

Equity market returns... with less risk.

How TD Low Volatility Strategies can help investors pursue highly competitive returns with significantly less volatility.

Investor's perception of risk has changed over the past decade. It wasn't just the crash of 2008 that changed perceptions about risk. It was the extreme volatility, which saw major indices swing 1,000 points or more in a single day. This caused many investors to re-evaluate the risks inherent in traditional benchmarks and to turn their focus toward achieving better risk-adjusted returns.

The basic relationship of risk and reward described in Modern Portfolio Theory appears to hold true at the asset class level. As investors go from treasury bills to longer bonds to equities, there is certainly higher risk and higher potential return. But once the focus is exclusively on equities — Canadian, U.S., or global — the stocks with the highest volatility have

actually underperformed the broad market over the last 50 years or so. However, if you look at stocks with relatively low risk — such as utilities and consumer staples, which satisfy less cyclical demand and some insulation from economic swings — it's clear that expected returns are roughly on par with the broad market, **except with a lot less volatility.**

TD Low Volatility Strategies

Against this backdrop, TD Asset Management (“we/our”) was among the first to bring low volatility equity strategies to Canada by launching the TD Emerald Low Volatility Canadian Equity Pooled Fund Trust (PFT). This was created to help institutional investors pursue the returns of domestic equities with significantly less volatility. What’s more, unlike many strategies aimed at reducing risk, TD Emerald Low Volatility does not rely on derivatives, short selling, or leverage. The strategy is kept very transparent and efficient, because it is ultimately a long-only portfolio of conservative equities.

Today, more than nine years after its launch, the strategy has garnered substantial attention and delivered strong risk-adjusted returns in line with the expectations set from our original historical simulations. Its success spurred the subsequent launch of four other low volatility equity funds for institutional investors, including the TD Emerald Low Volatility Global Equity PFT,

and led to tremendous growth in the low volatility products space. Globally, TDAM is a top 5 investment manager in low volatility equity strategies, with assets under management in excess of \$20 billion¹, as of March 31, 2019.

Construction

Our portfolios begin with a particular universe of stocks, such as the constituents of the S&P/TSX Composite Index or the MSCI World ex-Canada Index. These indices are the benchmarks against which we can compare performance. Our low volatility funds use risk as the primary measure to determine the inclusion, exclusion and optimal weighting of the stocks in the portfolio – a marked contrast to the benchmark indices, which use market capitalization as their criterion.

Many studies have concluded that it is significantly more reliable to forecast return volatility than to forecast future stock returns², which is a key reason that we focus on a risk above returns in our investment process. To help ensure that the portfolio is well diversified, we also apply common sense constraints such as maximum country, sector and individual stock weights.

Using standard deviation and correlation analysis, we assess the risk that each security contributes to the portfolio. Firms with very short return histories and firms that recently underwent significant events such as spin-offs, mergers or takeovers are excluded from this analysis (and from our portfolios). We use state-of-the-art risk models to estimate the various correlations among the large numbers of equities involved. We assume that return correlations originate from sensitivities to common risk factors. For example, decreases in oil prices will systematically and negatively impact oil producing firms while the same fall in oil prices will positively impact energy users such as transportation and chemical firms.

Characteristics

Because we focus on risk as opposed to capitalization in our construction process, our portfolios tend to look very different from their benchmark indices. Stocks with lower return volatilities and lower correlations with other stocks will tend to have larger weights, and not all benchmark securities will be included because stocks with higher return volatilities or with higher correlations will have either zero or smaller weights.



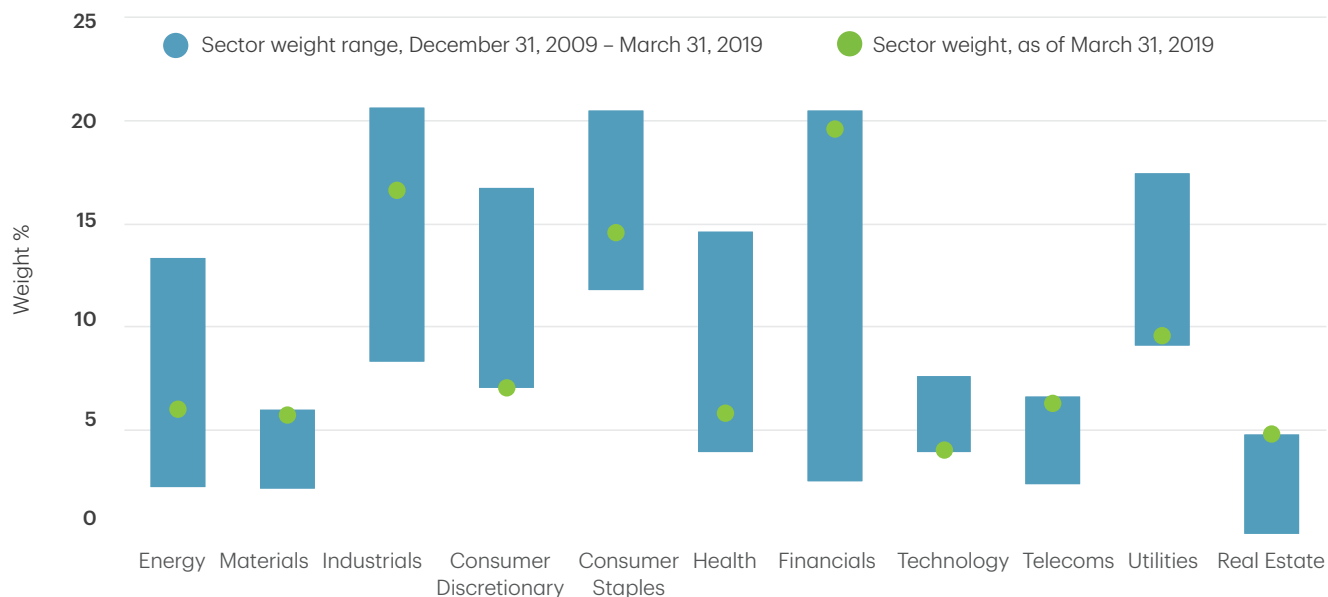
The inclusion and weighting of each individual stock within the strategy, is determined by the risk level that it contributes to the portfolio as a whole. For example, if an investor were to sort 1,000 stocks into five portfolios of 200 stocks each based on their volatility over the previous five years, the least volatile group of stocks would produce returns equal to or better than all the other groups 70% of the time, whereas the most volatile portfolio would outperform only 30% of the time.

¹ Source: eVest, March 31, 2019. ² Chopra and Ziemba (1993) find that errors in estimating expected returns are over ten times larger than when estimating variances, and over twenty times larger than errors in estimating covariances.

Our low volatility funds are dynamic and sector weights vary with changes in predicted risk, but broadly speaking, stocks from the Utilities or Consumer Staples sectors tend to be well represented in our portfolios as these stocks are typically issued by firms with relatively stable technologies and markets (chart below). The stocks of fast growing firms are

less well represented as their stock prices tend to be heavily influenced by fast changing expectations of future cash flows. Similarly, the stocks of firms with low degrees of accounting or economic leverage have higher weights than the stocks of firms that are heavily indebted or have fixed costs that cannot easily be altered according to fluctuations in demand.

Figure 1: Sector weights vary with changes in predicted risk



Sector weights of the TD Emerald Low Volatility Global Equity PFT. Each bar represents the range for each sector weight within the Fund since December 31, 2009, and each dot represents the sector weight as of March 31, 2019. The Fund inception date was December 22, 2009. Source: TDAM, MSCI Inc.

The TD low volatility portfolios have fewer mega cap stocks than their capitalization-weighted index benchmarks and more companies with mid and small market capitalization. Although small caps are, on average, more volatile than larger caps, this is not true for every stock. There are some very large-cap Information Technology companies that can be more volatile than some smaller caps from the Consumers or Utilities sectors, which is why assessing each individual stock's risk level is a key part of our process.

Returns

A large body of professional and academic research suggests that investors can expect higher risk-adjusted returns from low volatility equities over the long run. However, lower volatility equities do not outperform higher volatility equities under all scenarios. Less volatile equities tend to underperform more volatile equities during strong bull markets.

Similarly, TD low volatility equity portfolios will likely underperform their capitalization-weighted index benchmarks in strong bull markets. In such markets, characterized by general optimism and falling risk aversion, the stocks of faster growing and more volatile equities tend to rise faster than the stocks of more stable firms. The opposite is observed in falling markets, with low volatility equity portfolios losing considerably less than capitalization-weighted equity indices.

Figure 2 summarizes the pattern of monthly returns since the launch of the TD Emerald Low Volatility Global Equity PFT more than nine years ago. This pattern of returns should appeal to investors who are particularly sensitive to capital preservation and are willing to accept some underperformance during particularly good times in exchange for lower volatility portfolio that will provide less volatile returns in choppy markets.

Figure 2: Monthly returns from January 1, 2010 to March 31, 2019

Market Strength & Direction ¹	No. of Months	Average Fund ² Return	Average Index ³ Return	Average Excess Return	Hit Rate ⁴
Market < -2%	17	-1.80%	-3.73%	1.93%	88%
Market within ± 2%	52	0.67%	0.32%	0.36%	63%
Market > 2%	42	2.87%	3.71%	-0.84%	21%

¹ Market measured as the monthly return on the MSCI World ex-Canada Index. ² TD Emerald Low Volatility Global Equity PFT. ³ MSCI World ex-Canada Index. ⁴ Percentage of positive excess returns. Source: TDAM.

Figure 3 shows the annualized returns of the TD Emerald Low Volatility Global Equity PFT as of March 31, 2019. The Fund's annualized return since inception is 13.93%, 2.06% higher than the return of the MSCI World ex-Canada Index over the same period, and its annualized return volatility is 7.71%, 21% less than the 9.78% volatility of the benchmark index.

With a higher return and lower volatility, the Fund boasts a high risk-adjusted return (measured using the Sharpe ratio) of 1.71. The TD Emerald Low Volatility Global Equity PFT's performance is entirely consistent with the long-term historical evidence we presented in our previous research papers.

Figure 3: TD Emerald Low Volatility Global Equity PFT

As of March 31, 2019	3 Months	1 Year	3 Years	5 Years	Since Inception ¹	Volatility ²	Sharpe Ratio ³
TD Emerald Low Volatility Global Equity PFT	8.23%	11.36%	11.60%	12.91%	13.93%	7.71%	1.71
MSCI World ex-Canada	9.92%	7.81%	12.00%	11.17%	11.87%	9.78%	1.13
Difference	-1.69%	3.55%	-0.40%	1.74%	2.06%	-2.07%	0.58

¹ Inception date: December 22, 2009. ² Volatility is the annualized standard deviation of all monthly returns since inception. ³ The Sharpe ratio is computed using all monthly returns. Note: Returns for periods greater than one year annualized; numbers may not add due to rounding. Source: TDAM, MSCI Inc.

The future

Our track record demonstrates historical outperformance, but what about future performance? We do not expect future returns to be identical to past returns, in part because we expect returns from both high and low volatility equities will be more modest going forward. However, we do expect low volatility equities to continue to provide attractive risk-adjusted returns. In fact, we believe that volatility, which has been notably low over recent years, will increase to more normal levels. In an environment of increasing volatility, we expect that investors will find low volatility returns, and the smoother return profile they offer, even more attractive going forward.

Against this backdrop, the low volatility equity strategy could possibly fall victim to its own success. If investors dislike volatility, they should prefer assets

with less volatile returns. This process should bid up their prices, thus lowering their expected returns until, in equilibrium, investors are indifferent between assets with various risk levels. However, several decades after the theory was published in academic journals and became a core component of most finance textbooks, the empirical evidence suggests that this still has not yet happened.

As awareness of risk grows, investor behaviors' could change, and the low volatility effect may eventually disappear when enough capital is benchmarked using the Sharpe ratio and when enough investors are willing to deviate significantly from the traditional cap-weighted benchmarks. However, until that paradigm shift occurs, we believe that there is a window of opportunity for low volatility investors, and the rewards for early investors may be significant.

Low volatility strategy in defined benefit pension plans – A case study

Low volatility strategies can also play a very important role within defined benefits pension plans (DBPP). Below is a case study that helps illustrate the potential benefits of exploiting more efficient equity strategies such as low volatility equities and the benefits they can provide to defined benefit pension plans.

In **figure 4** we compare a mix of assets consisting of capitalization-weighted equities and long-term bonds.

Our base case consists of 40% in the FTSE TMX Canada Long Term Overall Bond Index, 40% in the MSCI World ex-Canada Index, and 20% in the S&P/TSX Composite Index. For simplicity, we will proxy the return on the liabilities of the plan using the returns on the FTSE TMX Canada Long Term Overall Bond Index. During the 111 months covered by this sample experiment which assumes monthly rebalancing to the target asset mix, the base asset mix delivered an annualized asset return of 9.11% and an asset return volatility of 6.02%. If we focus on the excess return of assets over liabilities, the annualized return is 2.03% with an annualized volatility of 6.63%.

Figure 4: Asset mix scenarios: January 2010 through March 2019

	Asset Return	Asset Volatility	A-L Return ¹	A-L Volatility ²
Base case (cap-weighted equities)	9.11%	6.02%	2.03%	6.63%
Low volatility with same weights	10.85%	5.56%	3.77%	4.83%
Low volatility with same asset risk	12.24%	6.02%	5.16%	6.65%
Low volatility with same A-L risk	12.23%	6.01%	5.15%	6.63%

¹ Annualized assets minus liabilities return. ² Annualized assets minus liabilities volatility.

The second line in the table summarizes the impact of replacing all capitalization-weighted equities with TD low volatility equity funds. The assets thus consist of 40% in the FTSE TMX Canada Long Term Overall Bond Index, 40% in the TD Emerald Low Volatility Global Equity PFT, and 20% in the TD Emerald Low Volatility Canadian Equity PFT. The asset return increases while the asset return volatility falls. More importantly for the plan sponsor, the return on assets now exceeds that on liabilities by 3.77% while the volatility of the excess return of assets over liabilities falls to 4.83%.

If the plan sponsor targets an asset return volatility of around 6.0%, he or she could achieve that by increasing the allocation to low volatility equities and decreasing the bond allocation. If we preserve the ratio of 2-to-1 for global and Canadian equities, that target level of asset return volatility can be achieved by investing 17% in the FTSE TMX Canada Long Term Overall Bond Index, 55% in the TD Emerald

Low Volatility Global Equity PFT, and 28% in the TD Emerald Low Volatility Canadian Equity PFT. The asset return increases further while the asset return volatility remains identical to the base case. The return on assets now exceeds that on liabilities by 5.16% while the volatility of the excess return of assets over liabilities becomes 6.65%, which is similar to the base case.

A third alternative asset mix would be the mix of low volatility equities and long-term bonds that generate the same level of asset-liability excess volatility as the base case. That would consist of investing 18% in the FTSE TMX Canada Long Term Overall Bond Index, 55% in the TD Emerald Low Volatility Global Equity PFT, and 27% in the TD Emerald Low Volatility Canadian Equity PFT. This would have resulted in assets returning 5.17% more than the cost of liabilities, an almost identical result to the previous scenario.

case study



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