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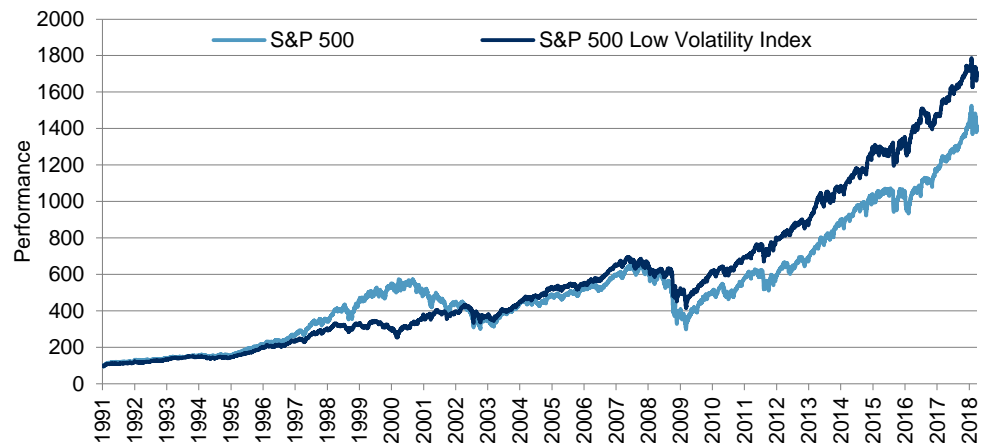
# Low Volatility Indexing in Canada

## THE LOW VOLATILITY ANOMALY

Although the low volatility anomaly was first documented more than 40 years ago,<sup>1</sup> the fearful and volatile market environment of the years following the 2008 financial crisis propelled the concept to the forefront of market participant interest. In recent years, low volatility has been a hot topic in investment discourse, and this has resulted in innovative financial instruments that exploit the anomaly. Importantly, the low volatility anomaly is not limited to one or two markets, but rather it seems to be universal.<sup>2</sup>

The [S&P 500® Low Volatility Index](#) is a passive vehicle that seeks to exploit this phenomenon systematically.<sup>3</sup> Since 1991, the index has outperformed the [S&P 500](#), and it has done so at a substantially lower level of volatility (see Exhibit 1). In Canada, the performance differential between the country's benchmark index and its low volatility counterpart is even more pronounced (see Exhibit 2).

**Exhibit 1: Performance of the S&P 500 Low Volatility Index Versus the S&P 500**



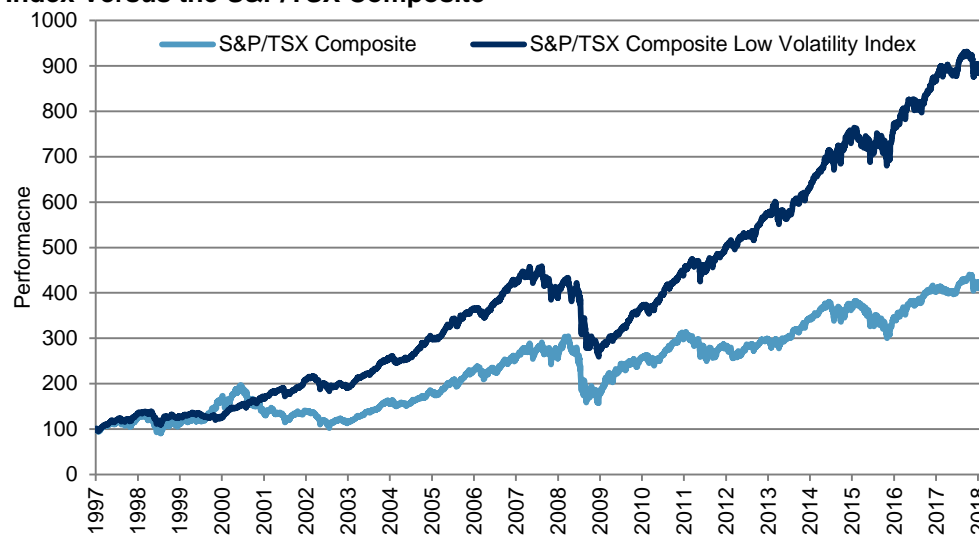
Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 1990, to March 31, 2018. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

<sup>1</sup> Jensen, Michael C., Fischer Black, and Myron S. Scholes, "The Capital Asset Pricing Model: Some Empirical Tests," Studies in the theory of Capital Markets, Praeger Publishers Inc., 1972. See also Fama, Eugene F. and James D. MacBeth, "Risk, Return, and Equilibrium: Empirical Tests," The Journal of Political Economy, Vol. 81, No. 3. (May-June 1973), pp. 607-636.

<sup>2</sup> Chan, Fei Mei and Craig J. Lazzara, "Is the Low Volatility Anomaly Universal?" S&P Dow Jones Indices, April 2015.

<sup>3</sup> The index is designed to track the least volatile stocks in the S&P 500, as measured by their historical standard deviation. For more details, see the [complete methodology](#).

**Exhibit 2: Relative Performance of the S&P/TSX Composite Low Volatility Index Versus the S&P/TSX Composite**



Source: S&P Dow Jones Indices LLC. Data from March 21, 1997, to March 31, 2018. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

## WHAT IS ANOMALOUS?

There are different ways to construct a low volatility portfolio, and they will, of course, produce different portfolio characteristics.<sup>4</sup> One common assumption behind these methodologies is that low volatility is a factor of return, in the same sense that small size or cheap valuation are regarded as factors of return.<sup>5</sup> This is a difficult—indeed, anomalous—assumption, since it seems to contradict what “everyone knows” about risk and return. Anyone who studies finance learns early on that risk and reward go hand in hand, and that with higher expected returns comes higher risk. Therefore, low volatility portfolios, which are by definition less risky than the market average, should underperform.

Academics regard “the long-term outperformance of low-risk portfolios [as] perhaps the greatest anomaly in finance.”

Against this logical theory, we have only some inconvenient evidence. Exhibits 1 and 2, for example, show that the low volatility indices not only outperformed their respective benchmarks (by 0.79% and 3.93% on an annual compound growth basis for the U.S. and Canada, respectively), but they did so with a significantly lower monthly standard deviation (23% lower in the U.S. and 32% lower in Canada). Other examples abound. It is no wonder that academics regard “the long-term outperformance of low-risk portfolios [as] perhaps the greatest anomaly in finance.”<sup>6</sup>

<sup>4</sup> Soe, Aye M., “[The Low-Volatility Effect: A Comprehensive Look](#),” S&P Dow Jones Indices, August 2012.

<sup>5</sup> Think of a “factor” as a quality or attribute with which excess returns are associated. See Fama, Eugene F. and Kenneth R. French, “[Common risk factors in the returns on stocks and bonds](#),” *Journal of Financial Economics* 33 (February 1993), pp 3-56.

<sup>6</sup> Baker, Malcolm, Brendan Bradley, and Jeffrey Wurgler, “[Benchmarks as Limits to Arbitrage: Understanding the Low-Volatility Anomaly](#),” *Financial Analysts Journal* 67 (2011), pp 40-54.

## PERSISTENCE

The methodology underlying our low volatility indices is almost painfully simple. In the case of the S&P 500 Low Volatility Index, at each quarterly rebalance, the stocks in the S&P 500 are sorted by their volatility (based on the standard deviation of each stock’s daily returns over the past year). The 100 least-volatile stocks become the constituents of the S&P 500 Low Volatility Index, and they are weighted inversely to their volatility. No quadratic formulae need apply.

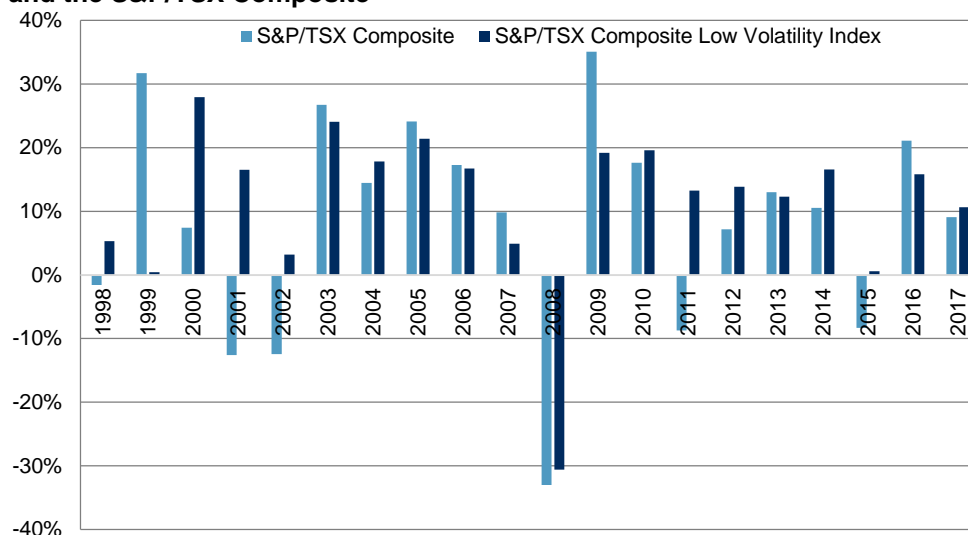
Our low volatility methodology requires the conviction that low volatility persists.

This simple procedure does not require the construction of risk models or the artful use of complicated optimization routines. What it does require, however, is the conviction that low volatility persists. Otherwise said, the methodology assumes that the stocks that have been the least volatile for the past year will continue to be of below-average volatility for at least the next quarter.

Is this assumption correct? The evidence for it lies in the performance of our low volatility indices. For example, over its entire history, the [S&P/TSX Composite Low Volatility Index](#)<sup>7</sup> has been 32% less volatile than the [S&P/TSX Composite](#).

Notably, low volatility strategies offer protection during times of turmoil, such as the 2008 global financial crisis and the deflation of the technology bubble in 2000-2002 (see Exhibit 3). The price of mitigating the downside is that low volatility strategies tend to lag the market during good times.

**Exhibit 3: Annual Returns for the S&P/TSX Composite Low Volatility Index and the S&P/TSX Composite**



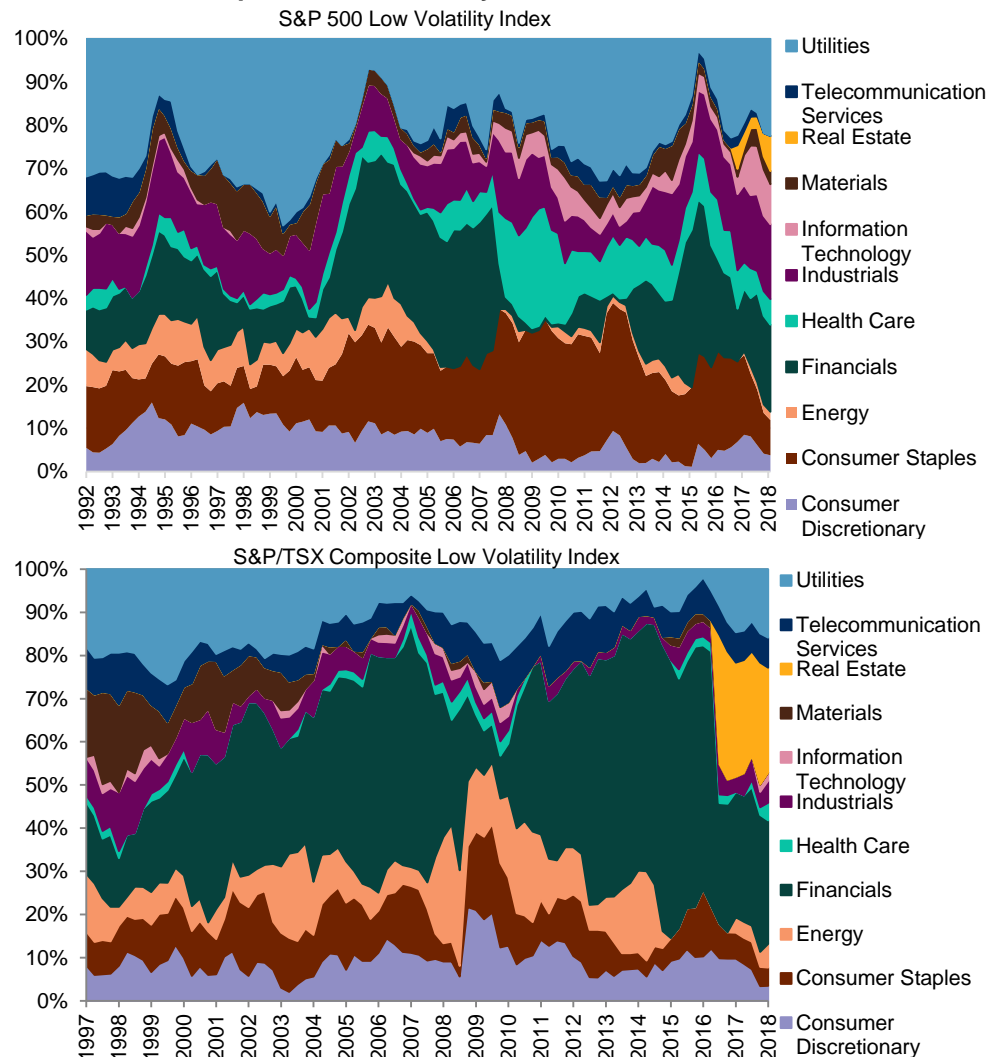
Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 1997, to Dec. 29, 2017. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

<sup>7</sup> The index is designed to track the least-volatile stocks in the S&P/TSX Composite, as measured by their historical standard deviation. For more details, see the [complete methodology](#).

Low volatility indices have historically held few (and sometimes no) names from the information technology sector.

It is not surprising that, in both the U.S. and Canada, low volatility indices have historically held few (and sometimes no) names from the information technology sector (see Exhibit 4). Nor is it surprising that the utilities sector has typically held a significant weight over time. Interestingly, there was slight divergence when it came to holdings in the financials sector. While financial holdings were significant for the S&P 500 Low Volatility Index and the S&P/TSX Composite Low Volatility Index in the years immediately prior to the 2008 financial crisis, they were significantly reduced in both cases well before the meltdown. The financials sector weighting in the low volatility indices recovered much sooner and faster in Canada than in the U.S.

**Exhibit 4: Historical Sector Composition for the S&P 500 Low Volatility and the S&P/TSX Composite Low Volatility Indices**



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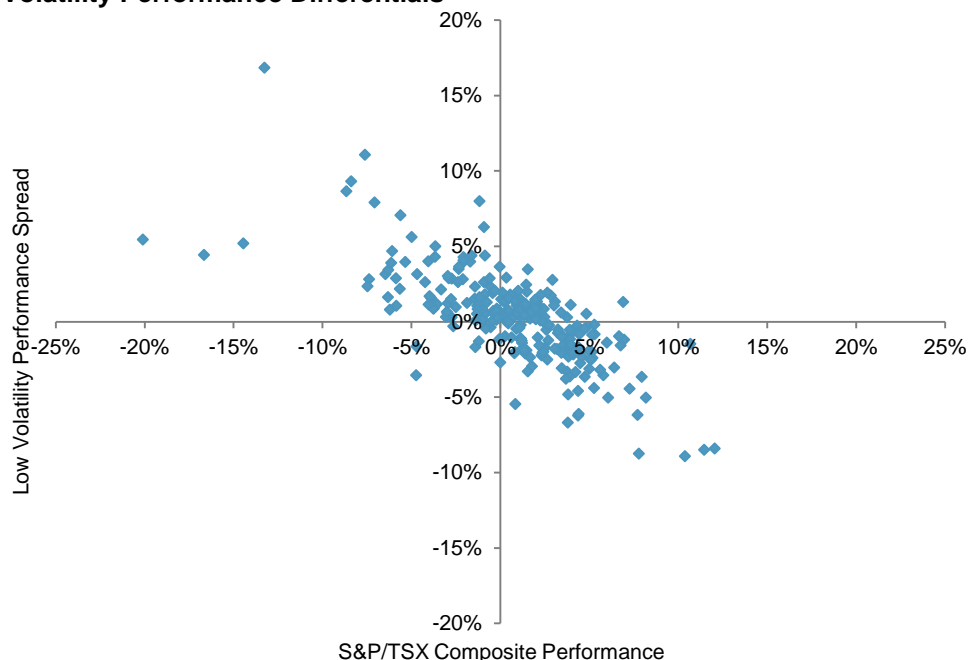
Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 1991, to Feb. 28, 2018, for the S&P 500 Low Volatility Index and March 31, 1997, to March 31, 2018, for the S&P/TSX Composite Low Volatility Index. Past performance is no guarantee of future results. Charts are provided for illustrative purposes and reflect hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

It's instructive to observe how a low volatility index performs in different market environments.<sup>8</sup>

Exhibit 5 offers a convenient way to look at the relationship between benchmark “parent” and low volatility “child.” The horizontal axis measures the monthly performance of the S&P/TSX Composite; the vertical axis measures the performance spread between the S&P/TSX Composite Low Volatility Index and its benchmark. Each point represents one month’s results from April 1997 through March 2018. The scatter plot tells us that low volatility is quite likely to outperform when its parent index is weak and to underperform when its parent index is strong.

**Exhibit 5: Relationship Between S&P/TSX Composite Performance and Low Volatility Performance Differentials**

Low volatility is quite likely to outperform when its parent index is weak and to underperform when its parent index is strong.



Source: S&P Dow Jones Indices LLC. Data from March 31, 1997, to March 31, 2018. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Exhibit 6 gathers the monthly data from Exhibit 5 into four “buckets,” defined by the monthly performance of the S&P/TSX Composite. There are a total of 252 months in our data; the S&P/TSX Composite declined in 95 and increased in 157. We divided both the positive and negative months using the median return in each category, which gives us an appreciation for the magnitude of market movements, as well as their direction.

For example, in the 47 months during which the S&P/TSX Composite declined the most, the S&P/TSX Composite Low Volatility Index outperformed by an average of 3.24%. Moreover, it outperformed the

<sup>8</sup> We've long argued that it's vital to understand how index performance can be contingent on the market environment. See Lazzara, Craig J., [“The Limits of History,”](#) S&P Dow Jones Indices, February 2013.

S&P/TSX Composite in all but three months, or 94% of the time. As we move down the rows of Exhibit 6, the spread between the S&P/TSX Composite Low Volatility Index and the benchmark diminishes and the hit rates decline. In the 78 best months, the S&P/TSX Composite Low Volatility Index underperformed 88% of the time, by an average of 2.22%. Results are analogous in the smaller negative and smaller positive months.

We can therefore observe that the low volatility strategy attenuates the market’s return in both directions. Historically, the S&P/TSX Composite Low Volatility Index has tended to rise less than the market when the market is up and to decline less than the market when the market is down.

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**Exhibit 6: Monthly Performance in Different Market Environments**

MARKET REGIME	NUMBER OF MONTHS	S&P/TSX COMPOSITE (%)	S&P/TSX COMPOSITE LOW VOLATILITY INDEX (%)	SPREAD (%)	HIT RATE (%)
Less than -2.38%	47	-5.80	-2.57	3.24	94
Between 0% and -2.38%	48	-1.01	0.68	1.69	88
Between 0% and 2.65%	79	1.34	1.37	0.02	61
Greater than 2.65%	78	4.87	2.65	-2.22	12

Source: S&P Dow Jones Indices LLC. Data from March 31, 1997, to March 31, 2018. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

### THE BEST OFFENSE IS DEFENSE

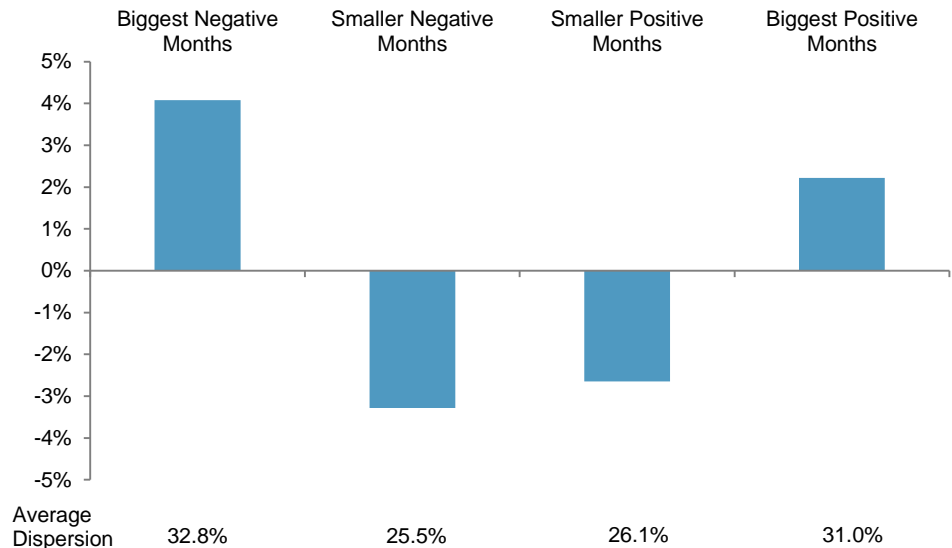
The spreads between the performance of the S&P/TSX Composite Low Volatility Index and the S&P/TSX Composite were not the same in all market environments. We can get a better understanding of this nuance through the lens of *dispersion*, which lets us measure the opportunity available for outperformance or underperformance. When dispersion is relatively wide, the opportunities to profit from stock selection are relatively large; when dispersion is narrow, the opportunities diminish. We see this when we measure the mean absolute deviation of strategy indices in various dispersion environments.<sup>9</sup>

Exhibit 7 shows the average dispersion of the S&P/TSX Composite in each of the four market environments described in Exhibit 6. While dispersion over the period averaged 28.7%, the months in which the S&P/TSX Composite performed the worst were the months in which the market’s dispersion was highest (32.8%). This means that the S&P/TSX Composite Low Volatility Index tended to be correct (i.e., to outperform) at a time when the reward for outperformance was substantially above average.

<sup>9</sup> Chan, Fei Mei and Craig J. Lazzara, “[Gauging Differential Returns](#),” S&P Dow Jones Indices, January 2014.

Conversely, when the S&P/TSX Composite Low Volatility Index tended to underperform, the penalty for being wrong was below average.<sup>10</sup>

**Exhibit 7: Deviation of Dispersion From Overall Monthly Average in Different Market Regimes**



Source: S&P Dow Jones Indices LLC. Data from March 31, 1997, to March 31, 2018. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

**ONE EXPLANATION**

The stock market’s lottery tickets are the stocks of highly volatile, potentially untested companies.

There are a number of (non-mutually exclusive) explanations for the existence of a low volatility effect or anomaly. Perhaps the simplest and most intuitive comes from behavioral finance, specifically from the cognitive bias that behavioral economists call the “preference for lotteries.” Their argument is that no rational person would ever buy a lottery ticket, since the expected return of such a purchase is negative. But we know that billions of lottery tickets are sold all over the world every day. Why do so many people behave in a way that classical economics regards as completely irrational? The behavioral argument is that some people are willing to risk a known amount of money in exchange for the possibility, however slim, of a gigantic payoff.

If this happens in a game of pure chance, how does it apply to financial markets? What is the analogy of a lottery ticket in the stock market? The stock market’s lottery tickets are the stocks of highly volatile, potentially untested companies. Ultimately, they may not amount to much, but one of them could be the next Apple or the next Google. Some market participants are willing to pay up for the chance of a large reward.

<sup>10</sup> See also Chan, Fei Mei and Craig J. Lazzara, “[The Best Offense: When Defensive Strategies Win](#),” S&P Dow Jones Indices, March 2015.

This tendency, which amounts to buying volatility for volatility's sake, drives the price of lottery-like stocks above their fair value. This means that a portfolio that systematically excludes the most volatile stocks—exactly what our low volatility indices do—could be expected to outperform over time, globally.



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