

Appendix C - Asset Allocation

An important concept in portfolio management is that risk can be reduced by diversifying across different assets, and through the effective management of the investment horizon. This appendix analyzes these two methods for the Canadian investor by testing whether they hold true in the Canadian context, and how they can be effectively applied when building a portfolio.

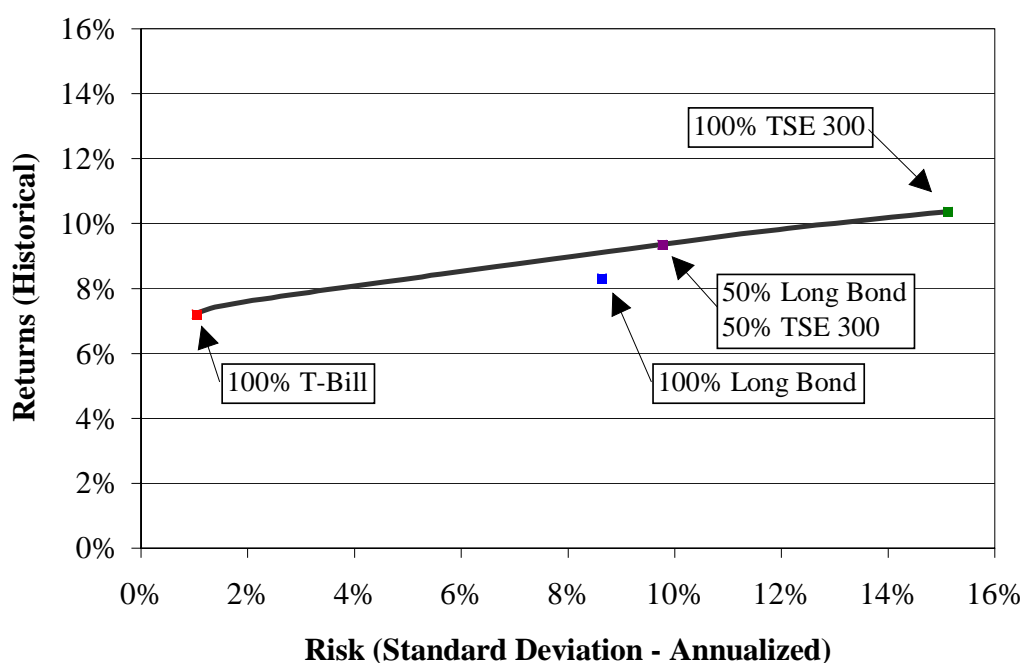
Asset Allocation

The first means of increasing return while maintaining or lowering risk is by diversifying across different assets. The greater the difference between the assets, the greater the effect of diversification, while purchasing similar assets will not greatly reduce portfolio volatility.

A simple analogy would be the difference between two portfolios, one of which contains two bank stocks and the other a bank stock and a technology stock. Most of the forces affecting one bank stock are the same as those affecting the other, so the performance of the two stocks will be very similar. However, many forces affecting the technology stock will be different than those affecting the bank stock, so their correlation, or similarity of behavior, will be lower. The diversification benefits of buying many similar or highly correlated assets is lower than buying a group of different assets with low correlations.

Asset allocation involves grouping similar assets into asset classes, forecasting the asset class volatilities, returns and correlations, and determining their optimal mix. The volatilities and correlations tend to change gradually over time, while the returns are very difficult to forecast (especially in the short term). The optimal mix of these asset classes takes the form of what is called an efficient frontier. Efficient frontiers are simply the best portfolio (highest return for a given level of risk) that is possible based on the asset classes selected. An efficient frontier for the Canadian marketplace from 1956 to April 1998, using equity, bonds and treasury bills as the asset classes is described in the following chart.

Canadian Efficient Frontier (1956 to Apr-98)



Canadian Efficient Frontier (1956 to Apr-98)

Portfolio Mix	Return	Risk
50% Long Bond 50% TSE 300	9.35%	9.77%
100% T-Bill	7.21%	1.04%
100% Long Bond	8.32%	8.64%
100% TSE 300	10.37%	15.12%

As expected, Treasury bills have the lowest risk (volatility) and return, and equities the highest risk and return with bonds somewhere in between.

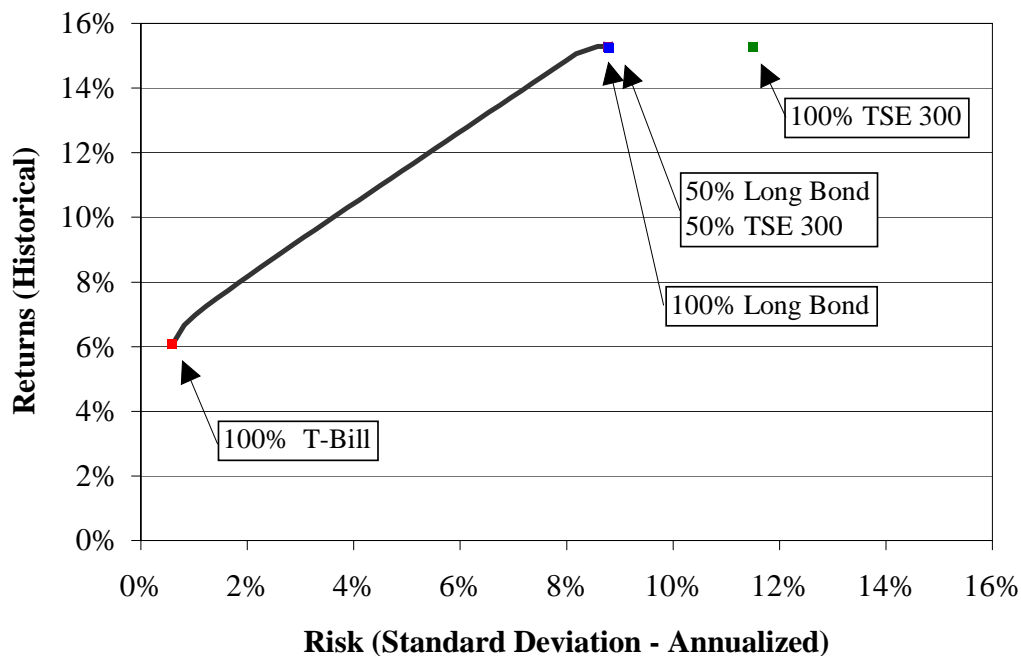
Notice that the 100% Long Bond portfolio falls below the frontier. This means that a portfolio with a combination of treasury bills, bonds and equities could be built with the same level of risk as long bonds but with higher returns.

A 50%/50% Bond/Equity portfolio has also been plotted on the graph. This point lies on the efficient frontier. If an investor's tolerance for risk had been 9.77% annual volatility, then this would have been their optimal portfolio.

If one were to ask most investors what their tolerance for risk was, few would be able to give an exact answer. The usual method is to examine the investor's present portfolio, and get a sense of how much more risk they are prepared to take. Because most investors do not have an exact understanding of their risk tolerances, they have a tendency to be too cautious. One of the best opportunities to add value is to assist the investor in determining these tolerances.

Another efficient frontier was generated using the recent degearing period of 1991 to April 1998.

Canadian Efficient Frontier (1991 to Apr-98)



Canadian Efficient Frontier (1991 to Apr-98)

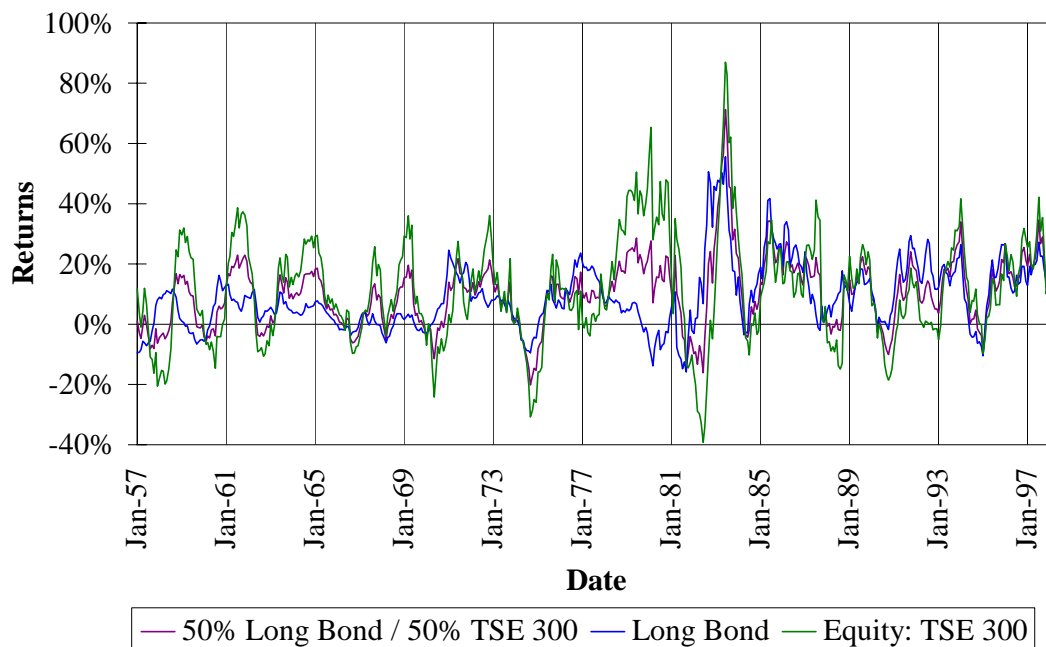
Portfolio Mix	Return	Risk
50% Long Bond 50% TSE 300	15.28%	8.78%
100% T-Bill	6.08%	0.61%
100% Long Bond	15.29%	8.79%
100% TSE 300	15.28%	11.50%

The frontier for the 1990s has a substantially different slope. The frontier for the past forty years is very shallow, whereas for the past seven years it is quite steep. The strong equity and bond markets in the mid 1990s resulted in very high returns for these asset classes versus treasury bills, causing a much steeper curve.

The 100% Equity portfolio is far to the right of the 1990s efficient frontier. This is because the bond market outperformed the equity market in the 1990s, while having less risk (lower annual volatility). The degearing of the U.S. and Canadian government debt and the substantial decline in inflation, have led to this unusually strong performance. The frontier for the past forty years is very shallow, whereas for the past seven years it is quite steep. The strong equity markets in the mid 1990s has resulted in very high returns in equities versus treasury bills, causing a much steeper curve.

The 50%/50% bond/equity portfolio lies at the extreme end of the efficient frontier for the 1990s. Since equity and bond returns were almost identical for this period, on a total return basis the asset mix between these two asset classes has been irrelevant for the past few years. Therefore, almost any investor has done well, as long as they have been in the market. This is unlikely to continue indefinitely. The graph below, shows the volatility of three different portfolios (100% equity, 100% bonds and 50%/50% equity/bonds).

**Long Bond, Equity & 50%/50% Long Bond/Equity Volatilities
Annual Moving Average**

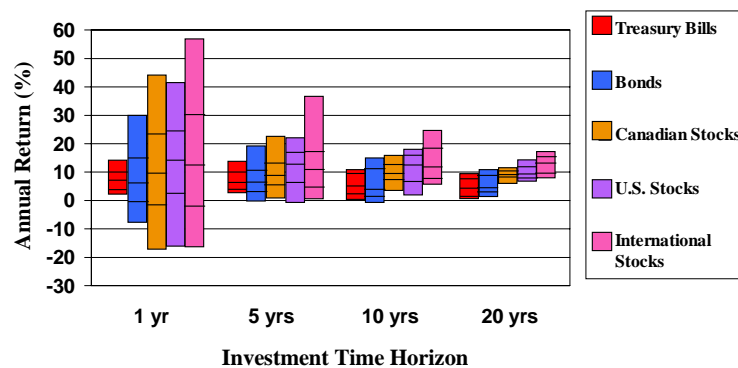


The markets have not had a severe downturn since 1982, and have performed unusually well since 1994. Since this performance is unusual, the efficient frontier is likely to flatten and shift downwards in the next few years.

Time Diversification

Risk reduction through the effective management of the investment horizon is based on the concept that a premium is paid in the long term for reducing risk in the short term. The idea is that as the time horizon is extended, risk is reduced for all assets, but the more volatile the asset in the short term, the greater its volatility will decrease as its investment horizon is extended. The chart below describes this behavior for a number of broad asset classes.

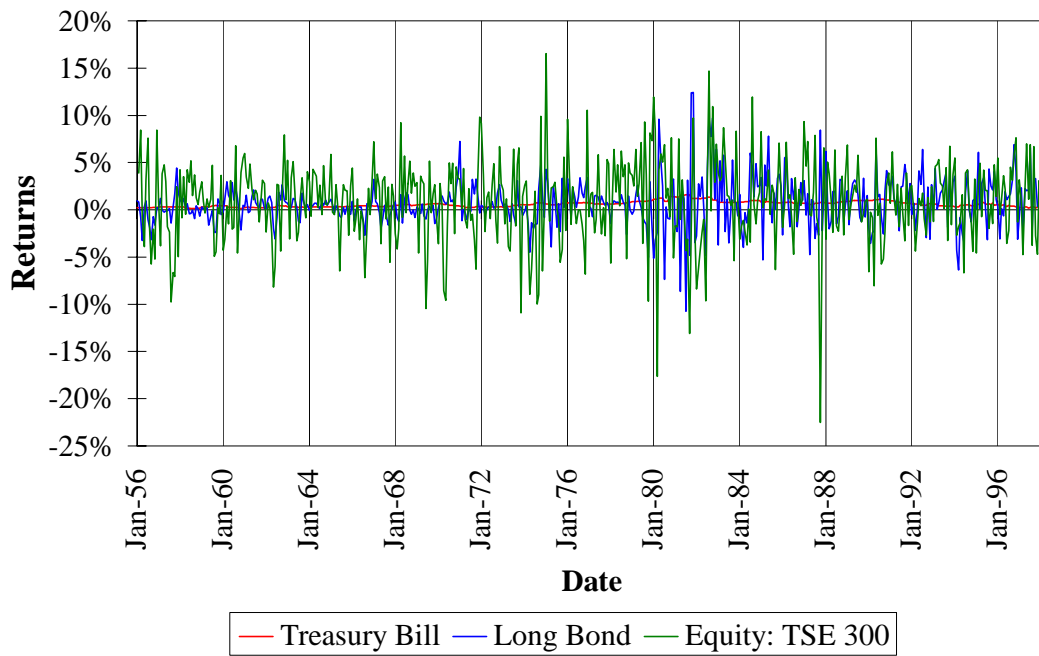
Risk Reduces as Investment Time Horizon Increases



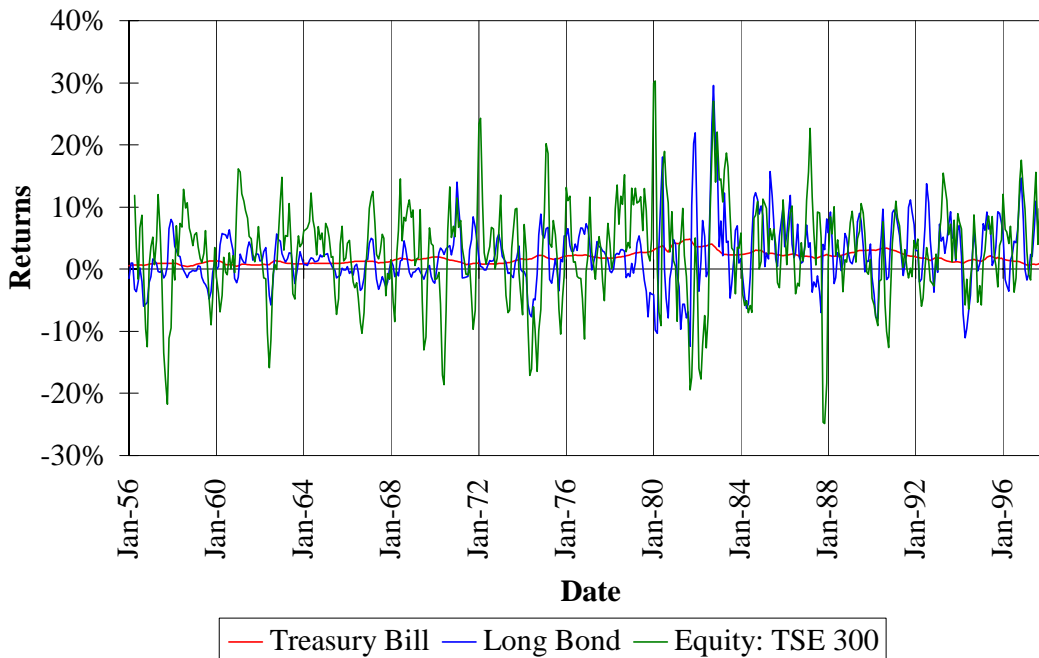
While some investors claim to have long term investment horizons, investor behavior is substantially different. Most investors, while having long term investment horizons, react to much shorter term events. The result being that the investment horizon is very different from the risk horizon. This means that most investor's investment horizon is substantially longer than their risk horizon. This results in a lower short term volatility / lower long term return bias in investor behavior. One of the most important benefits of good investment policy and management is to bring the investor's risk horizon more in line with their investment horizon.

To see how volatility declines as the horizon increases, the following graphs depict the volatilities in Canadian treasury bills, bonds and equities using monthly, quarterly, annual and three year moving averages.

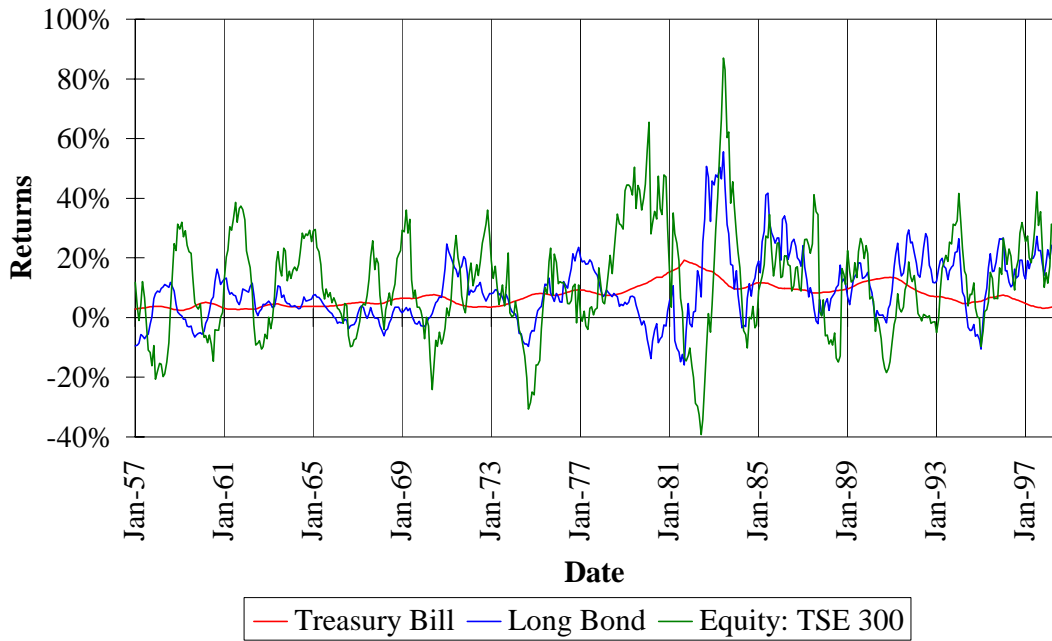
Treasury Bill, Long Bond & Equity Volatilities Monthly Moving Average



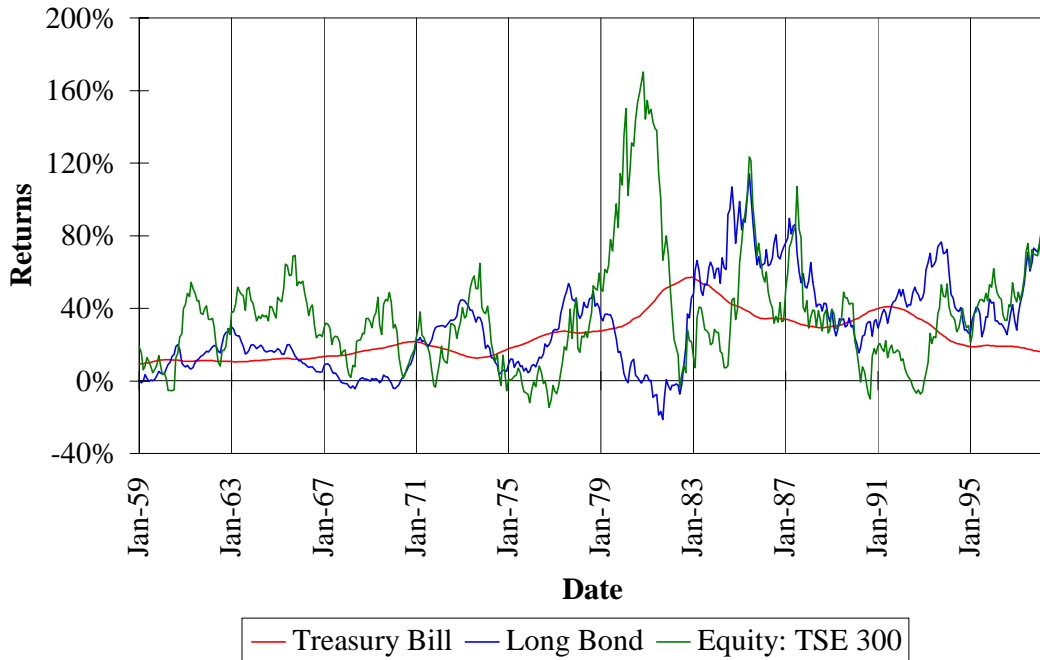
Treasury Bill, Long Bond & Equity Volatilities Quarterly Moving Average



Treasury Bill, Long Bond & Equity Volatilities Annual Moving Average



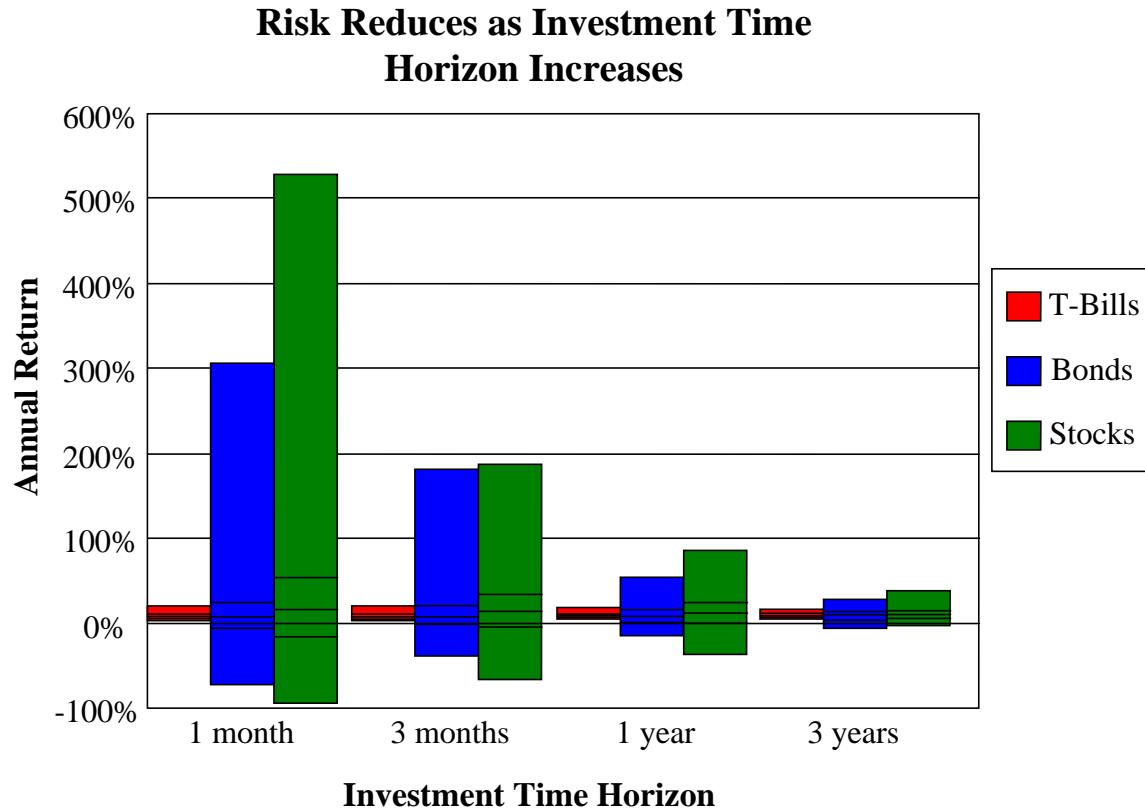
Treasury Bill, Long Bond & Equity Volatilities Three Year Moving Average



Only a few times in the past forty years have the equity and bond markets suffered a loss over a three year period. Whereas, from the monthly moving average it be can see that no

one year period has gone by without at least a couple of months suffering negative returns.

These moving averages are compared in the following chart:

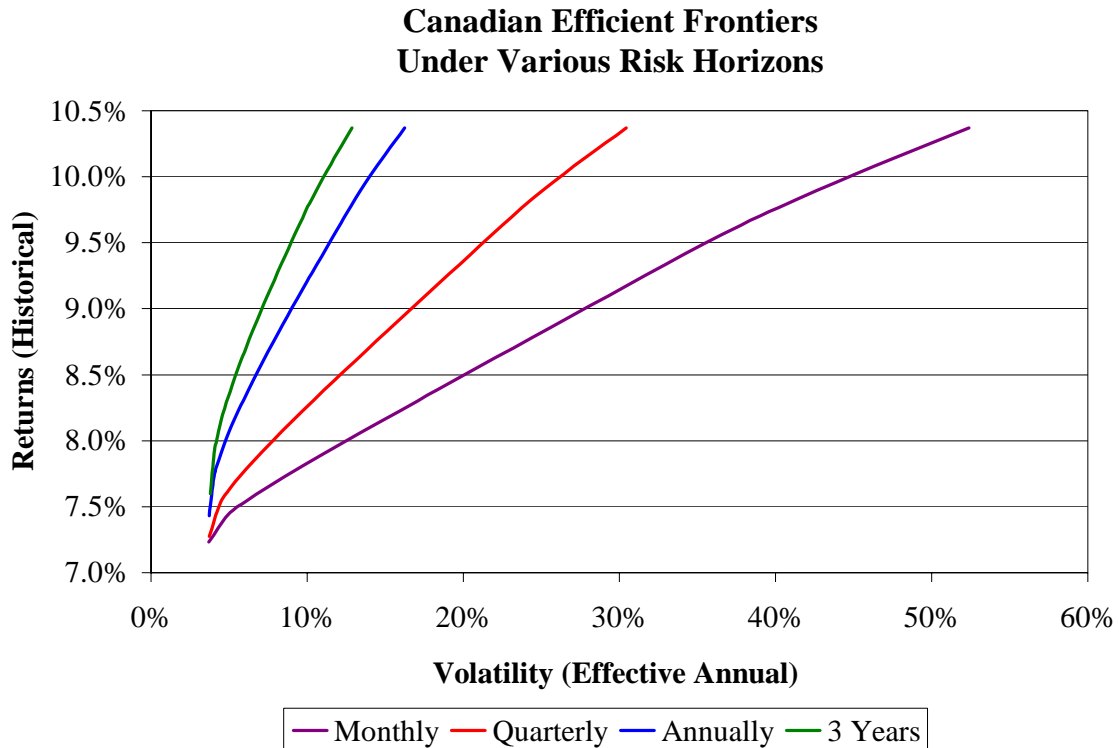


The more volatile assets in the short term have greater long term returns. Once again, a premium is paid in the long term for reducing risk in the short term.

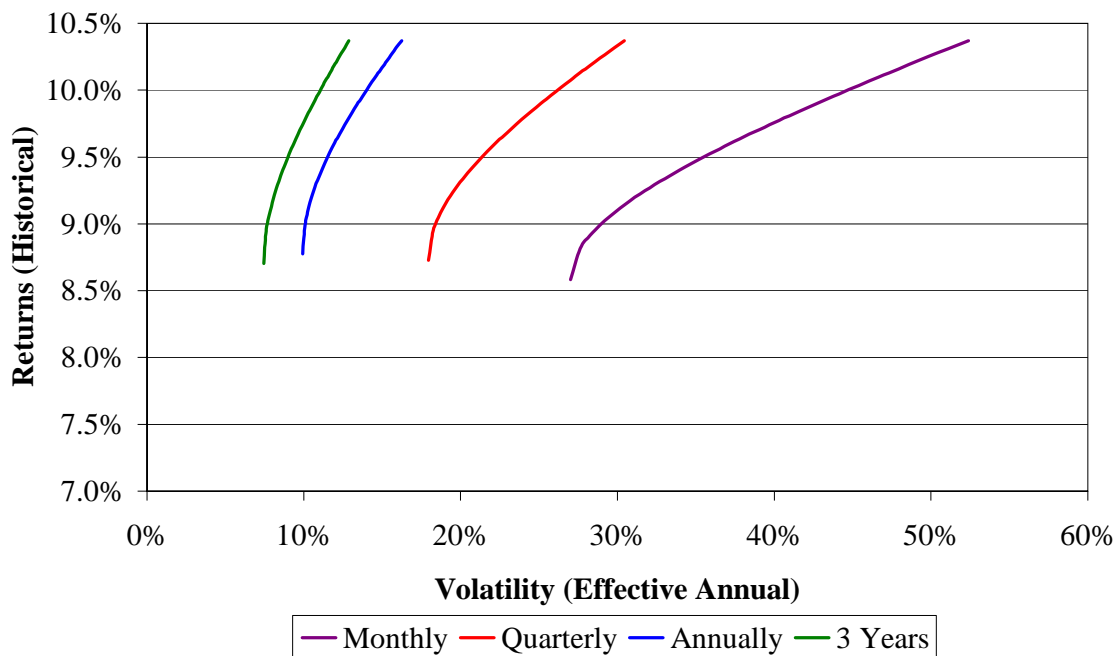
All investors are sensitive to negative returns (they don't like them) and will change their investment behavior when losses occur. However, investors will differ in terms of how long and by how much they sustain negative returns before changing their behavior. If one month of negative returns is too much for them, then they should avoid bonds and equities. Whereas, investors with long term horizons should remember that there have been few periods in the past forty years where the three year moving average for bonds and equities has been negative.

Asset Allocation and Time Diversification

In determining an investor's sensitivity to risk, the investor must consider both the time horizon and asset diversification. The following graphs are a series of efficient frontiers under monthly, quarterly, annual and 3 year horizons. (Footnote: the graphs use Canadian data from 1956 to the present, and use an effective annual volatility as opposed to an annual volatility).



Efficient Frontiers Two Asset Classes: Long Bonds & Equity (TSE 300)



The first graph describes the Canadian efficient frontiers using treasury bills, bonds and equities. An interesting aspect to this graph is how the risk of holding a treasury bill does not substantially change as the investor lengthens their investment horizon. The curves meet near the 100% treasury bill point (or the point of lowest volatility). As expected, as the investor increases their investment horizon, the curves become steeper. They can purchase more volatile assets while still experiencing the same degree of risk, because they have increased their tolerance of short term volatility (the investors perception of risk changes as their investment horizon changes).

The second graph is the efficient frontier for only two asset classes, bonds and equities. Without the unique characteristics of treasury bills (risk free rate), the investors point of lowest risk is substantially higher.

As the investment horizon is lengthened, the investor's efficient frontier becomes steeper. This is an extremely important concept for the investor. The steeper the frontier, the greater return for the same level of perceived risk. If an investor is indifferent between a risk horizon of one year and three years, then they will generate a higher long term return if they base their asset allocation decisions on the three year horizon.

Dynamic Asset Allocation

Most asset allocation strategies have some sort of decision rule for resetting the asset mix. This decision rule is frequently set without a great deal of analysis, since it is implicitly set in the initial strategic asset mix. If a policy decides a 60/40 equity/bond mix, then the implicit decision rule is to rebalance when the portfolio deviates from this mix. Comparing the effects of different decision rules can be a fairly complex task, with only minor deviations in long term risk and return.

The three main types of rebalancing strategies are: Buy & Hold, Constant Mix and Portfolio Insurance.

Buy & Hold

A Buy & Hold strategy is simplest of the three and the approach is exactly what the name suggests. The investor sets their initial asset mix and does not attempt to rebalance back to that initial mix. If a 50/50 equity/T-bill portfolio turns into a 70/30 mix after a few years of strong equity returns, the investor keeps this new asset mix.

Constant Mix

The Constant Mix approach is the most widely used amongst institutional investors since 1987. This approach sets an initial asset mix, and periodically rebalances back to this mix. If the investor were to start with a 60/40 equity/bond mix, and after a strong equity market the portfolio mix were to be 65/35, then with a Constant Mix strategy, the investor would sell equities and buy bonds to bring the mix back to 60/40.

Portfolio Insurance

The Portfolio Insurance approach has gone out of fashion since the 1987 correction, since it is believed that the severity of the correction was partially due to the common use of this method amongst large institutional investors. Using Portfolio Insurance, the investor sets a floor at which their portfolio value will not fall below. For example, using equities and treasury bills, as the equity market rises they will sell treasury bills (low risk asset) and buy equities (higher risk asset), and the equity market falls they will sell the equities and buy treasury bills. This is done such that if the equity market declines then the investor will keep selling equities and buying treasury bills until at the portfolio floor level they hold 100% treasury bills.

In 1987, a number of large institutional investors used this strategy, so when the equity market began declining rapidly, these investors began to automatically sell equities through their computer trading models. This created enormous selling pressure in the

market, driving prices down further and causing more selling. The stock exchange set rules against programmed rebalancing after this event.

Summary

To effectively construct a portfolio, the investor must understand the effects of diversification across assets and time. The relationship between these two concepts can be quite complex. Various techniques have been developed over the past forty years to assist the investor in constructing portfolios and understanding the subtleties of diversification. Responsible investors and fiduciaries should understand these relationships and utilize these tools to build optimal portfolios for themselves or their clients.