TD Asset Management

NEW THINKING

TDAM Quantitative Equity Investing

Year in Review & Look Ahead

The year 2018 kept most, if not all, portfolio managers anxious; it began with a jolt of volatility and ended with a shock. Regardless of the angle used to examine financial markets, whether monetary, fiscal, trade or political; all these factors played an important role in what transpired to be a year in which volatility returned to the markets. Since the financial crisis, these forces have worked together to propel the global economy forward, but their synchronous rhythm started to destabilize in 2018. A flattened yield curve, global trade tensions, the fading impact of tax cuts in the U.S., the economic slowdown in China and political tensions are clear dangers that came to the forefront in December and will likely ensure a volatile 2019. With that being said, low volatility strategies delivered on their stated objectives and most importantly helped mitigate losses in these difficult market conditions.

It is not in our clients' interest that markets fall, but it if they do, the TDAM suite of Low Volatility funds will provide the best chance of "living to fight another day".

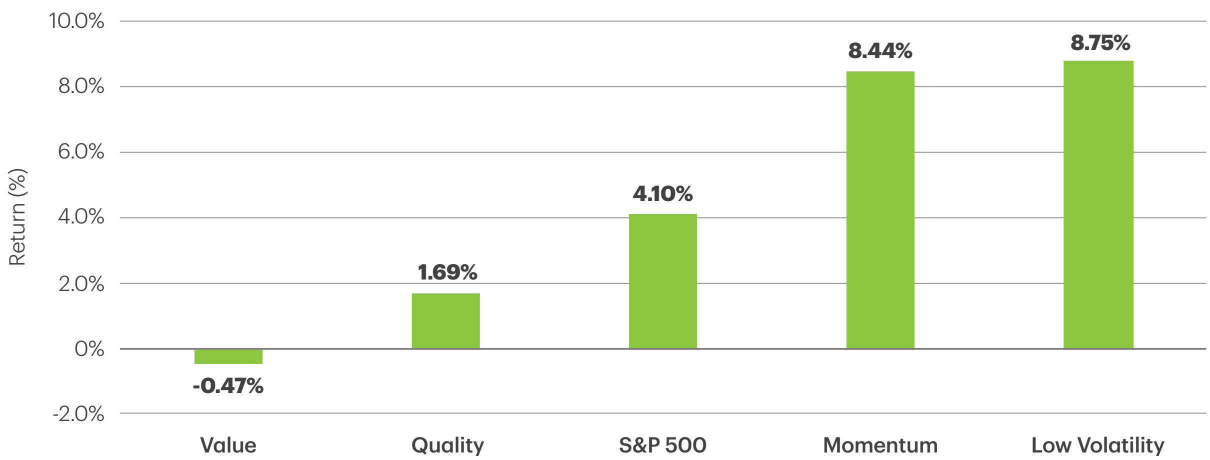
Low Volatility, A Shining Star

Over the past year, the global economy has shown signs of moving towards a late cycle phase. Monetary conditions, led by the U.S. Federal Reserve, have tightened and the U.S. dollar has risen sharply. Growth in most of the developed and emerging markets has slowed from the brisk pace of 2017. Furthermore, commodity prices have been in turmoil and geopolitical tensions have emerged globally – all heightening macroeconomic uncertainty and adversely impacting equity markets in 2018.

The *Low Volatility* strategy is a shining star among investment factor-based strategies, followed by the *Momentum* and *Growth* factors, which received an outsized contribution from a few U.S. technology giants. Pro-cyclical factors such as *Value* and *Size* have underperformed (see **Chart 1**).

Chart 1: Factor Returns for the S&P Dow Jones Indices (CAD)

A comparative look at the 2018 calendar performance of investment factors and the overall U.S. market.



Data Range: January 2018 to December 2018. Source: TDAM, S&P Dow Jones Indices.

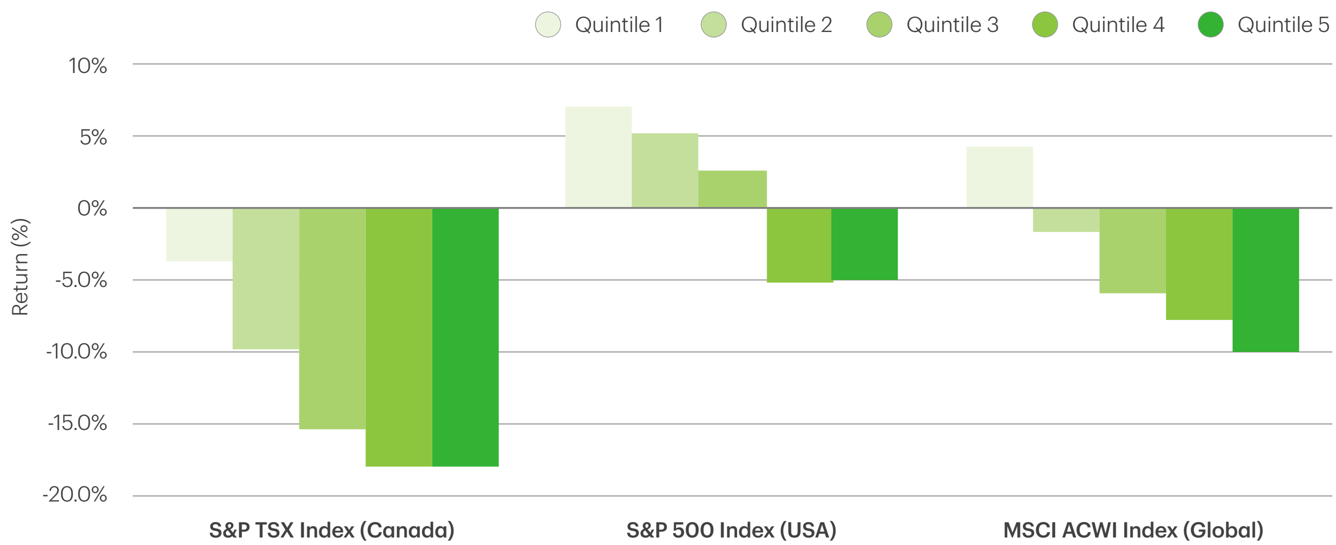
A Low Vol Refresher

According to the broadly-accepted theory of the Capital Asset Pricing Model (CAPM), high beta stocks should outperform their low beta counterparts to compensate investors for accepting higher risk. However, over the last few decades, low beta stocks have outperformed high beta stocks, defying the underlying theory of CAPM. The outperformance exhibited by low volatility strategies is not a passing phenomenon, but a long-standing trend that will most likely persist should behavioral biases as observed in 2017/2018 with the lottery effect of Cannabis stocks and Bitcoin). and regulatory limits (leverage and shorting constraints) prevent the low volatility anomaly from being fully arbitraged away.

To gain a simplified understanding of how low volatility works, one needs to look at volatility quintiles. Essentially, stocks are sorted into five equally-weighted buckets based on their volatility rank for each major index. For the low volatility anomaly to exist, the quintiles with lower volatility stocks should deliver higher-risk adjusted returns relative to the quintiles with higher volatility stocks, over the long run.

The chart below (**Chart 2**) shows the performance by volatility quintile for each equity universe in CAD (i.e. Canada, U.S. and Global) over the last year. The quintiles are formed by ranking the stocks in each universe by their 3-year volatilities. As observed, the low volatility effect worked quite well in 2018, with the least volatile stocks (i.e. Quintile 1) outperforming the most volatile stocks (i.e. Quintile 5) across these markets.

Chart 2: Low Volatility performance of each index, ranked by Quintile



Data as of December 2018. Source: TDAM, December 2018.

The results are very pronounced across all markets. This is particularly true for U.S. and global equity markets, where the first volatility quintile (i.e. Quintile 1) completed the year in positive territory. Therefore, a low volatility portfolio constructed by equally-weighting the lowest 20% of stocks by their realized volatility would have outperformed its equally-weighted benchmark over the past year, by a meaningful margin.

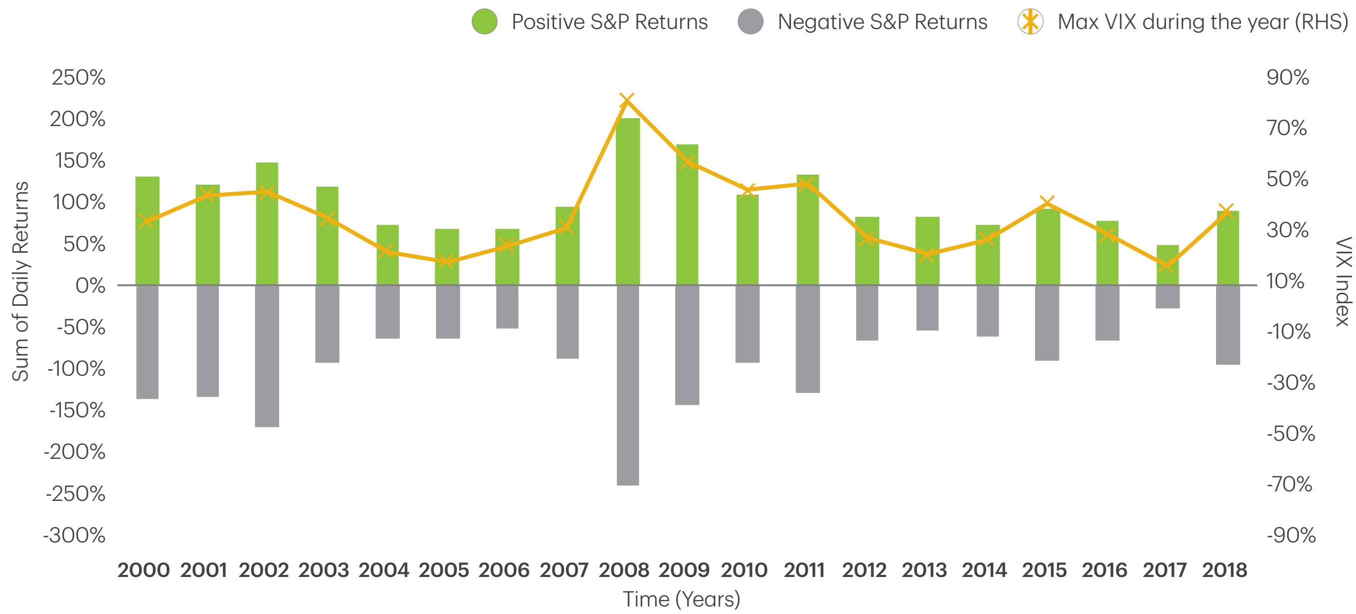
However, there could be times during the market cycle when a low volatility strategy could face certain headwinds. Typically, those headwinds are strong during periods when overall market risk is low, mainly because of the decline in volatility of high-beta assets that close the gap with their low-beta peers. In addition, those periods generally enjoy favorable macroeconomic and geopolitical conditions, expansionary monetary and fiscal policies, buoyant market sentiment and high investor confidence. During a period of abnormally low market volatility, as experienced in recent years, low volatility strategies would underperform relative to the market.

Volatility is Back

After hitting new highs earlier in the year and again in the third quarter, global equities declined markedly during the last quarter. For Canadian investors with international holdings however, the impact of the weaker Canadian dollar helped to dampen or eliminate the losses. This stands in sharp contrast to 2017, where global equities averaged double digit returns. A deep downturn in emerging markets was followed by sharp declines in major equity indexes around the world. A culmination of threats by President Trump (i.e. firing Federal Reserve Chairman Jerome Powell/Federal Reserve independence, renewed calls for funding a border wall and a U.S. government shut down if said funding is not provided) finally boiled over into financial markets in December. In fact, December stands out as being one of the most volatile months since the Great depression. Peak to trough, the S&P 500 fell 15.6% intra month and narrowly avoided a bear market (-20% drawdown) before experiencing some of the strongest days since the Great Recession. With reduced market liquidity during the holiday period, the price action was quite remarkable across all asset classes.

Chart 3: Return of Market Volatility in 2018

Chart contrasting returns of the S&P 500 versus Max VIX Index Level, from 2000 to 2018.



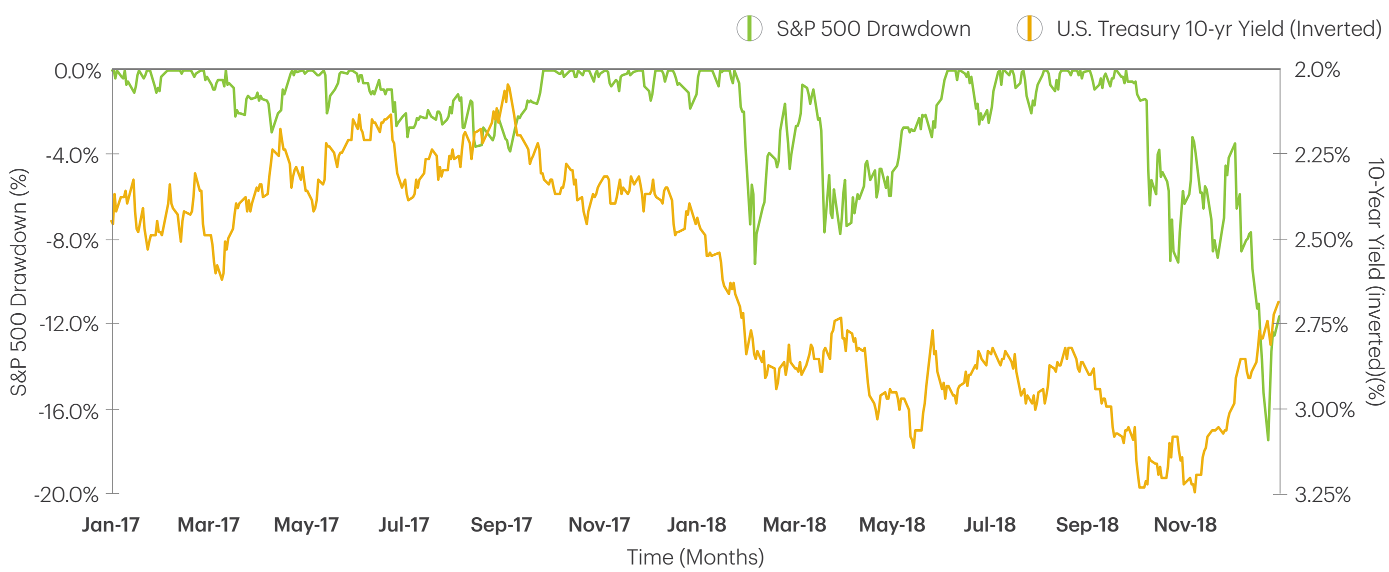
Data as of December 2018. Source: TDAM, Bloomberg, December 2018.

In comparison to other developed economies, the U.S. economy remained ahead of the pack and continued to power ahead in 2018, particularly in the first half of the year, when growth began to wane in the rest of the world. In addition to the fiscal boost provided by tax cuts, the U.S. economy also benefited from relatively healthy consumer finances, strong corporate profits and a well-functioning financial system.

With the unemployment rate declining to multi-decade lows and import prices increasing due to various tariffs imposed by the Trump administration, it is not a surprise that U.S. inflation rose to 2%. This economic backdrop allowed the Federal Reserve to remain focused on monetary policy normalization and maintain its planned course of action of raising interest rates. U.S. Treasury yields were experiencing pressure, spiking to multi-year highs of 3 ¼%.

Chart 4: Equity Markets vs. Interest Rates

A contrasting look at the S&P 500 Drawdown and U.S. Treasury 10-yr yield, from Jan./17 to Dec./18.



Data as of December 2018. Source: TDAM, Bloomberg, December 2018.

However, when 10 year rates rose rapidly in January and in the two instances when the U.S. long-term interest rate attempted to move beyond 3 ¼%, riskier assets, particularly prominent technology equities, declined sharply. In response to a strong market reaction, the Federal Reserve backpedaled on their plans to further increase the policy interest rate 3 or 4 more times in 2019. Currently markets are not pricing any rate hikes for 2019.

A major theme that emerged throughout the year was 'risk resurgence', with 2018 now being classified as the year in which market volatility returned and the global economy downshifted. The strong and synchronous growth pace of 2017 has morphed into a sluggish stride, with very divergent trends arising around the world. Among other major regions, European growth has been suffering from fresh rounds of political crises, including riots in France, the election of a populist government in Italy and Brexit negotiations that remained tense, with uncertainty rising about the U.K. economy and its assets.

Regarding emerging markets, their performance in 2018 was among the worst. Negative catalysts for said performance included a strengthening U.S. dollar, lower commodity prices and China's weakening growth, due to cooling off from a policy-induced rebound in 2017 and the escalating trade war with the U.S. that shook business confidence and investor sentiment. As a result, Chinese domestic shares have entered a bear market, dropping more than 20%.

Beyond the above-mentioned, weak natural resource prices were behind the poor performance of commodity-dependent developed economies, such as Canada and Australia.

Necessary, but Not Sufficient

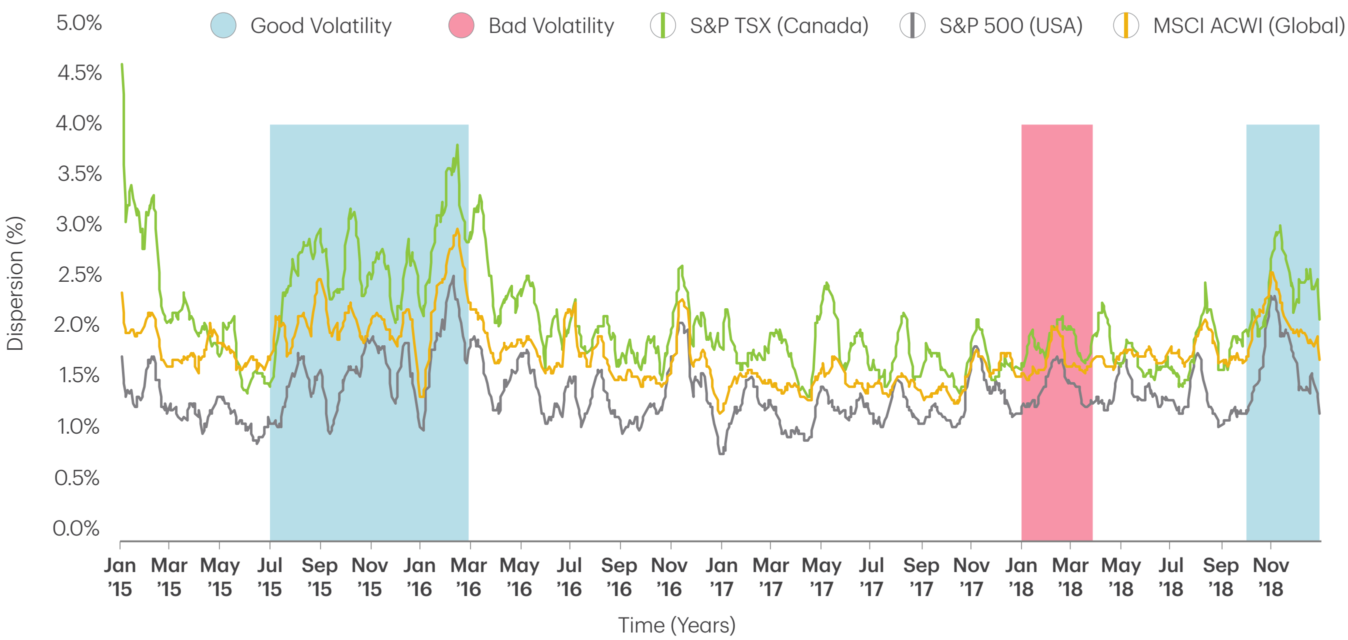
The volatility observed in 2018 was akin to that of 2015, in which crude oil prices dropped precipitously. In such a market environment, one would expect low volatility strategies to perform very well; however, that is not always the case. Though higher market volatility is necessary for a low volatility strategy to perform well, higher volatility in and of itself is not a sufficient condition for it to achieve market outperformance.

Portfolio managers are often heard expressing a need for volatility to be present for them to make money; and when they can't, they blame it on 'bad' volatility. That sentiment is partially true for 2018. Our Low Volatility funds suffered during the 'bad' volatility spike of Q1 2018, where there was nowhere to hide, but the Q4 volatility was a boon for our strategies. For the S&P/TSX, the lack of dispersion in Q1 was more pronounced and our funds fully participated in the Q1 downside. The same occurred across all of our funds, but to a lesser extent.

The following charts (**Chart 5a and 5b**) provide an illustrative look at a cross-sectional standard deviation of returns over a 10-day period in the upper panel and an estimate of volatility in the lower panel. As observed, volatility increased by a similar magnitude in both the first and second half of the year, but dispersion behaved quite differently. A low dispersion number means that all stocks posted similar returns, while a larger number implies that there were real winners and losers. In the market sell-off of January/February, the dispersion looked no different than it had in the past three years. However, when markets sold off in late 2018, the dispersion was comparable to levels seen in 2015/2016, during the oil crash.

Chart 5a[1]: 10-day Moving Average of Dispersion

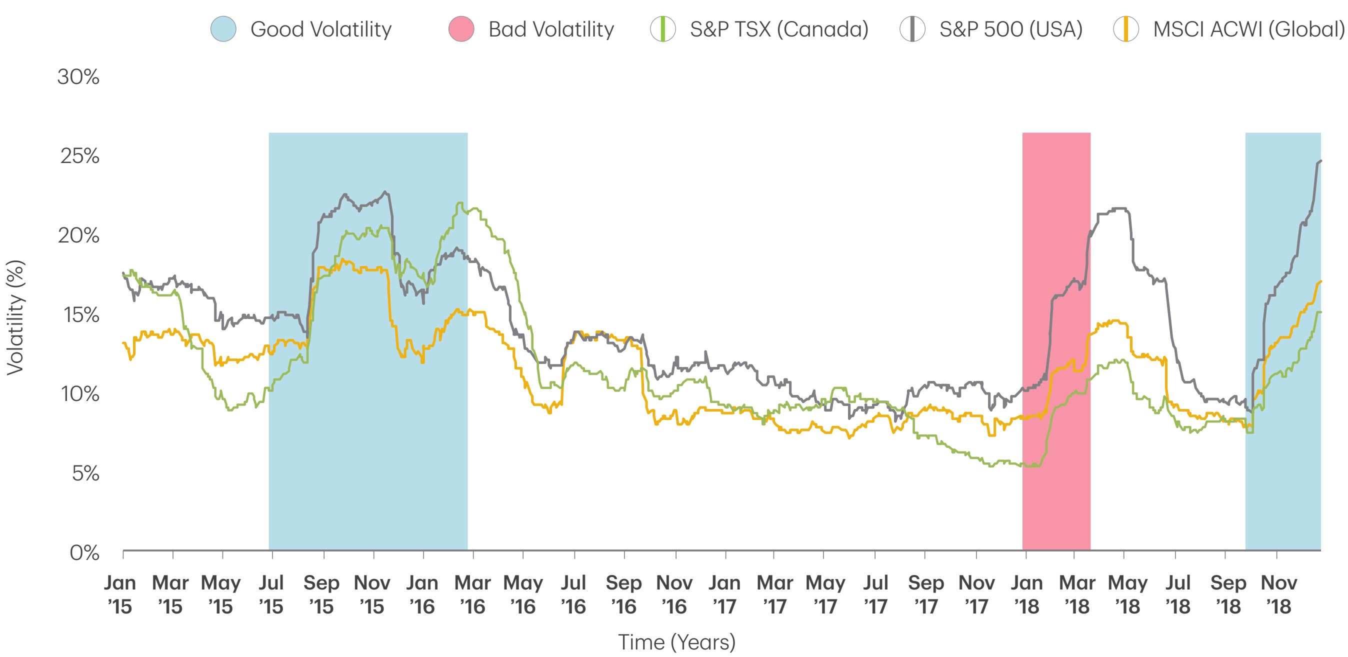
A comparative look at the equity markets indices of Canada, U.S. and Globally.



Data as of December 2018. Source: TDAM Internal.

Chart 5b: 3 Month Daily Volatility Annualized

A comparative look at the equity market indicies of Canada, U.S. and Globally.



Data as of December 2018. Source: Bloomberg.

[1] Charts 5a and 5b are for illustrative purposes only.

Simply put, a lack of dispersion is not conducive for low volatility investing, since there is literally nowhere to hide in the market. However, high dispersion provides winning opportunities and the creation of 'safe haven' sectors, such as Utilities, Consumer Staples and Real Estate. These sectors allow low volatility strategies to properly provide downside protection, during high volatility periods.

Looking Below the Surface

While volatility was a common theme globally in 2018, the sources of volatility varied for each region. Within Canada, the most volatile stocks of the S&P/TSX were tied to natural resources, and more recently healthcare companies. On the other hand, Global (MSCI ACWI) and U.S. (S&P 500) indices derived much of their risk from the technology sector. This divergence in volatility is the underlying reason why low volatility strategies have not performed similarly in different regions.

In taking a deeper look at each region, within Canada, the Information Technology sector performed well in 2018, whereas Energy, Consumer Discretionary and Health Care performed poorly. Last year, the defensive positioning of the fund provided downside protection, resulting in its outperformance relative to the cap-weighted index. The major contributors to positive performance were overweight positions in the Consumer Staples sector (mainly chain stores), underweight Energy (this sector performed poorly due to weak oil prices), and overweight Real Estate (via residential REITs). Our holdings in the Financial sector detracted from the performance as the major Canadian banks, which we underweight, held up well in the selloff.

TD *Emerald* Low Volatility Canadian Equity PFT	Active Weight	Value Added
Grand Total	**0.0%**	**4.2%**
Consumer Staples	9.4%	1.4%
Energy	-4.9%	1.2%
Real Estate	5.2%	1.1%
Communication Services	4.2%	0.6%
Industrials	0.4%	0.3%
Information Technology	-1.1%	-0.4%
Financials	-9.2%	-0.4%
Other Sectors (Incl FX Hedges)	n/a	0.3%

Source: TDAM. December 2018. Returns are Gross of Fees and Trading Costs. PFT = Pooled Fund Trust.

TD *Emerald* Low Volatility All World Equity PFT	Active Weight	Value Added
Grand Total	**0.0%**	**2.4%**
Financials	2.1%	1.5%
Consumer Staples	2.1%	1.1%
Communication Services	4.7%	0.6%
Industrials	8.2%	0.6%
Consumer Discretionary	-3.2%	-0.5%
Information Technology	-14.2%	-0.8%
Health Care	-8.1%	-0.9%
Other Sectors (Incl FX Hedges)	n/a	0.9%

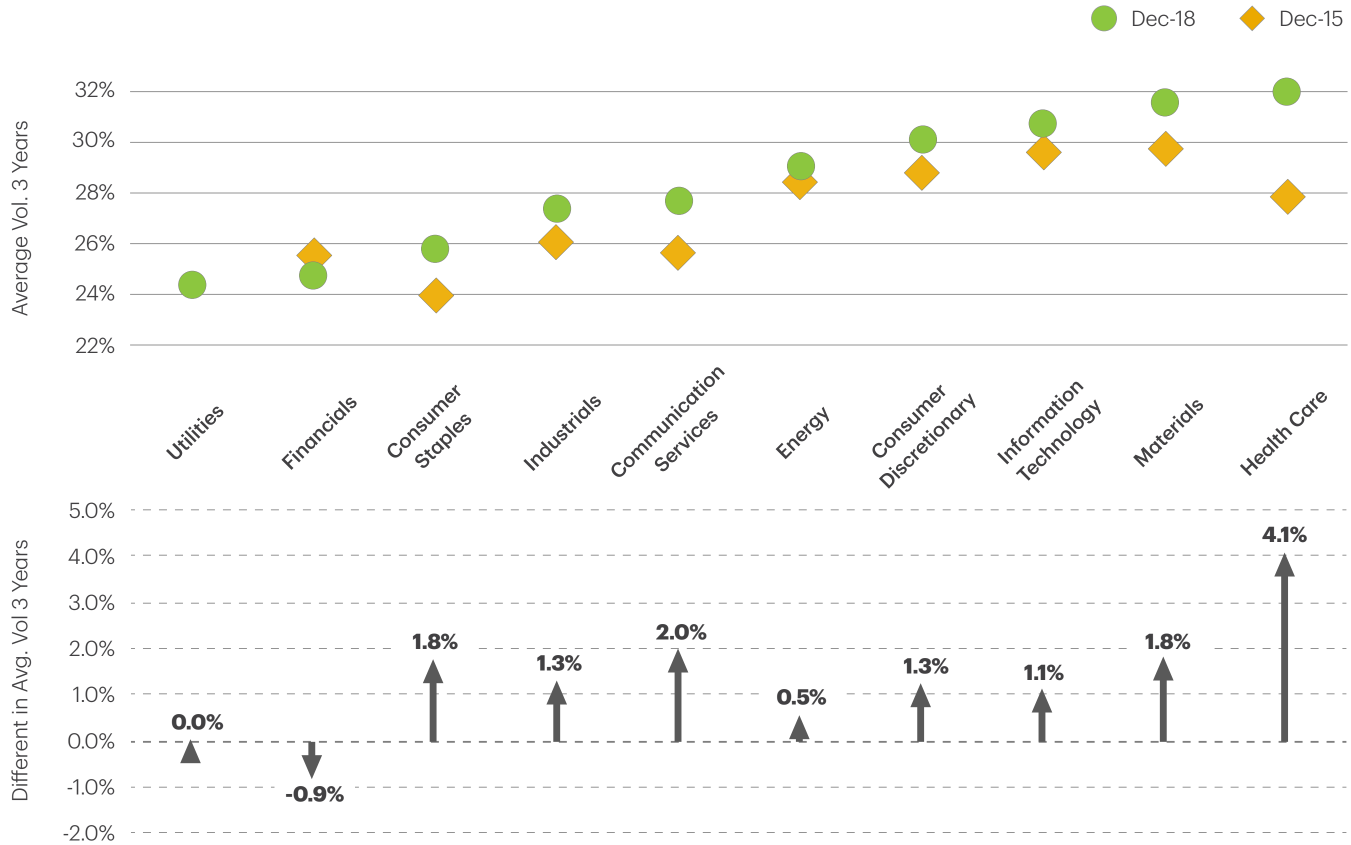
Source: TDAM. December 2018. Returns are Gross of Fees and Trading Costs.

Regarding global equities, Health Care, Information Technology and Utilities were the primary performance drivers. The value added of the funds came from overweighting Financials (via above benchmark weighting in international finance companies and underweighting North American banks) and overweighting Consumer Staples. Not surprisingly, Information Technology detracted while Health Care, which we underweight despite being historically viewed as a defensive sector, also detracted. Political risks, especially in the U.S., have been a major source of volatility for the sector. Facing potential large-scale changes to the Affordable Care Act and proposed drug pricing reforms, many investors have limited their exposure to the sector. As a result, the volatility among Health Care equities has increased the most over the past 3 years[2] (see **Chart 6**).

[2] Note: Communication Services experienced a larger increase, but the sector was revamped by MSCI in 2018.

Chart 6[3]: Sector Volatility

Chart contrasting the average volatility between Dec-15 to Dec-18.



Data as of December 2018. Source: TDAM, Bloomberg, December 2018.

Finally, our U.S. fund performed very well thanks to strong stock selection across the sectors. Utilities, being one of the best performing sectors in the U.S., contributed positively to the fund. Not owning the large U.S. banks helped our stock selection in Financials and underweighting Energy also contributed materially. Similar to the performance of our global funds, Health Care and Information Technology sectors detracted from the performance during the past year.

TD *Emerald* Low Volatility U.S. Equity PFT	Active Weight	Value Added
Grand Total	**0.0%**	**3.5%**
Utilities	16.3%	1.6%
Financials	10.1%	1.3%
Energy	-5.1%	0.8%
Industrials	3.8%	0.8%
Health Care	-7.8%	-0.5%
Information Technology	-15.6%	-0.5%
Other Sectors (Incl FX Hedges)	n/a	0.0%

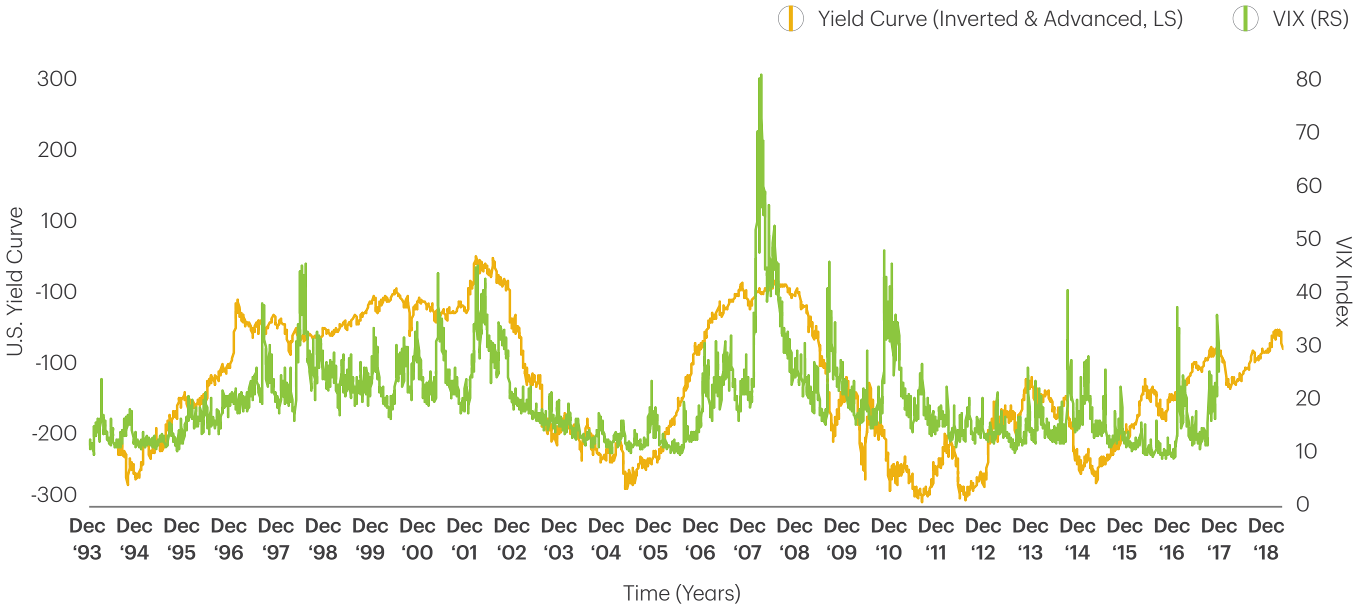
Source: TDAM. December 2018. Returns are Gross of Fees and Trading Costs.

The clouds of political risks have started to abate over the past year, especially following the mid-term elections in the U.S., which resulted in a split Congress and political gridlock in Washington, reducing the likelihood of important reforms and regulatory changes. The Health Care sector has benefitted from this political stalemate, as its performance for the year was among the strongest, representing a significant headwind for relative performance of our low volatility funds. Looking forward, it is unlikely that political risk will completely disappear, given current political rhetoric among lawmakers, and it is expected that the sector will remain riskier than it has been historically.

[3] Note: These are average single stock volatility by sector.

Chart 7: Rising Yields, Rising Volatility

A contrasting looking at the U.S. Yield Curve and VIX Index, from Dec./93 to Dec./18.



Data as of December 2018. Source: TDAM, Bloomberg, December 2018.

What do we expect going forward? Higher (vol) for longer

As the global economic cycle matures, near full employment becomes realized as wages and inflation increase over time, as a result central banks and governments may be prompted towards more normalized monetary and fiscal policies. Historically, in such a market environment, equity market gains slow down and volatility picks up. Furthermore, the flattening to inversion of the yield curve indicates a possible slowdown of future growth (see **Chart 7**). Taking this altogether, investors need to be more cautious going forward, utilizing low volatility strategies to mitigate market volatility.

Though identifying potential 'hot spots' for the global economy in the future is difficult, anticipating and managing economic shocks, as they become present, is still possible. In the present, there are potential economic shocks that could occur in 2019, which would derail a tepid recession outlook. These potential shocks include both economic and geopolitical risks, suggesting that the odds of returning to a prolonged low volatility environment is much lower than typical, during late-cycle increases in market volatility.

One potential danger facing global growth is an unexpected increase in inflation within the U.S. This risk stems from a prolonged period of tightness in the labour market, with wage growth accelerating further and perhaps spiraling into much higher inflation than desired by policymakers. No rate hikes are priced in for the remainder of this business cycle, and the unexpected surge could be a shock. Given the strong negative correlation between equity prices and interest rates presently, this scenario would not bode well for stocks.

Another potential risk lies with China. The unprecedented private sector debt amassed over the past decade threatens the country's economic outlook. If the extent of reported non-performing loans is larger than expected, it could result in a sudden halt in credit intermediation by financial institutions. Amidst slowing growth in China, global assets will face significant downside risk.

Finally, various geopolitical risks, such as the resumption of global trade wars, a disorderly exit of the United Kingdom from the European Union, a deep decline in crude oil prices, and an Italian government debt crisis are just a few of the foreseeable risks on the horizon. While the likelihood of these events remains low at the moment, they have the potential to be impactful and should be monitored closely.

Appendix

Returns as of December 31, 2018	1 Year	3 Years	5 Years	Since Inception[1]
TD *Emerald* Low Volatility Canadian Equity PFT	-4.58%	6.66%	6.99%	11.36%
100% S&P/TSX Composite TR - C$	-8.89%	6.37%	4.06%	5.67%
Difference	**4.30%**	**0.29%**	**2.93%**	**5.69%**

[1] Fund Inception Date: September 11, 2009. Sources: TMX Group Ltd., TDAM.
Note: Returns for periods over one year are annualized; net of expenses; numbers may not add due to rounding.

Returns as of December 31, 2018	1 Year	3 Years	5 Years	Since Inception[1]
TD *Emerald* Low Volatility All World Equity PFT	1.52%	6.97%	11.14%	12.72%
MSCI All Country World Index ND (C$)	-1.26%	6.00%	9.63%	10.65%
Difference	**2.78%**	**0.97%**	**1.52%**	**2.07%**

[1] Fund Inception Date: May 9, 2011. Sources: MSCI Inc., TDAM.
Note: Returns for periods over one year are annualized; net of expenses; numbers may not add due to rounding.

Returns as of December 31, 2018	1 Year	3 Years	5 Years	Since Inception[1]
TD *Emerald* Low Volatility U.S. Equity PFT	-0.98%	10.57%	–	9.15%
100% S&P 500 TR - US$	-4.38%	9.26%	–	6.97%
Difference	**3.41%**	**1.31%**	**–**	**2.18%**

[1] Fund Inception Date: May 4, 2015. Sources: Standard & Poor's, TDAM.
Note: Returns for periods over one year are annualized; net of expenses; numbers may not add due to rounding.