, many investors may not realize that some asset components (such as emerging market bonds) are very sensitive to equity market risk. They may have more exposure to some risk factors than they believe. Ideally, we should be able to measure the exposure of each portfolio component to risk factors, a requirement that significantly complicates the portfolio management process. Many institutions are moving in the direction of managing their exposure to risk factors but while the conceptual arguments are solid, this approach is not yet widely used to build individual or institutional portfolios. It is only a question of time and education, however.

The following table shows the same information as the previous one but for five factors related to the U.S. equity market only. Obviously, the same type of analysis could be shown for many other asset classes and markets using their appropriate risk factors.

It is also important to understand that Size, Value, Momentum and Betting against Beta are risk premiums that can be captured beyond the Market risk premium. For example, having some exposure to the Momentum factor will, over the long run, add performance over and above that of exposure to the Market factor only. Furthermore, many so-called uncorrelated strategies offered by hedge funds are often simply portfolios that are designed to load on many risk factors but not on the Market risk factor itself. It is also interesting to see that some risk premiums (Betting against Beta and Momentum) appear to have been historically almost as large as the Market risk premium or even larger. The table also shows that low-beta stocks did in fact outperform high-beta stocks over the entire period, which explains the proliferation of low-risk volatility/ low-risk products in the industry.

PERFORMANCE OF RISK FACTORS IN DECLINING ORDER

	RANK				
TWO YEARS ENDING	**1**	**2**	**3**	**4**	**5**
Dec-92	16.4%	15.0%	9.3%	9.2%	3.5%
Dec-94	19.4%	13.8%	9.8%	2.5%	1.8%
Dec-96	27.5%	21.6%	9.6%	-0.1%	-2.7%
Dec-98	21.0%	16.9%	13.0%	-5.9%	-12.9%
Dec-00	19.9%	0.7%	0.4%	-11.4%	-14.0%
Dec-02	23.3%	17.9%	17.6%	9.5%	-18.5%
Dec-04	21.3%	19.9%	14.9%	14.2%	-7.6%
Dec-06	12.0%	7.5%	6.0%	5.3%	-0.7%
Dec-08	16.7%	-6.4%	-15.5%	-21.0%	-22.2%
Dec-10	24.5%	20.7%	14.5%	8.1%	-29.4%
Dec-12	9.9%	7.1%	5.6%	-1.1%	-1.7%
Dec-14	20.9%	18.1%	6.5%	-1.6%	-2.6%
Average	8.4%	5.6%	4.9%	2.6%	2.5%

Market Size Value Momentum Betting against Beta

Diversification across risk factors offers tremendous possibilities, especially if it involves a large number of factors and asset classes. That said, even though there are many products that make use of risk factors (value, small-cap, momentum, and low-beta funds and ETFs), it is almost impossible for individual investors to reap these benefits fully. The factor returns, other than Market, provided above are the result of creating long-short portfolios and using leverage.[2] Most investors, even some institutional investors, do not have the ability and/or the willingness to accept these requirements. Thus, investment products that seek these risk premiums tend to simply tilt their allocation toward specific stocks that offer the desired characteristics but without the use of short positions or leverage. Doing so allows them to capture some of the benefits associated with risk factor exposures. So-called smart-beta products do this is in a systematic way.

Diversification is essential, but doing it well and appropriately to meet the needs of investors is a challenge. That is why most investors require the support of a knowledgeable advisor. A wisely diversified portfolio should have exposure to different asset classes and different geographic regions. Finally, although diversification across risk factors is a rational and effective approach, it presents more implementation challenges. Smart-beta products are a step in this direction. Thus, we should no longer use the term "smart beta"; it should be replaced by "factor investing" or "factor products."

[2] Factor returns are usually calculated by combining a long portfolio having the desired characteristics (such as value firms) and a short portfolio having contrarian characteristics (such as growth firms).

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INVESTMENT PRINCIPLES
INFORMATION SHEET FOR CFA PROFESSIONALS

THE BENEFITS OF DIVERSIFICATION

THE IMPACT OF THE CURRENCY AND COUNTRY OF ORIGIN ON GLOBAL DIVERSIFICATION REQUIREMENTS

3D

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IMPORTANT NOTICE

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- 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 IMPACT OF THE CURRENCY AND COUNTRY OF ORIGIN ON GLOBAL DIVERSIFICATION REQUIREMENTS

Most investors are not sure of how to deal with currency risk. Many pension funds hedge 50% of their exposure to foreign equities, assuming that hedging 50% (or its flipside, which is tolerating 50% exposure) is a neutral decision. Global diversification and the tendency to have a home bias are rarely discussed from the point of view of the investor's home country. This document explains that currencies are not created equal and that different domestic markets do not offer the same level of diversification. Thus, determining how much exposure to foreign currencies and markets is appropriate is, like any other risk management decision, affected by the investor's currency perspective.

IT'S A QUESTION OF PERSPECTIVE AND ECONOMIC STRUCTURE

In October 2008, large-cap stocks in the United States and Canada declined by 17.5% and 16.9%, respectively. During the same month, the Canadian dollar declined by 12.9% against the U.S. dollar while the U.S. dollar appreciated by 14.8% against the Canadian dollar. Thus a Canadian investor who was in the U.S. equity market and fully exposed to the U.S. dollar would have generated a loss of only 5.3% [(1-.175)*(1+.148)-1] whereas a U.S. investor in the Canadian equity market would have suffered a loss of 27.6% [(1-.169)*(1-.129)-1]. Even though both equity markets performed similarly in local currency, the performance spread measured in the investors' home currencies was a significant 22.3%! Of course, the U.S. investor could have decided to hedge all the currency risk related to the Canadian dollar (or to buy a product that offers such hedging); if so, her return would have been very close to -16.9%. The Canadian investor would have been better off not hedging at all. But how can we make such a decision?

Currencies are notoriously difficult to forecast. Many factors affect exchange rates, such as the long-term trend toward purchasing power parity (a ratio of the cost of buying a basket of goods and services in one country to the cost of buying the same basket in another country), the difference in potential economic growth, interest rates, and inflation, all of which

affect the relative demand for currencies. Not to mention changes in commodity prices (for commodity-centric economies) and political and social stability, etc. It's complicated! Even so, currencies can also be classified according to how they react, on average and in the long run, to changes in global growth and global uncertainty. Some currencies are clearly procyclical whereas others are considered countercyclical.

- Countercyclical currencies tend to appreciate in bad times and depreciate in good times. Countries with countercyclical currencies have broad economic infrastructure, safe and diversified financial systems, reasonable fiscal soundness, and relative social and political stability. Their currencies are used as a reserve and a safe asset. The U.S. dollar is usually considered the dominant countercyclical currency.
- Procyclical currencies tend to depreciate in bad times and appreciate in good times. Countries with procyclical currencies usually have greater economic dependency on a few industries, and their currencies are not widely used as a reserve asset. The Canadian and Australian dollars are examples of procyclical currencies. The term Dutch disease is often used to describe countries that see their currency appreciate strongly, and their manufacturing sector decline, when a resource sector, such as energy, is booming. This phenomenon may lead to an economy that is less diversified and more procyclical.

IMPACT OF PRO- AND COUNTERCYCLICALITY ON CURRENCY EXPOSURE

It is not always easy to classify a currency as countercyclical or procyclical. But this characteristic affects an investor's appropriate exposure to foreign assets (equities in particular) and to foreign currencies and thus the decision as to whether currency risk should be hedged. Even though we cannot say what specific level of currency exposure or currency hedging is appropriate for an investor, we can provide some guidelines.

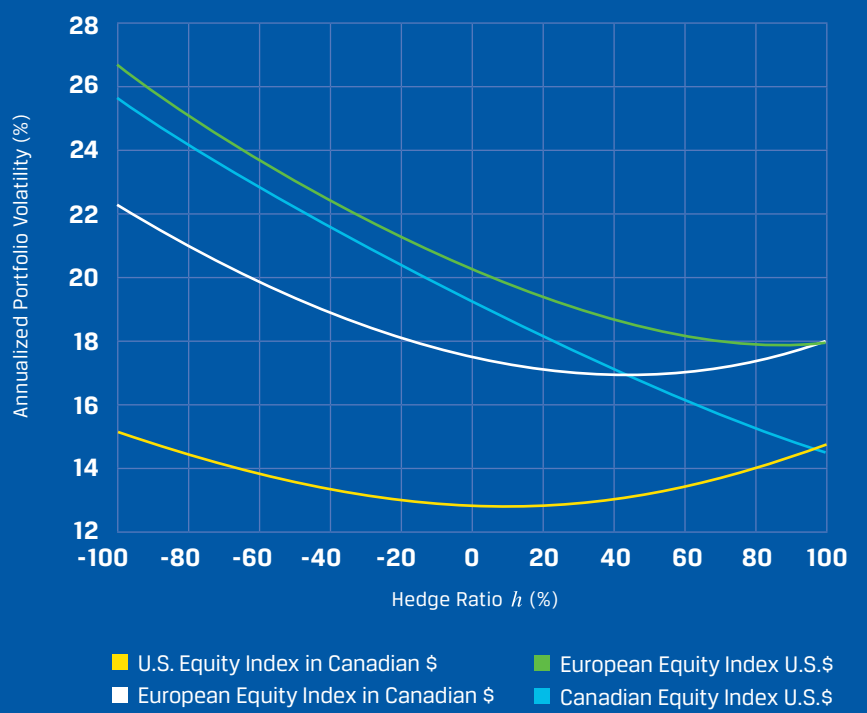
The following equation illustrates the level of currency hedging (h) on a specific foreign asset (P) that minimizes its volatility in terms of the investor's local currency. If the equation seems complicated, we suggest you pay more attention to its general implications, which are specified below. $\sigma(P)$ and $\sigma(ER)$ represent the volatility of the asset in its local market and of the exchange rate, measured in units of the foreign currency of the investor per unit of the domestic currency. $\rho(P, ER)$ represents the correlation between them.

$$h = 1 + \rho(P, ER)\, x\, \frac{\sigma(P)}{\sigma(ER)}$$

From this equation, we can conclude the following:

- If there is no clear pattern between currency movements and asset returns (the asset's correlation with the currency is close to nil), full hedging (or acquiring a product that offers a hedging program) is advisable;
- If the foreign currency appreciates (i.e. the domestic currency depreciates) when the asset performs poorly, meaning the correlation is less than zero and the domestic currency is procyclical, hedging should be minimal or nil;
- If the foreign currency depreciates (i.e. the domestic currency appreciates) when the asset performs poorly, meaning the correlation is more than zero and the domestic currency is countercyclical, the hedging ratio should be high, even superior to one, although it would be a difficult policy to implement for most portfolios, even institutional portfolios; and
- If the volatility of the portfolio is much greater than that of the exchange rate, the impact of the correlation on the hedging ratio is amplified.

Over all, we can conclude that the international equity exposure of investors in currencies that are strongly procyclical does not need to be hedged significantly (or not at all), but that the equity exposure of investors in strongly countercyclical currencies should be hedged significantly. The following figure illustrates the relationship between portfolio volatility and level of currency hedging from the point of view of a U.S. or Canadian investor in different markets. The results are based on data from 1991 to 2014.



The figure shows that a hedge ratio of approximately zero is preferable for a Canadian investor in the U.S. market, and that a 40% hedge would have minimized the volatility of investing in the European market. By comparison, the U.S. investor would have been better off having a fully hedged or close to fully hedged position in the European or Canadian market. But because optimal hedge ratios are certainly not stable, it is preferable to pay more attention to the general principles than to specific numbers.

U.S. investors live in the world's most widely diversified economy. Their equity market offers balanced exposure to most sectors and sub sectors and a wide array of potential firms in each sector. U.S. investors know their currency tends to appreciate in bad times. In comparison, the Canadian economy is less diversified. The financials, energy, and materials sectors are dominant, and Canadian investors know their currency tends to depreciate in bad times. In relative terms, Canadian investors have a greater need for exposure to foreign markets and foreign currencies than do U.S. investors. The appropriate exposure to foreign markets and currencies is affected by the diversity offered by the investor's local financial markets and by the status of her own currency. The average U.S. investor needs less exposure to foreign markets than a Canadian investor does. It is also rational for the average U.S. investor to hedge this exposure significantly, whereas the Canadian investor may not want to hedge at all or as much.

Of course, the timing for implementing such an approach is always a challenge. Although purchasing power parity is a poor indicator of future currency trends, because there are so many other considerations of currency valuation, it is preferable not to hedge a procyclical currency (assuming it is currently hedged) when it is significantly overvalued, whereas it is preferable to hedge a countercyclical currency (assuming it is unhedged) when it is severely undervalued. We should consider hedging a procyclical currency only if it appears severely undervalued and not hedging a countercyclical currency if it appears severely overvalued. At the very least, we should realize that hedging 50% of assets denominated in a foreign currency is almost never a neutral hedging ratio, no matter what the investor's currency of exposure is.

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INVESTMENT PRINCIPLES
INFORMATION SHEET FOR CFA PROFESSIONALS

THE BENEFITS OF DIVERSIFICATION

THE ACTIVE-PASSIVE DEBATE

3E

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- Exempt market dealers
- Portfolio managers
- Investment fund managers
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THE ACTIVE-PASSIVE DEBATE

The debate over active versus passive asset management has been raging for many years and will continue to do so. The debate is focused on the following question: Is it possible to outperform the market reliably with some form of active management? This document presents several arguments for and against active management. But it may be useful to first explain what is meant by the following terms: indexed, passive, quantitative, and active asset management.

CAP-WEIGHTED INDEXES

Capitalization-weighted indexes are the most common type of market index. Cap-weighted indexes are a representation of the total market value of a segment of the securities market (such as large-cap equities or investment-grade fixed income). In cap-weighted indexes, the weighting of each security within the index is determined by its size, as measured by market capitalization. For example, Apple Inc. had a total market capitalization of $677 billion on January 29, 2015, whereas all the securities in the S&P 500 Index had a combined value of $17,417 billion. Thus the Apple weight in the S&P 500 cap-weighted index was about 3.89%. Apple was the largest firm in the index on that date. The smallest firm had a weighting of about 0.01% and was worth a few billion dollars. The S&P 500, the S&P/TSX, and the MSCI ACWI are examples of cap-weighted indexes. Cap-weighted indexes are the closest representation of the market itself.

Indexing means investing in a product that is designed to replicate an index as accurately as possible. About 40% of all equity products are indexed to cap-weighted indexes (or are nearly cap-weighted, a practice often called quasi indexing or benchmark hugging), which implies that 60% of all equity products are actively managed. Many products, such as mutual funds or exchange-traded funds (ETFs), are designed to replicate cap-weighted indexes. One of the arguments used

to justify investing in indexed products is their lower trading and management costs. Another argument is that, after fees, few active managers outperform the market in the long-term. The evidence shows that mutual funds collectively perform about the same as the market before fees and underperform after fees.[1] In fact, fewer than 30% of non-indexed products and managers outperform cap-weighted indexes over long horizons, such as five to 10 years. Why? There are two main reasons.

First, a fundamental reason is that investing is really a zero-sum game before fees are considered. For example, all securities issued in the market must be owned by investors (individuals, pension funds, mutual funds, etc.). If a security such as Alphabet represents 2% of the value of all securities available in the equity market, it follows that if one investor owns more than 2% of Alphabet in his portfolio, then another investor (or several investors combined) must own less than 2% in his/their portfolio(s). It cannot be otherwise because the total ownership of Alphabet must sum to 2% of the total equity owned by investors. Therefore, if Alphabet performs better than the index and if you own more of Alphabet than its market share of 2%, your portfolio will perform better than the index (all else being equal). But if you own more of Alphabet than the index, it follows that some other investors own less, and these investors will necessarily perform worse than the index (all else being equal). Therefore, if we ignore fees, the zero-sum game argument implies that for each investor who outperforms the market by exactly one dollar, there has to be one or more investors who underperform the market by exactly one dollar. The likelihood of outperforming in a zero-sum game is about 50%. Thus, to win at the asset-management game, a manager must not only be really good at it but also better than most of other managers.

Second, asset management is not a free endeavour. Active asset management is usually more expensive than indexed management. When all fees are considered, a dollar of gain before fees equals to less than a dollar of gain after fees, and a dollar of loss before fees equals to more than a dollar of loss after fees. Once fees are considered, asset management is no longer a zero-sum game but a negative-sum game. Thus, to win at the asset management game, a manager must not only be better than others but also good enough to cover his own fees.

Thus, because of the zero-sum argument and because of the higher level of fees usually required by active managers, theory as well as empirical evidence shows that about 30% of the funds managed actively will outperform a cheap index product in the long run. This is not a forecast but a structural reality. We already know that we have fewer than three chances out of 10 to identify a winning product or a winning manager over investment horizons such as five to 10 years; so the more relevant question is, Can we determine ahead of time which managers and products are more likely to outperform? But first, let's discuss other types of so-called indexed products.

OTHER INDEXES

By definition, products that are not based on capitalization principles can be considered actively managed. Even so, many products are tracking indexes that are not cap-weighted. In principle, an index is the result of three criteria: first, an eligibility criterion that determines which securities will be included in the index (such as the largest 1,000 securities by capitalization); second, an allocation criterion that determines how much weight is given to each security (such as the ratio of a security's capitalization to total capitalization in a cap-weighted index); and third, a rebalancing criterion to bring the allocation back to its target. For example, the allocation criterion of the S&P 500 Equal Weight Index is simply the ratio of 1 over N (the number of securities in the index) and the allocation is rebalanced to 1 over N on a quarterly basis. There are many other allocation rules, such as:

- accounting measures, such as sales, book value, cash flows, and dividends;
- dividend size, dividend yield, or dividend growth;
- proxies of risk factors, such as market beta, price to book, and momentum; and
- diversification methodologies, such as low volatility or maximum diversification.

For example, the S&P 500 Dividend Aristocrats Index measures the performance of S&P 500 companies that have increased their dividends every year for the past 25 years. The index treats each constituent as a distinct investment opportunity, without regard for its size, by equally weighting each company. In general, it seems a portfolio-assembly process gets to be called an index once it gains some acceptance. By being called an index, it also gains credibility among investors, whether such credibility is deserved or not.

[1] Fama, E.F., and K.R. French, 2010, Luck versus skill in the cross-section of mutual fund returns, The Journal of Finance 65, 1915-1947.

Indexes that are constructed according to well-defined eligibility and allocation criteria, but that are not built according to cap-weighted principles, usually seek to emphasize specific exposures to risk factors other than simply the market, such as value or momentum. These indexes are based on construction rules that are systematic, well understood and well defined, but their structures and performances will be far different from those of cap-weighted indexes. We will use the terms passive indexes and passive products to refer to indexes that are not based on market-capitalization principles and to the products that track them simply because their construction rules are systematic. But, from a performance point of view, we can conclude that non-cap-weighted indexes, as well as products that track non-cap-weighted indexes, are far from passive. They represent an active bet against the market.

It can also be difficult to distinguish a passive product (as defined) from a quantitative product. Perhaps we should not even try. For example, let's consider the family of low-volatility equity products. Some products are built with a sampling methodology that will simply eliminate riskier securities (such as the 30% of securities having the highest volatility), others will scale security weights by the inverse of their volatility (attributing larger relative weights to less risky securities and vice-versa), and still others are built with optimization processes that seek to statistically achieve the lowest volatility. Are the first two methodologies passive and the third quantitative? Are they all passive and/or all quantitative? Does it truly matter?

ACTIVE MANAGEMENT

Fundamental managers, often referred to as active managers, rely on analytical research, absolute or relative expected-return forecasts, and their own judgment and experience in making investment decisions about which securities to buy or sell and which weighting to attribute to each security. Even so, fundamental managers will normally have a specific investment philosophy and follow well-defined investment and analytical processes. But, in contrast to passive products, whereby the composition of the portfolio structure can usually be accurately replicated by simple application of a specific set of rules, fundamental managers use their personal skills and knowledge to influence the composition and allocation of their portfolios.

PASSIVE PRODUCTS VERSUS ACTIVE MANAGEMENT

If you simply do not believe that active products can outperform a cap-weighted index after fees, then the rational decision may simply be to acquire the most affordable indexed products available provided by reliable firms. But you may still want to invest in affordable active or passive products even if you do not believe that asset managers can outperform the market after fees, if you are looking for specific product characteristics that are suited to your needs, such as a product that generates a higher current income. There may also be tax implications that will favour specific products.

Passive (not cap-weighted) products could certainly be considered a form of active management, even though the portfolio construction rules are systematic. What are the conceptual arguments that could explain why a passive product could be expected to outperform a cap-weighted index in the long run? First, we must recognize that the allocation rules within these products do not assume that we have the ability to explicitly forecast expected returns, such as stock or sector "A" will outperform stock or sector "B" by 5% over the next 12 months. For example, allocating to securities on the basis of an equal-weight principle, dividends paid, or book values does not require making explicit return forecasts. Thus passive products are all about diversification and implicitly or explicitly achieving specific exposures to risk factors. In fact, passive products are about making implicit expected return forecasts; for example, value stocks are likely to outperform growth stocks on average over the long run or stocks with greater price momentum are likely to outperform stocks with lesser price momentum on average over the long run. It's implicit.

There is no consensus on how these passive products are classified, but we will use the classification based on three types of diversification processes proposed by Langlois and Lussier (2016):[2]

- Products that explicitly emphasize specific risk premiums – These could be products that specifically tilt their exposure to risk premiums, such as Value, Size, Momentum, and Betting against Beta;
- Products that attempt to avoid a specific weakness of cap-weighted indexes – cap-weighted indexes use the price of the security of each company to determine

[2] Lussier, Jacques, and Langlois, Hugues (2016), *Rational Investing*, Columbia University Press, Chapter 5. Coming fall 2016.

its weighting in the index. We know that all securities are mispriced in relation to their true but unknown fundamental value. Markets are volatile because we constantly incorporate new information in search of the true but unknown fundamental value. Uncertainty causes volatility. But even if we do not know whether a security is overpriced or underpriced, we can reasonably assume that if a security is overpriced (underpriced) relative to others, it will be necessarily overweighted (underweighted) in a cap-weighted index. Relative overpricing (underpricing) is highly correlated with overweighting (underweighting) in a cap-weighted index. Thus products that do not use the price of a security as a variable to determine its weighting in the index may neutralize this issue. Examples are equal weight (1/N) products and products that use accounting measures to set the allocation such as book value or sales. For example, there is presumably no correlation between a 1/N weighting mechanism and the overvaluation or undervaluation of securities; and

- Products that seek to emphasize low volatility or other principles of efficient diversification – Such products will improve long-term compounded returns through more efficient management of volatility. Examples of such products are minimum volatility and maximum diversification.

Whatever the category of products, assuming we use the classification stated above, all these products create exposure to a number of risk factors. The first category of products is meant to create specific and explicit risk-factor exposure (such as a product designed to offer a value bias), whereas the two others create implicit factor tilts. For example, a value fund (first category) is exposed to the value risk premium because the construction process of such a fund specifically emphasizes value firms, such as firms having low price to book ratios. It's explicit.

But what about a low-volatility product built with an optimizer that only uses information about historical returns? We could show that such a product is also usually exposed to the value risk premium even though the portfolio construction process does not explicitly use information that can be used to categorize securities as being value or growth. In other words, the optimization process implicitly emphasizes value firms, simply because they tend to have lower volatility on average. Similarly, an equal-weight product will implicitly emphasize smaller firms. It's implicit.

It is important to recognize that, even if we agree with the efficiency of the underlying principles stated above and their ability to outperform cap-weighted indexes in the long run, the short-term deviations of performance (the tracking error) of passive products against the index can be significant. Thus these concepts could substantially underperform cap-weighted indexes over several years even though they might outperform in the long run.

Fundamental managers are also implementing these diversification approaches within their portfolios. For example, a fundamental manager adopting a value investment style would be exposed to the value factor just as a passive value product would be. As indicated, these managers also have the ability to add their own experience into the mix and incorporate their return expectations. But this does not change the zero-sum argument. A manager who incorporates his own return expectations into the mix must still be better than other managers to be successful in the long run. The debate is still raging as to whether a passive "value" approach should be expected to perform better or worse than a fundamental "value" manager in the long run. Both are exposed to similar risk factors.

FACTORS CAN EXPLAIN EXCESS PERFORMANCE

We have seen in document 3c that we can measure the performance of a risk factor. It means we may be able to use these factor performance measures to explain how and why a product performed in the past. The following table explains the performance of a well-known financial product using only the market factor[3] or using all five factors discussed in document 3c. Depending on which approach is used, we can conclude the following:

- If we use only the market factor, the market beta is almost one (like the market portfolio) but the manager generated an alpha of 2.14%; and
- If we use the five-factors approach, the market beta remains similar but the product also has exposure to other risk factors, but mostly to the "value" factor. But once we adjust for the different factor exposures, we have explained all the alpha.

	ALPHA	MARKET	SIZE	VALUE	MOMENTUM	BETTING AGAINST BETA
One factor	2.14%	0.99	-	-	-	-
Five factors	-0.23%	1.01	-0.08	0.32	0.03	0.07

The purpose of factor analysis is to better understand the sources of return and risk for a given product or manager. In this way, investors are better able to evaluate whether the risk exposure is appropriate and suited to their investment beliefs and risk profiles.

The same type of analysis can be used for any product or manager. But some managers do not like to use a factor approach to explain their performance because it could demystify the sources of their performance and portray them as less than unique.

Cap-weighted index products are usually the most affordable investment products, and most take the form of ETFs or inexpensive index funds. If you do not believe in the ability to outperform the market, they are the best investment approach. On the other hand, passive and fundamentally managed products are both a form of active management and can have a significant level of tracking error. In the case of passive products, the expectation of excess performance is linked to how they diversify and explicitly or implicitly create exposures to risk factors. Successful fundamental managers also play a similar diversification game but also have the ability to incorporate their own experience into the mix as well as their explicit return expectations. The main question is whether these other aspects contribute to a better long-term performance. The debate is still going on.

[3] The market factor is represented by the performance in excess of the risk-free rate of all securities in a given universe.

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INVESTMENT PRINCIPLES

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THE BENEFITS OF DIVERSIFICATION

HOW TO REBALANCE

3F

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HOW TO REBALANCE

We have already explained in 3a that the benefits of diversification cannot be captured without a rebalancing process. If portfolios are not rebalanced, the allocation will drift gradually toward the best performing asset, which is usually the riskiest asset. Thus the volatility of a portfolio that is not rebalanced is likely to increase over time, and the portfolio will not benefit from the impact of lower volatility on compounded returns. There are many choices of rebalancing methodologies, such as calendar, threshold, and risk-based. The methodologies do not all have the same return to risk efficiency, although any method should prove better than buy-and-hold. Furthermore, the efficiency of diversification is very much a function of the diversity of the asset classes in the portfolio. The rebalancing process will be of greater benefit to portfolios that incorporate a larger number of asset classes.

COMPOUNDED RETURNS AND REBALANCING

In document 3a, we explained that volatility drains the compounded return of a portfolio by about half the squared standard deviation of returns. In other words:

$$\text{Average Compounded Return} \cong \text{Average Periodic Return} - \text{Volatility}^2/2$$

There are at least two implicit assumptions in this relation: first, that the volatility is stable over time; and, second, that the portfolio is continuously rebalanced. Obviously, neither assumption is true. Portfolios are not rebalanced continuously and volatility is far from stable. For example, market volatility is usually far more significant during difficult economic environments than in more normal times. Thus it is important to know not only the different forms of portfolio rebalancing but also how they fare comparatively. Thus the objective here is not to justify rebalancing (this aspect has already been covered), but to determine its impact and to examine whether some rebalancing methodologies may be more efficient.

CALENDAR, THRESHOLD, AND RISK-BASED REBALANCING

Let's assume a portfolio with an allocation target of 60% equities and 40% bonds. Even if the portfolio is initially allocated on a 60/40 basis, market returns will cause the actual portfolio allocation to deviate from this target. A calendar rebalancing implies rebalancing the portfolio toward the target at specific intervals, which could be monthly, quarterly, annually, etc. A threshold rebalancing is triggered only when the actual portfolio allocation deviates from the 60/40 target by a given spread. For example, rebalancing may be triggered if the fixed-income component deviates by more than 10% from its 40% target value (namely, it goes below 36% or above 44%). In both cases, when rebalancing occurs, the portfolio may be rebalanced exactly to the long-term target or to some tolerance band in order to reduce portfolio turnover. For example, if the tolerance band for fixed income is between 38% and 42%, the portfolio will be rebalanced toward 38% fixed income if the allocation is below 36% and toward 42% if it is above 44%.

Risk-based rebalancing is more complex. As we stated, the volatility of a portfolio is not stable over time. For example, a risk-based rebalancing methodology may involve implementing an allocation that has the same current volatility as the average long-term volatility of a 60/40 portfolio. Let's assume the average long-term volatility of a 60/40 portfolio is 9%. If the current volatility of a 60/40 portfolio is higher than 9% because of a recent spike in equity volatility, risk-based rebalancing will involve reducing the allocation to equity in order to keep the level of volatility constant. As with calendar and threshold rebalancing, a tolerance volatility band may also be applied, such as tolerating the current allocation as long as portfolio volatility remains between 8% and 10%.

REBALANCING METHODOLOGIES AND PERFORMANCE

Lussier (2013)[1] completed an extensive review of most rebalancing methodologies documented in the literature and compared their efficiency using similar portfolio contexts for all. The analyses considered all three types of methodology, different portfolio targets (ranging from 40/60 to 80/20), different rebalancing intervals (from weekly to every two years), different threshold measures, two rebalancing targets (to the target and to a tolerance band), and two types of portfolios (a simple portfolio based solely on the S&P 500 and on Treasury bonds and a more diversified portfolio containing U.S. and international equities as well as small-cap equities and commodities). The study covered a period of 30 years. The results of all methodologies were compared with a standard calendar monthly rebalancing approach. The main conclusions are consistent with the results of most other studies:

- With a calendar approach, the highest excess performances were achieved with semi-annual rebalancing although quarterly and annual rebalancing also delivered good results. But the improvement against a standard monthly rebalancing is far better for a more diversified portfolio than for a portfolio with only few asset classes. Gains of 10 to 15 basis points (bps) were observed on average.

- The threshold methodology using a tolerance threshold of about 20% to 25% (which is triggered when any of the portfolio components deviates from its target allocation by more than 20% to 25%) yielded better results with average excess performances of about 20 to 35 bps on average.

- A controlled volatility strategy which consisted of targeting the average long-term volatility of the target allocation yielded even better results, although it is obviously more difficult to implement.

A portfolio benefitting from greater diversification of asset classes can expect even greater gains. To a certain point, these results are intuitive. We know that when an asset class benefits from a favourable environment, the price momentum in this asset class can last several quarters. For example, when equity outperforms or underperforms fixed income or when U.S. equities outperform or underperform international equities, this relative performance trend will usually last several quarters, or even years, although it is difficult to forecast how long it will last. By rebalancing too often, we run the risk of selling rising assets or buying losing assets too quickly. But if we wait too long to rebalance, a rising asset may start to fall out of in favour, and some of the previous gains may be lost. Similarly, a risk-based methodology yielded better results because managing the total risk of a portfolio leads to a more stable long-term risk and a lesser drag of volatility on compounded returns. Furthermore, managing

[1] Lussier, J., 2013, *Successful Investing Is a Process*, Wiley-Bloomberg Press, pp. 170-179.

volatility or even capping portfolio volatility at a maximum level sometimes protects the portfolio from the unfavourable performances that are generally observed during periods of extreme volatility.

REBALANCING AND RISK

Do we increase portfolio risk if we do not rebalance as often? Although not rebalancing at all will usually cause the allocation of the portfolio to drift toward the riskier assets, calendar rebalancing on a quarterly or even on an annual basis has not been found to increase risk. There is an intuitive explanation for this. Let's consider an unfavourable equity market. If the equity market declines and if we rebalance every day or every month, we will continually be purchasing equities to bring the portfolio back to its target allocation. But if we rebalance less frequently, we actually allow the portfolio to maintain a lower allocation to the declining (riskier) asset until a rebalancing eventually occurs, let's say a quarter or a semester later. This may actually decrease risk significantly if equities are declining significantly and volatility is high. But if the value of the equities rises, we allow the allocation to equities to drift higher and conceptually the risk of the portfolio to increase. But rising equity markets often occur when volatility is lower, which means we tolerate a higher allocation to equities in environments of normal or lower volatility. As long as the rebalancing interval is not too significant, we could not find evidence that a longer rebalancing interval, such as three to 12 months, is riskier than a monthly interval.

Rebalancing improves compounded returns by allowing the diversification process to work. But there are many rebalancing methodologies, and the evidence shows that some may provide higher excess returns without necessarily increasing risk. In the case of calendar rebalancing, quarterly to annual rebalancing intervals were found to be more efficient on average than monthly rebalancing, but threshold rebalancing can provide even better results. Finally, risk-based rebalancing appears to be a superior methodology although it is more complex to implement. Most investors would be well-served if they implemented disciplined calendar-based rebalancing and then eventually explored other methodologies.

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ISSUES AFFECTING BENEFITS

THE IMPACT OF FEES

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THE IMPACT OF FEES

While successful investing requires good planning and efficient investment products, we must remain diligent about the level of overall fees paid by investors. The impact of fees on investors' financial well-being can be very significant. There are at least three forms of fees: product management fees; other product fees (such as transaction and custody costs, which are less transparent to investors); and advisory fees. Sometimes, advisory and product management fees are blended together, such as in Canadian mutual funds.

THE MATHEMATICS OF FEES

Let's consider a single scenario first. An investor saves $1,000 a year for 30 years and realizes an annual rate of return of 6%. If we exclude any fees, the final cumulative value of the portfolio will be $83,802 of which $30,000 consists of capital contributions (30 x $1,000) and $53,802 of compounded income from performance. If total annual fees were 2.5% (some investors knowingly or unknowingly pay as much as 2.5% in total annual fees or even more), the total compounded income would have been only $23,429. Thus $30,373 ($53,802 – $23,429) or 56.5% of all income earned would have been paid as fees. Some fees are unavoidable but, considering the uncertainty of gross returns and the certainty of fees, investors must avoid paying more than necessary.

Let's now consider several scenarios. A portfolio generates an annual return of 3% or 6% over horizons of 10, 20, or 30 years. The investor invests $1,000 a year. The total annual fees vary from 0.5% to 2.5%. The following two tables illustrate how much total wealth will be accumulated at the end of the investment period in the absence of fees, how much of this total wealth is attributed to compounded investment income and how much of this income is left after fees depending on the level of the fees (from 0.5% to 2.5%).

LOW RETURN ENVIRONMENT = 3% ANNUAL			EARNED INCOME AFTER FEES OF:				
Horizon	Total Wealth	Earned Income	0.5%	1.0%	1.5%	2.0%	2.5%
10 Years	$11,808	$1,808	$1,483	$1,169	$863	$567	$279
20 Years	$27,676	$7,676	$6,183	$4,783	$3,471	$2,239	$1,084
30 Years	$49,003	$19,003	$15,000	$11,379	$8,102	$5,133	$2,441

HIGH RETURN ENVIRONMENT = 6% ANNUAL			EARNED INCOME AFTER FEES OF:				
Horizon	Total Wealth	Earned Income	0.5%	1.0%	1.5%	2.0%	2.5%
10 Years	$13,972	$3,972	$3,583	$3,207	$2,841	$2,486	$2,142
20 Years	$38,993	$18,993	$16,786	$14,719	$12,783	$10,969	$9,269
30 Years	$83,802	$53,802	$46,419	$39,761	$33,752	$28,328	$23,429

A few obvious conclusions can be drawn from these two tables:

- In a low-return environment, fees can represent a very large proportion of all income earned. For example, assuming a 3% return environment, a 30-year horizon, and 2.5% annual fees, fees would amount to 87% of the gross income earned [($19,003 - $2,441)/$19,003].
- Even if we assume a higher-return environment, such as 6%, fees would still account for more than half (57%) of the gross income earned. Fees reduce the ability of a portfolio to compound returns.

We must also be realistic. Investors cannot totally avoid paying fees, and most investors require advisory services, an issue we will discuss in 5a. But they should take care not to overpay. Let's consider a 30-year horizon and 6% return. We'll assume the investor pays 1% in total fees instead of 2%. Let's also assume that the gross return (6%) is not affected by the amount of fees paid. As indicated in document 3e, investing is a zero-sum game before fees, and the typical investor will realize a performance similar to that of the market before fees. Thus the most rational hypothetical scenario for the average investor is to assume that the performance gross of fees will be similar to that of the market, no matter what the level of annual fees is. Assuming a gross return of 6% in both fee scenarios, the investor will have accumulated total capital of $69,761 at the horizon end if the fees are 1.0% ($30,000 from capital injections and $39,761 from compounded income) instead of $58,328 if the fees are 2.0%, a difference of 19.6%.

How significant is a 19.6% difference? The income investors can draw from their savings at retirement is pretty much proportional to the amount of assets they have accumulated. Therefore, we can conclude that if assets under a 1.0% total fee scenario are 19.6% higher than those under a 2.0% fee scenario, the annual income at retirement could be at least 19.6% higher. And that is significant. Furthermore, during retirement, higher fees will also drain portfolio income, which may amplify the drain on expected income during retirement.

WHAT IS A REASONABLE LEVEL OF FEES?

The range of fees investors pay varies widely. For example, at the low end, fully automated digital (robot) advisors provide all-in fees of about 0.25% to 0.50% annually. But the investment planning services and guidance provided to investors by such systems are usually limited. At the high end of the fee spectrum, some investors knowingly or unknowingly pay all-in fees of 2.5% or more annually but do not necessarily get superior investment results before fees. Within this range,

there are several possibilities. There are digital, but advisor-assisted, wealth management platforms (mostly in the United States) that provide all-in fees below 1.0% and more complete financial advice and allow for direct investment in single stocks. There are also advisory firms that provide excellent investment planning to high-net-worth investors, sometimes for an all-in fee of less than 1.0%. The main concern is for investors who do not have millions of dollars in assets. Such investors are at risk of paying too much, and many of them still need appropriate guidance.

Studies consistently show that the average investor does poorly when investing on his own, far worse than a balanced portfolio of 60% equities and 40% fixed income rebalanced at fixed intervals. The decisions of average investors, including when to buy and sell, are often driven by emotions. As will be discussed later, an important role of advisors is to help investors manage their own emotions and fears, in order to set an appropriate investment plan and stick to it. There is significant financial value in the guidance and reassurance that can be provided by a good advisor. In fact, in document 5c, we attempt to quantify the value of advisory services by estimating the potential long-term cost to the average investor of investing without the benefit of appropriate advice and guidance.

Investors also deserve transparency concerning all the fees that they pay. Only then can they properly compare the costs and benefits of choosing specific investment vehicles and the value of dedicated financial planning. At a minimum, investors should be informed about:

- the cost of advisory services;
- the cost of asset management services and how they compare with alternatives;
- the total of all other costs affecting financial products (transaction, custody, ticketing, auditing, etc.) and
- any charges for entering or exiting financial products. Such charges should be considered with even more care.

Fees cannot be avoided entirely. According to the literature, there is little evidence that greater portfolio management fees lead to higher gross returns on investments. Furthermore, there are wide discrepancies in fees among financial products, and the cumulative impact of fees on the accumulation of wealth is significant. Therefore, investors should know how much they are paying in product fees and have the ability to compare such fees with alternatives. All else being equal, advisors should find the most cost-effective products for their clients. Investors must also better understand the value and purpose of advisory services (to be discussed in 5a).

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ISSUES AFFECTING BENEFITS

THE IMPACT OF TAXES

4B

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THE IMPACT OF TAXES

Much like fees, taxes reduce investors' net returns and accumulated wealth. Different sources of returns, such as interest, domestic (and foreign) dividends, and capital gains, may be taxed differently, which affects the relative attractiveness of financial products. Furthermore, in some countries, income from specific investment vehicles is tax-exempt, such as municipal securities in the United States. The inclusion of financial assets in specific government-sponsored programs can also affect the overall tax burden. For example, several governments have put in place tax-exempt and tax-deferred programs to promote savings for such purposes as children's education and retirement. Taxation affects net returns and risk. Therefore, it affects product selection and asset allocation.

GENERAL IMPACT OF TAXES AND FEES ON RETURNS

Let's consider a fixed-income investment yielding 3.0% before management fees and taxes. We initially ignore the possibility of capital gains or losses. Let's also consider two scenarios of asset management fees (0.30% and 1%) and two tax scenarios (non-taxable and taxable at 40%). The following table shows the average yearly returns after taxes and fees and the cumulative value of a $1,000 yearly investment over 10, 20, and 30 years.

	TOTAL CAPITAL			
	FEES = 0.30%		FEES = 1.00%	
	Non-Taxable	Taxable	Non-Taxable	Taxable
Net Return	2.70%	1.62%	2.00%	1.20%
10 Years	$11,612	$10,936	$11,169	$10,684
20 Years	$26,769	$23,778	$24,783	$22,722
30 Years	$46,553	$38,859	$41,379	$36,285

Taxes further decrease the accumulation of capital. But taxes also reduce the net impact of fees, assuming all fees are tax-deductible. For example, although the difference between the 0.30% and 1.00% fee scenarios is 0.70% on a before-tax basis, it is only 0.42% on an after-tax basis (0.70% x (1-40%)).

Furthermore, this example shows the importance of managing both taxes and fees. The earned income of a lower-fee, tax-exempt scenario is much greater than that of a higher-fee, taxable scenario. For example, in the 30-year case, the earned income is $16,553 ($46,553 – (30 x $1,000)) for the most favourable scenario, whereas it is only $6,285 under the least favourable scenario.

SOURCES OF INCOME AND IMPACT OF TAXES

Most countries tax sources of investment returns differently. We will use examples from the U.S. and Canadian tax codes to illustrate. Canadian and U.S. tax policies have some common elements but there are also differences. Obviously, the reality can be quite complex.

SOURCE OF INCOME	UNITED STATES	CANADA
Interest	Taxed at ordinary tax rate except municipal securities which are untaxed.	Taxed at ordinary tax rate.
Eligible Domestic Dividends	Lower tax rate than interest income.	Lower tax rate through a tax credit designed to manage the impact of double taxation (corporate and individuals).
Foreign Dividends	Taxed at ordinary tax rate.	Taxed at ordinary tax rate.
Capital Gains	Taxed at ordinary tax rate if realized within one year but at a lower tax rate beyond one year.	Taxed at 50% of ordinary tax rate. No restriction on timing unless trading is unusually high.
Capital Losses	Can be used against current and forward gains and limited current income.	Can be used against current gains, forward gains and gains realized three years back.

Withholding taxes are another important consideration. Many countries levy a tax on dividends paid to foreign investors. Under the Canada-U.S. Tax Treaty, the withholding tax rate applicable to dividends is 15% in both countries. In principle if the dividend yield is 2%, a 15% levy would account for a loss of about 0.30% of returns. But investors can often recover withholding taxes by claiming a tax credit to offset foreign taxes in a taxable account or such taxes may not apply in some circumstances if countries have a tax treaty covering these situations. But it can get very complicated, even confusing. The net amount of withholding taxes on foreign securities may differ according to the type of instrument (such as direct investment in securities, locally listed ETFs or mutual funds that own the securities directly, foreign-listed ETFs, locally listed ETFs that may invest in foreign-listed ETFs, foreign-listed ETFs that may invest in foreign securities, etc.), and the location of the assets (in taxable, tax-deferred, or tax-exempt accounts). As a rule, it is preferable to avoid buying local ETFs that invest in foreign-listed ETFs that hold international securities. In such cases, some withholding taxes may not be recoverable or avoided. But, surprisingly, it is very difficult to find comprehensive literature on this issue.

Finally, there is the issue of the deduction of fees for tax purposes (in taxable accounts). Again, it can get somewhat complicated. For our purpose, we will assume that fees reduce the taxable cash distribution of interest and dividend income in mutual funds and ETFs, and that there is sufficient income distribution to cover these expenses.[1]

Now let's consider the following scenario: the ordinary tax rate is 40% and the tax rates on eligible domestic dividends and capital gains are both 20%. Let's also assume that the yearly expected return on fixed income and on equities (domestic and international) are, respectively, 3.0% and 7.0% (2.0% from dividends and 5.0% from capital gains). What would the net return be in all possible contexts? For now, we assume that capital gains are realized and taxed on a yearly basis. This assumption will be relaxed later on. Fees on financial products vary widely but with the advent of ETFs, equity products do not necessarily have higher fees than fixed-income products. In fact, they are often lower. We also assume total fees of 1.00% in all cases.

	FIXED INCOME	DOMESTIC EQUITIES	FOREIGN EQUITIES
Interest/Dividend	3.00%	2.00%	2.00%
Capital Gain Assumption	-	5.00%	5.00%
Gross Return	**3.00%**	**7.00%**	**7.00%**
Fees	1.00%	1.00%	1.00%
Net Return	2.00%	6.00%	6.00%
Taxes Paid	0.80%	1.20%	1.40%
Net Return After Tax	**1.20%**	**4.80%**	**4.60%**
Taxes as % of Net Return	**40%**	**20%**	**23%**

Despite lower tax rates on domestic dividends and capital gains, the taxes expected to be paid on domestic equities are higher than those paid on interest income because of the higher expected return. Of course, different return assumptions and tax rates could lead to a different conclusion.

[1] In the United States, investment management fees paid outside a fund are deductible but only beyond a 2% threshold of adjusted gross income of the miscellaneous itemized deductions in schedule A. In Canada, there is no such threshold but the level of fees must be reasonable.

TAXES AND ASSET LOCATION

Financial assets can be held in taxable accounts, tax-exempt accounts (Roth IRAs in the United States and TFSAs in Canada), or tax-deferred accounts (401-K in the United States and RRSPs in Canada). A tax-exempt account allows for the accumulation and eventual withdrawal of accumulated capital without any tax implications. A tax-deferred account implies that any tax contribution is deductible at the ordinary current tax rate and any withdrawal is taxed at the ordinary tax rate prevailing at that time. The return on investment accumulates free of taxes. Thus, in both tax-exempt and tax-deferred accounts, the return on investment accumulates tax-free. What differs is what happens when a capital contribution is made and when capital is withdrawn. Let's again assume a stable 40% tax rate and a $1,000 annual contribution for 30 years to a tax-exempt account allocated to a domestic equity portfolio as above.

In this case, the $1,000 contribution every year will cost the investor only $600 after tax because he will receive a tax refund of $400. Let's assume the investor has a choice between allocating $1,000 to the tax-deferred account or $600 to the tax-exempt account, because the net cost to the individual is essentially the same. After 30 years, assuming a 6.0% net return and unchanged tax rates, the accumulated capital in both accounts will be as follows:

	TAX-DEFERRED	TAX-EXEMPT
Yearly Investment	$1,000 before tax refund	$600
Value in 30 Years at 6.0%	$83,803	$50,281
Value After Tax in 30 years	$50,281	$50,281

The capital accumulated before tax is substantially higher in a tax-deferred account than in a tax-exempt account. But assuming the tax rate in 30 years is the same as it is now, both accounts will have the same purchasing power because if you withdraw capital from your tax-deferred account, it will be taxed at 40%. Thus we can conclude that both are usually equivalent if you assume your tax rate at retirement will be similar.

Furthermore, both options are preferable to a taxable account. For example, assuming the net return after tax is 4.8%, we could show that it would require an annual investment of $747.30 to achieve the same after-tax value after 30 years. That amount is $147.30 more than what would be required from a tax-deferred or tax-exempt account. In other words, you achieve the same standard of living while investing 19.7% less each year! It is very worthwhile for an investor to maximize the use of tax-exempt or tax-deferred accounts before investing through a taxable account.[2]

THE IMPLICATIONS

Investors should first maximize the use of tax-exempt or tax-deferred accounts. An investor who avoids taxes can reach the same final wealth with much less risk, or much greater wealth with the same level of risk.

Assuming investors hold a diversified portfolio of fixed income, domestic equities, and foreign equities, we should not be indifferent to the location of our financial assets. The traditional advice has often been to place fixed income in non-taxable accounts first (tax-deffered or tax-exempt) because of the higher tax rate on interest income. But the exact answer is related to:

- the relative level of income and capital gains expected on different asset classes and products;
- the specific tax rates that apply to each investor on different sources of income;

[2] The actual amount would be slightly less because capital gains would not fully be taxed on a yearly basis.

- the investment instruments used, the location of the instruments (taxable versus untaxed versus tax-deffered accounts), and how these factors affect the withholding taxes on foreign assets; and
- the expected annual turnover of the different portfolios (namely how fast capital gains will be taxed).

For example, contrary to conventional wisdom, in an environment of very low interest rates, an investor could be better-off putting local equities in a non-taxable account for two reasons:

- First, the amount of total taxes paid per dollar of assets may still be greater on equities because of higher expected returns even though the tax rates are lower on domestic dividends and capital gains than on interest income;
- Second, we should remember that the compounding effect of periodic returns is proportionally more powerful when the expected return (tax-adjusted) is higher. For example, on a portfolio allocated 50% to equities and 50% to fixed income, it is preferable to compound returns at 6% on equities and at 2% in fixed income than to compound returns at 5% on equities and 3% on fixed income. The argument to hold equities first in the non-taxable account may also apply to foreign equities even though we may be unable to obtain a tax credit for withholding taxes or benefit from an exemption. The main reason is that the tax rate on foreign dividends is higher than on domestic dividends if the securities are held in a taxable account. Thus, in a non-taxable account, investors may be subject to withholding taxes but will avoid the more significant tax rate on dividends.

To illustrate further the importance of asset location, let's assume our target asset allocation is 30% fixed income, 40% domestic equities, and 30% foreign equities. Asset returns, fees and tax rates are as specified earlier in this document. Let's also assume that 30% of our yearly savings may be placed in a non-taxable account. The portfolio is rebalanced on a yearly basis to maintain the target allocation. Four options are considered:

- All assets are placed in a taxable account and all capital gains are realized on a yearly basis (implying a 100% portfolio turnover).[3] This is a worst-case scenario.
- Assets are invested evenly in the non-taxable and taxable accounts, and all capital gains in the taxable account are realized on a yearly basis.
- Fixed-income assets are invested first in the non-taxable account. Because fixed income compounds at a lower rate than equities, the weighting of the non-taxable account will tend to fall below 30%. Thus it will be necessary to invest in fixed income in the taxable account as well. Two scenarios of portfolio turnover within the equity portfolios are considered, 100% and 30% (in parentheses). A lower turnover allows the portfolio to postpone taxation related to capital gains and consequently to compound asset returns on a larger investment base. The tax implications of the turnover required to rebalance the portfolio are fully recognized annually. But new contributions facilitate the rebalancing and mitigate the tax implications.
- Domestic equities are invested first in the non-taxable account. Initially, it will be necessary to invest in domestic equities in the taxable account as well to complete the 40% target allocation. But because untaxed equities will compound at a faster rate than taxed fixed-income securities and taxed foreign equities, it is eventually possible that all domestic equities could be in the non-taxable account. The same scenarios of portfolio turnover are considered as above.

Assuming, as before, $1,000 saved each year for 30 years, we obtain the following results:

	Taxable	Allocated Evenly	Fixed Income in Tax-Exempt Account First	Equity in Tax-Exempt Account First
Final Value After Tax	$54,943	$58,645	$56,904 ($57,350)	$59,384 ($59,601)
Gains in Excess of Yearly Contributions	$24,943	$28,645	$26,904 ($27,350)	$29,384 ($29,601)
Average Nominal Return	3.66%	4.03%	3.86% (3.90%)	4.10% (4.12%)

[3] We assume that capital gains, if in the United States, will retain the tax status of long-term capital gains (securities held for more than one year).

Using these particular parameters, fixed income should not be placed in the tax-exempt account first. Although the increase in final value may not appear impressive, we have to remember that $30,000 of the final wealth is accounted for by the yearly savings. Thus, in the taxable scenario, the net investment gains are $24,943 whereas they are $29,601 under the most favourable option, a difference of nearly 20%.

Relaxing the turnover assumption does increase the final wealth but the impact is obviously more mitigated if domestic equities are placed in the non-taxable account. Furthermore, the impact of a low turnover is not necessarily as significant as often advertised. For example, the tax benefits on total wealth of portfolio turnovers ranging from 0% (capital gains fully taxable at the end of the 30 years – a theoretical scenario) to 100% (capital gains fully taxable annually) were evaluated. The analysis shows that the tax benefits of a turnover lowered from 100% to 40% are less than those resulting from reducing turnover from 40% to 20%, a level of turnover that few active or passive products are able to deliver.[4] Thus the benefits of a lower portfolio turnover are mitigated when the turnover is already above 30% or 40%.

In specific circumstances, locating some equities in the tax-exempt account may also simplify the process of rebalancing. Investors often hesitate to rebalance because of the cash-flow implications of generating taxable capital gains. If the amount of capital invested in tax-exempt and/or tax-deffered accounts is relatively significant in relation to the size of the taxable account, it may be possible to structure the portfolio in order to realize most of the rebalancing outside the taxable account. Furthermore, we have to consider that if we hesitate to rebalance for tax reasons, we may lose part of the rebalancing premium discussed in document 3f.

Taxes significantly complicate the investment process, and there are many issues we have not covered, such the impact of taxes on risk. For example, although taxes reduce investors' returns they also affect risk by lowering the volatility of net returns. While a capital gain will be reduced by taxes, a capital loss will also be reduced net of taxes if the capital loss can be used against a capital gain. Finally, it is always financially preferable to make maximum use of non-taxable accounts. But determining which financial assets should be placed in taxable versus non-taxable accounts requires customized planning efforts. In a low-rate environment, we cannot assume that the traditional advice of allocating fixed income to tax-exempt or tax-deferred accounts is necessarily the right one. But because there is very little consensus on this issue, we simply recommend that advisors remain wary of conclusions that are based on traditional beliefs and analyze this aspect in the context of each investor.

[4] These calculations ignore the possibility of tax-loss harvesting.

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ISSUES AFFECTING BENEFITS

THE IMPACT OF INFLATION

4C

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THE IMPACT OF INFLATION

Investors' returns are reduced by fees and taxes. In addition, inflation reduces their standard of living by depreciating the quantity of goods and services that they can purchase with a given amount of nominal investment income. For example, assuming a 2% annual rate of inflation, $1,000 of income would purchase $1,000 of goods and services today; but to acquire the same amount of goods and services one year from now $1,020 would be required. In two years, it would be $1,040.40. Therefore, the projection of our final wealth 10, 20, or 30 years from now is best represented by the value of goods and services that this wealth will allow us to purchase in the future.

BASIC IMPLICATIONS OF INFLATION

Let's consider a single fixed-income investment of $1,000 invested for four years at an annual rate of 3%. Fees are 1.00% annually and the tax rate of interest income is 40%. Let's also assume that inflation is running at an annual rate of 2%. The following table illustrates how the value of the investment increases after each year in a tax-exempt account and in a taxable account. It also illustrates the cost of purchasing a basket of goods and services, now worth $1,000, as time passes.

	Value of Invested Capital (Non-Taxable)	Value of Invested Capital (Taxable)	Cost of a Basket of Goods and Services
Now	$1,000.00	$1,000.00	$1,000.00
Year One	$1,020.00	$1,012.00	$1,020.00
Year Two	$1,040.40	$1,024.14	$1,040.40
Year Three	$1,061.21	$1,036.43	$1,061.21
Year Four	$1,082.43	$1,048.87	$1,082.43

In this example, in the absence of taxes, the investment grows at the same pace as the cost of living but, in the presence of taxes, it grows much more slowly. Simply to maintain the current purchasing power requires a return after fees and taxes equal to that of the inflation rate. Thus the investor's purchasing power goes down over time. In 3b, we explained that the fixed-income yield is compensation for inflation, real return, and liquidity and credit risk. This example illustrates that governments unfortunately tax investment returns indiscriminately, whether the return is compensation for inflation or for credit risk. This illustrates even more the importance of reasonable fees and efficient tax management.

Another implication is the importance of adjusting the level of savings periodically to match the inflation rate. Otherwise, the significance of the saving effort declines over time.

A SIMPLE CASE STUDY INVOLVING FEES, INFLATION, TAXES, AND TAXABLE AND NON-TAXABLE ACCOUNTS

Let's assume a similar example as in document 4b. An investor invests $1,000 annually over 30 years in real-dollar terms. This means that, if inflation is 2.0%, her annual yearly contribution will increase by 2% a year to match the inflation rate. Thus the total nominal amount of all contributions is $40,568 whereas it is simply $30,000 in terms of current purchasing power (30 x $1,000). The investor's portfolio is allocated 40% to domestic equities, 30% to foreign equities, and 30% to fixed income. It is rebalanced annually. The investor is also allowed to place a maximum of 30% of her annual savings in the non-taxable account. The asset returns, fees, and tax rates are identical to those specified in document 4b.

The following table illustrates the final wealth under the four scenarios of asset location: fully allocating to a taxable account; allocating all three asset classes evenly within both the taxable and non-taxable accounts; allocating fixed-income first to the non-taxable account; and allocating domestic equities first to the non-taxable account. In the first two scenarios, we assume that all capital gains are fully realized yearly whereas, in the last two, we consider two levels of portfolio turnover, 100% and 30%.

The final wealth is expressed in nominal and real terms. For example, under the taxable scenario, final nominal wealth of $70,474 would be accumulated. But this wealth is the equivalent of $38,907 in terms of current purchasing power (at current prices of goods and services). In essence, the investment effort has increased the purchasing power of the yearly financial contributions from $30,000 in real terms to $38,907, an increase of $8,907. But appropriate use of the non-taxable account can lead to an increase of as much as $11,926.

	Taxable	Allocated Evenly	Fixed Income in Tax Exempt Account First	Equity in Tax Exempt Account First
Final value after tax	**$70,474**	**$74,824**	**$72,806 ($73,324)**	**$75,681 ($75,944)**
Purchasing Power	**$38,907**	**$41,308**	**$40,194 ($40,480)**	**$41,781 ($41,926)**
Average Nominal Return	**3.66%**	**4.03%**	**3.86% (3.90%)**	**4.10% (4.12%)**

This example unsurprisingly confirms the necessity of making maximum use of the non-taxable account. But it also illustrates the challenge of accumulating sufficient wealth for a comfortable retirement when we consider the impact of inflation. All portfolios have performances ranging from 1.66% (3.66% - 2.00%) to 2.03% (4.03% - 2.00%) above the inflation rate and this difference is what allows our standard of living to improve. But, in the presence of fees and taxes, it is unlikely that the investor can generate a net return greater than the inflation rate in the long run unless her portfolio is exposed to credit and/or equity risk.

Inflation substantially reduces the purchasing power of our savings, and governments are implicitly taxing the portion of portfolio return that is compensation for inflation. Generating a performance after fees and taxes that will reasonably outperform inflation requires careful long-term planning. Thus it is even more important to make efficient use of government programs that allow for the accumulation of tax-free returns.

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EVALUATING YOUR FINANCIAL NEEDS

THE ROLE OF ADVISORS

5A

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

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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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INVESTMENT PRINCIPLES

INFORMATION SHEET FOR CFA PROFESSIONALS

EVALUATING YOUR FINANCIAL NEEDS

BUILDING A PORTFOLIO

5C

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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 pro-cyclical 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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HOW MUCH MUST BE SAVED TO RETIRE WELL

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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-deffered 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 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.

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%

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-deffered 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-deffered 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 is 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 Canada

INVESTMENT PRINCIPLES
INFORMATION SHEET FOR CFA PROFESSIONALS

EVALUATING YOUR FINANCIAL NEEDS

FINANCIAL RISKS, RISK MITIGATION, AND COMMON SENSE

5E

Produced by CFA Montréal

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.)

CFA Montréal

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.

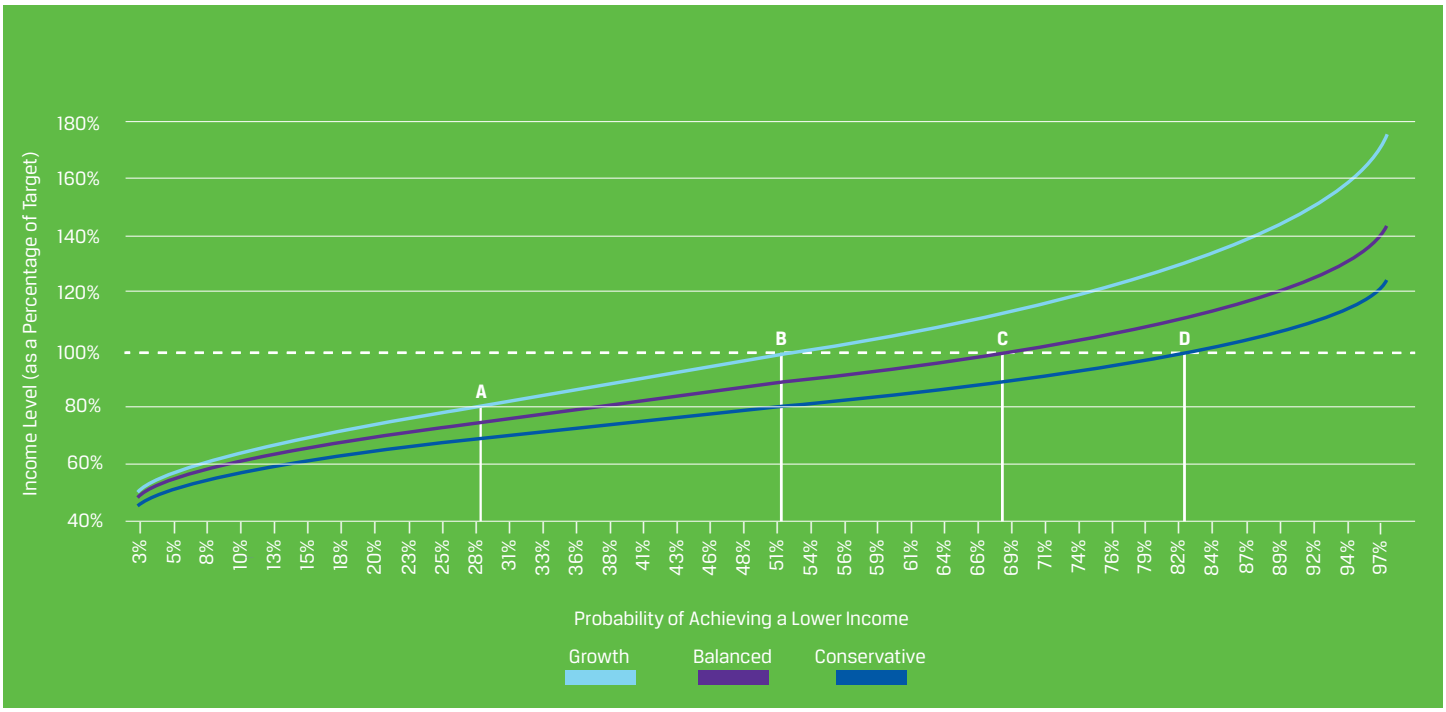
The analyses are based on a series of Monte-Carlo simulations (10,000 runs for each situation). Thus each simulation is based on 10,000 scenarios of 30 annual portfolio returns obtained from a distribution having the expected returns and volatilities specified in the table.[4] Our objectives are simple. 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			
	Real Return	Cumulative Value	Real Return	Cumulative Value	Ratio	Income Amount
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.