



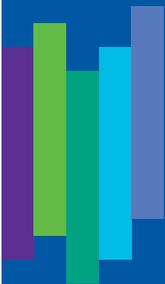
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## INVESTMENT PRINCIPLES

INFORMATION SHEET FOR CFA PROFESSIONALS

### THE BENEFITS OF DIVERSIFICATION

# HOW DIVERSIFICATION REDUCES RISK AND ENHANCES COMPOUNDED RETURNS



# 3A

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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
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- Exempt market dealers
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## THE BENEFITS OF DIVERSIFICATION

How Diversification Reduces Risk and Enhances Compounded Returns

# 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

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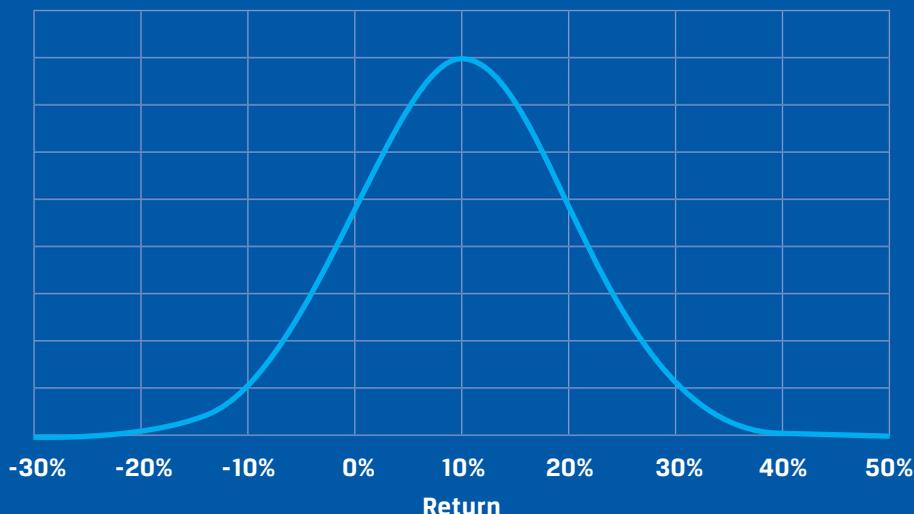
return and risk (as defined here by the standard deviation of periodic returns, which is referred to as volatility). Volatility is a simple measure of return dispersion around the average periodic return. It is computed with the following formula:

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

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%).

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### 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
<b>Periodic Return</b>	<b>11.50%</b>	<b>7.87%</b>	<b>10.05%</b>
<b>Compounded Return</b>	<b>9.82%</b>	<b>7.61%</b>	<b>9.54%</b>
<b>Volatility</b>	<b>18.49%</b>	<b>7.61%</b>	<b>10.63%</b>

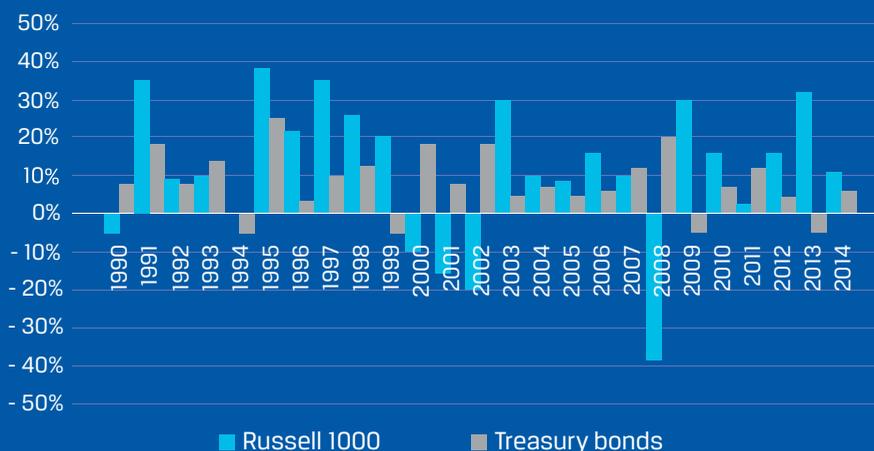
Equities being riskier than Treasury bonds, it is not surprising to observe that the volatility of equities is greater than that of Treasury bonds. In this case, investors were also rewarded for tolerating this greater volatility with a greater compounded return. But that is not always necessarily the 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.

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### 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:

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

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%) 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.

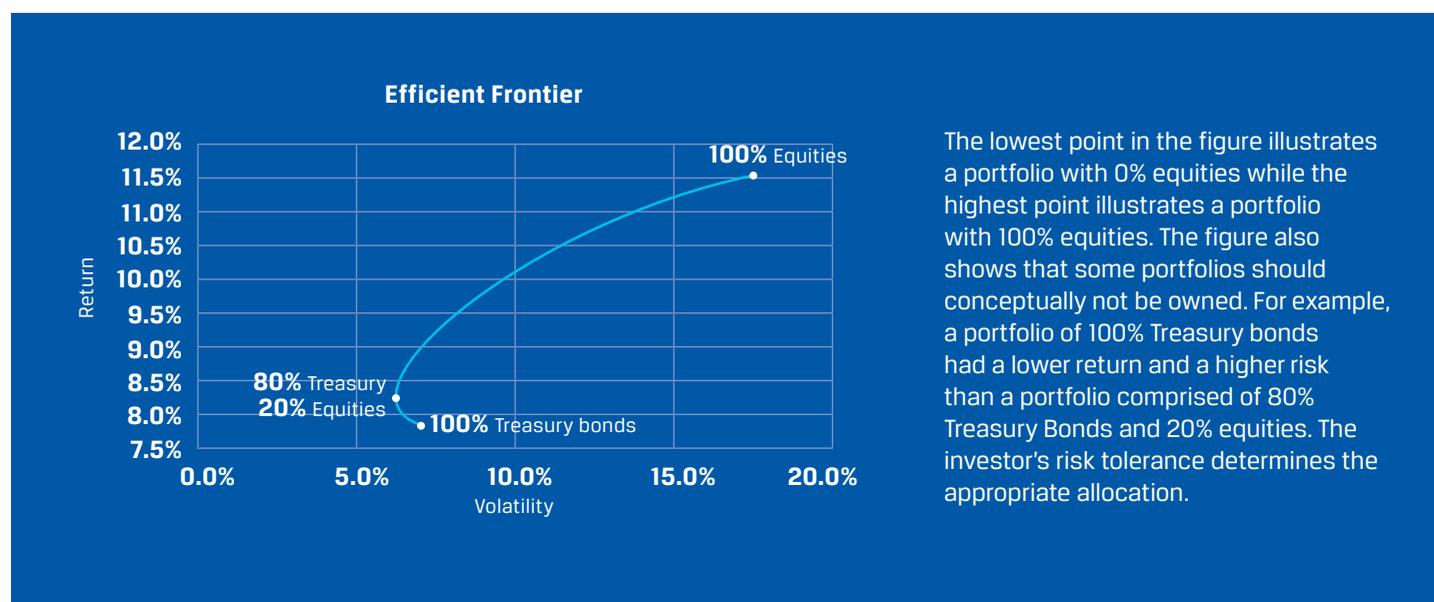
Finally, one crucial aspect of diversification is often overlooked: for diversification to reduce risk and to increase compounded returns as illustrated above, the portfolio has to be rebalanced. Without rebalancing, the benefits of diversification as a means of reducing volatility and increasing compounded 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.

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### 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 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.



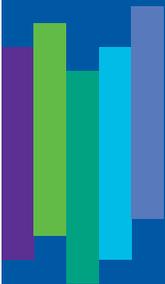
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### **THE BENEFITS OF DIVERSIFICATION**

# **THE FACTORS THAT DRIVE ASSET RETURNS AND THE EFFICIENCY OF DIVERSIFICATION**



# 3B

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# 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%.

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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.

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

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.<sup>12</sup>

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.

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

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.

<sup>1</sup> 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 ( $1.9804\% \times 2$ ).

<sup>2</sup> 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.

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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 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%
<b>Total</b>	<b>17.88%</b>	<b>1.13%</b>
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.

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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.



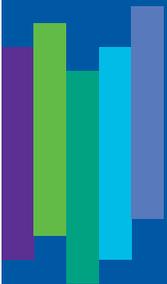
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### THE BENEFITS OF DIVERSIFICATION

# DIFFERENT WAYS PORTFOLIOS CAN BE DIVERSIFIED



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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

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Different Ways Portfolios Can Be Diversified

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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.<sup>1</sup> 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%
<b>Average</b>	<b>9.9%</b>	<b>8.6%</b>	<b>8.3%</b>	<b>7.5%</b>	<b>7.0%</b>	<b>4.6%</b>

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 Market Equities ■ Commodities ■ Fixed Income ■ Balanced

<sup>1</sup> Commodities are accessed by futures contracts, as opposed to the purchase of the commodities themselves. A basic characteristic 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 BENEFITS OF DIVERSIFICATION

Different Ways Portfolios Can Be Diversified

3C

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

TWO YEARS ENDING	RANK				
	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

## THE BENEFITS OF DIVERSIFICATION

Different Ways Portfolios Can Be Diversified

3C

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.<sup>2</sup> 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 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."

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<sup>2</sup> 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).



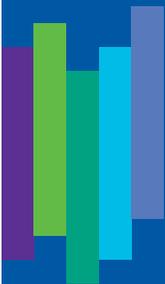
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## INVESTMENT PRINCIPLES

INFORMATION SHEET FOR CFA PROFESSIONALS

### THE BENEFITS OF DIVERSIFICATION

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



# 3D

## **IMPORTANT NOTICE**

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

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



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# THE 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.

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

From this equation, we can conclude the following:

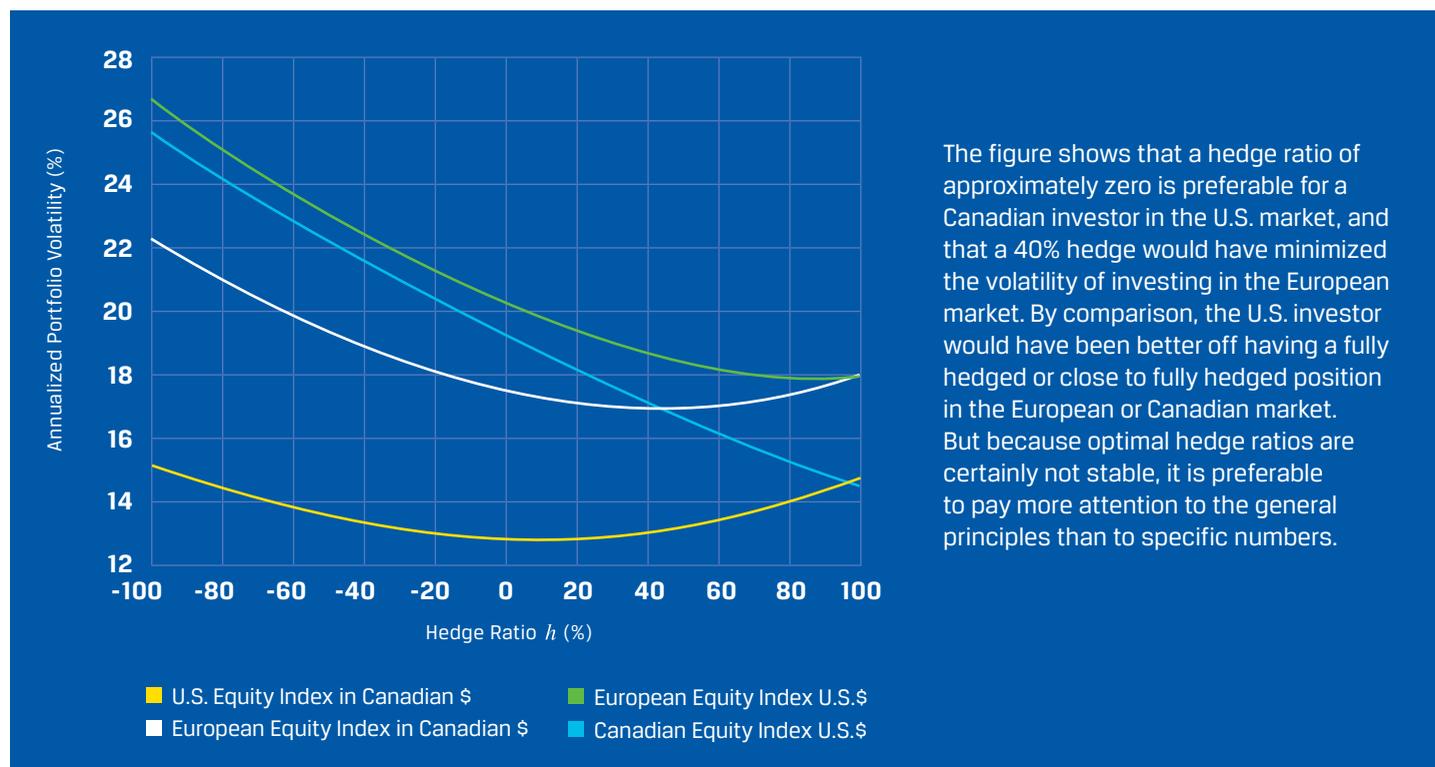
- If there is no clear pattern between currency movements and asset returns (the asset's correlation with the currency is close to nil), full hedging (or acquiring a product that offers a hedging program) is advisable;
- If the foreign currency appreciates (i.e. the domestic currency depreciates) when 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 BENEFITS OF DIVERSIFICATION

The Impact of the Currency and Country of Origin on Global Diversification Requirements

3D



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.



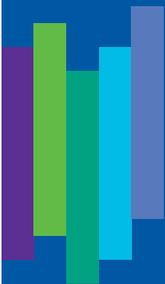
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### THE BENEFITS OF DIVERSIFICATION

### THE ACTIVE- PASSIVE DEBATE



# 3E

## **IMPORTANT NOTICE**

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



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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.<sup>1</sup> 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.

<sup>1</sup> 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):<sup>2</sup>

- 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

<sup>2</sup> 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<sup>3</sup> 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
<b>One factor</b>	<b>2.14%</b>	<b>0.99</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Five factors</b>	<b>-0.23%</b>	<b>1.01</b>	<b>-0.08</b>	<b>0.32</b>	<b>0.03</b>	<b>0.07</b>

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.

<sup>3</sup> The market factor is represented by the performance in excess of the risk-free rate of all securities in a given universe.



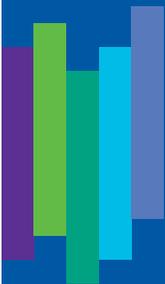
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## INVESTMENT PRINCIPLES

INFORMATION SHEET FOR CFA PROFESSIONALS

## THE BENEFITS OF DIVERSIFICATION

## HOW TO REBALANCE



# 3F

## **IMPORTANT NOTICE**

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

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



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# HOW 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)<sup>1</sup> 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 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

<sup>1</sup> 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.