**S&P Dow Jones Indices**

A Division of **S&P Global**

# Defense Beyond Bonds: Defensive Strategy Indices

"By failing to prepare, you are preparing to fail."

– Benjamin Franklin

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## Executive Summary

– The S&P 500® peaked on Jan. 3, 2022, and recorded a 20% decline in the first six months of the year. Bonds declined at the same time, as the U.S. 10-Year Treasury yield more than doubled.

– The combination of falling stock prices and rising interest rates is historically uncommon. When the equity and bond markets decline simultaneously, defensive equity factors—which aim to provide *protection* during falling markets and *participation* in rising markets—become more relevant.

– We explore ways of utilizing defensive strategy indices in order to improve the risk/return profile of a traditional asset allocation.

**Exhibit 1: The S&P 500 Declined 20% YTD While Interest Rates Steadily Climbed**
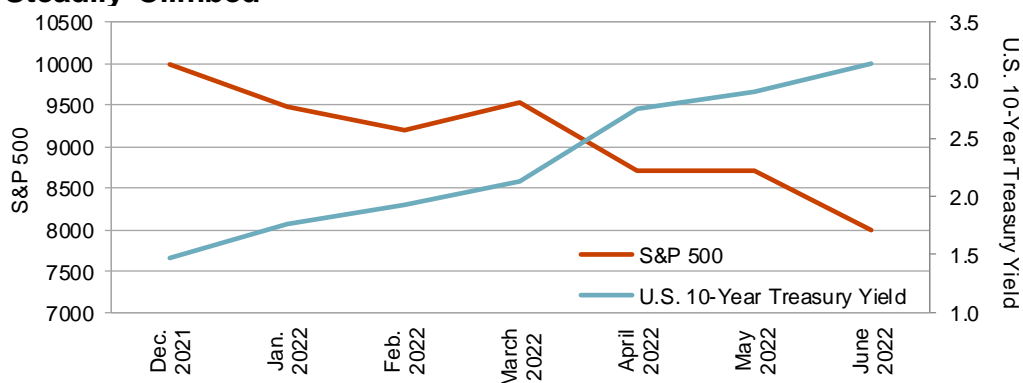


Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 2021, through June 30, 2022. Index performance based on total return in USD. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

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# Rising Rates and Falling Stocks

The S&P 500 reached its most recent peak on Jan. 3, 2022, and declined 20% through June 30, 2022.[1]  Were investors prescient, of course, avoiding losses would be easy: simply shift from equities to cash on or about Jan. 3, 2022.  For those of us not gifted with omniscience, however, market timing is an inadequate solution.

As Exhibit 1 suggests,  in the first six months of 2022, investors were beset not only by the declining stock market, but also by rising interest rates.  (The S&P U.S. Treasury Bond 7-10 Year Index was off by -10.6% as rates more than doubled.)  This represents a radical change of fortune from the rising stock and bond markets that characterized most of the past 40 years. It also has an important implication for portfolio construction.  Historically, investors who were unwilling or unable to bear the full risk of the equity market could hedge by constructing a balanced portfolio of stocks and bonds.  During the bull market in bonds that began in 1981, such defensive allocations did not require a major sacrifice in returns.  **If the bull market in bonds has ended, however, defensively minded investors might seek other ways of limiting their equity risk.**

Exhibit 2 shows that some factor indices would have dampened the S&P 500's volatility in the first half of 2022; some even outperformed the bond market. Our intent in this paper is to explore what we can learn from the history of these indices.[2]  Which factors are best suited to providing defensive outcomes?

**Exhibit 2: Performance in First Six Months of 2022**
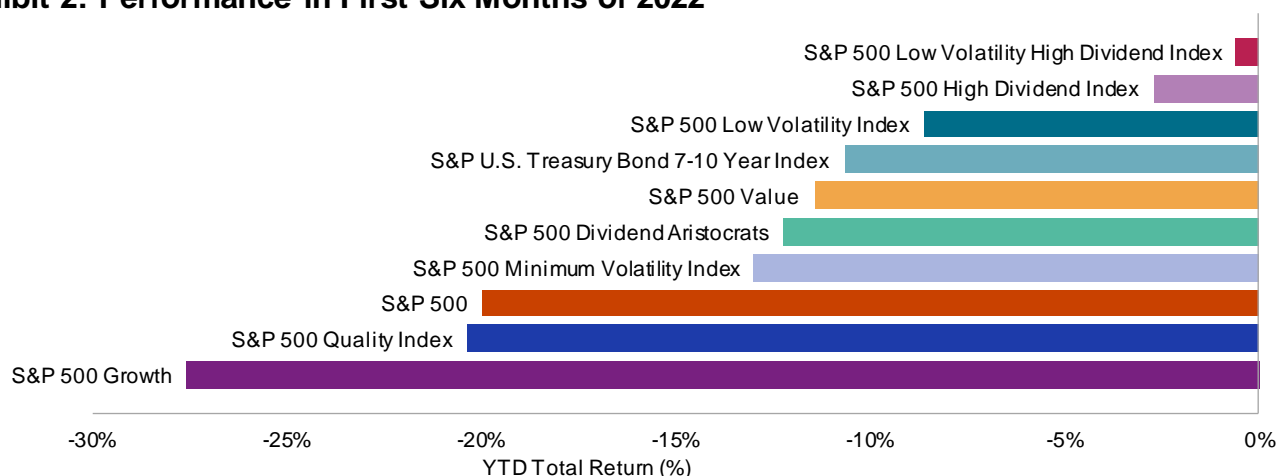


Source: S&P Dow Jones Indices LLC.  Data from Dec 31, 2021, through June 30, 2022.  Index performance based on total return in USD. Past performance is no guarantee of future results.  Chart is provided for illustrative purposes.

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[1]  Of course, we do not yet know the full extent of the downtown; the market might decline further from here, or alternatively, its rebound may have already begun.  Some things, these among them, are only knowable after the fact.

[2]  For a useful overview, see Brzenk, Philip et al., "Factor Indices: A Simple Compendium," S&P Dow Jones Indices, December 2021.

# Defense Against What?

Any analysis of index characteristics, while necessarily data-based, must start by understanding the market environment in which those data were observed.[3] The history of the factor indices we want to examine spans 27 years, beginning in mid-1995, and in that environment Exhibit 3 reminds us of two major trends.

First, our data come from a period of strong U.S. equity market performance, as the S&P 500 total return index compounded at a 9.5% annual rate. Second, interest rates were on a general downtrend. The U.S. 10-Year Treasury Note's yield fell from 6.17% in mid-1995 to a low of 0.62% in July 2020 before rebounding to 3.14% in June 2022.

**Exhibit 3: Rising Stock Prices, Declining Interest Rates**
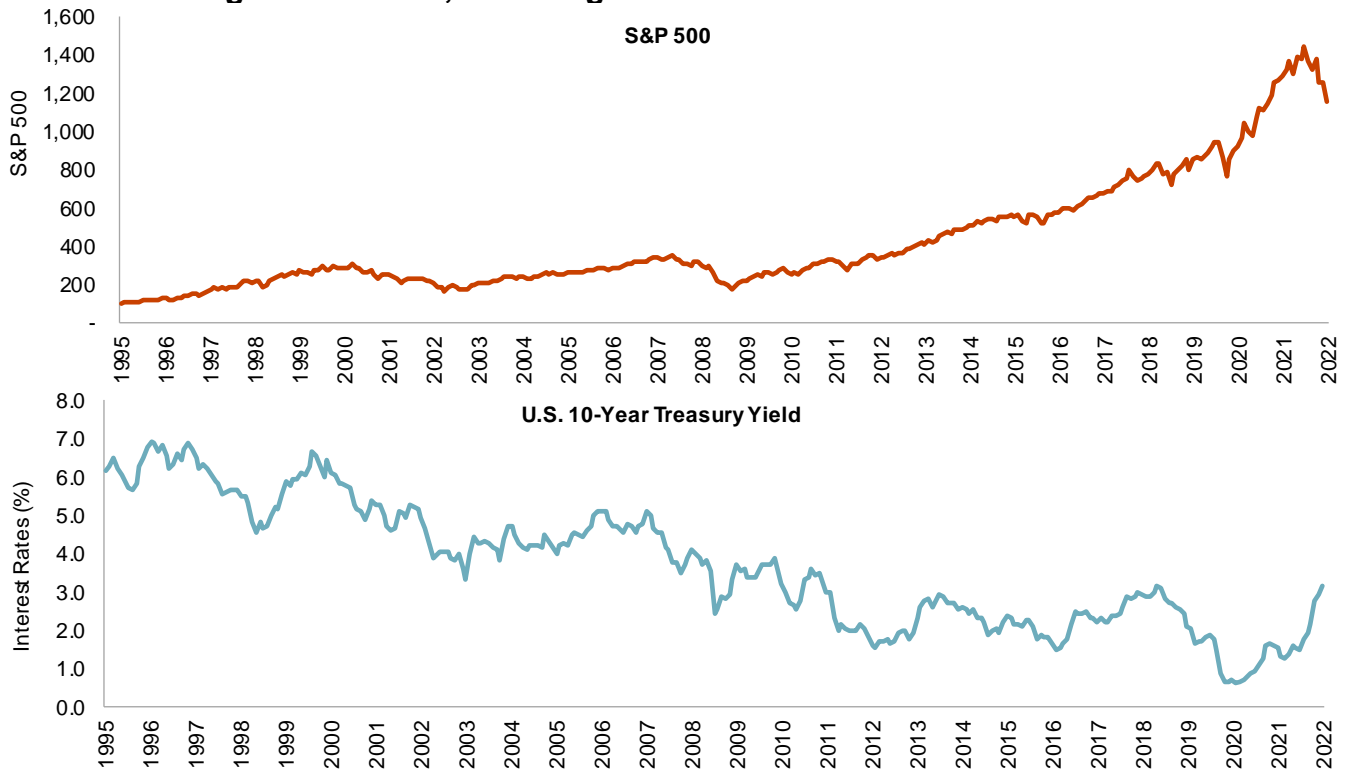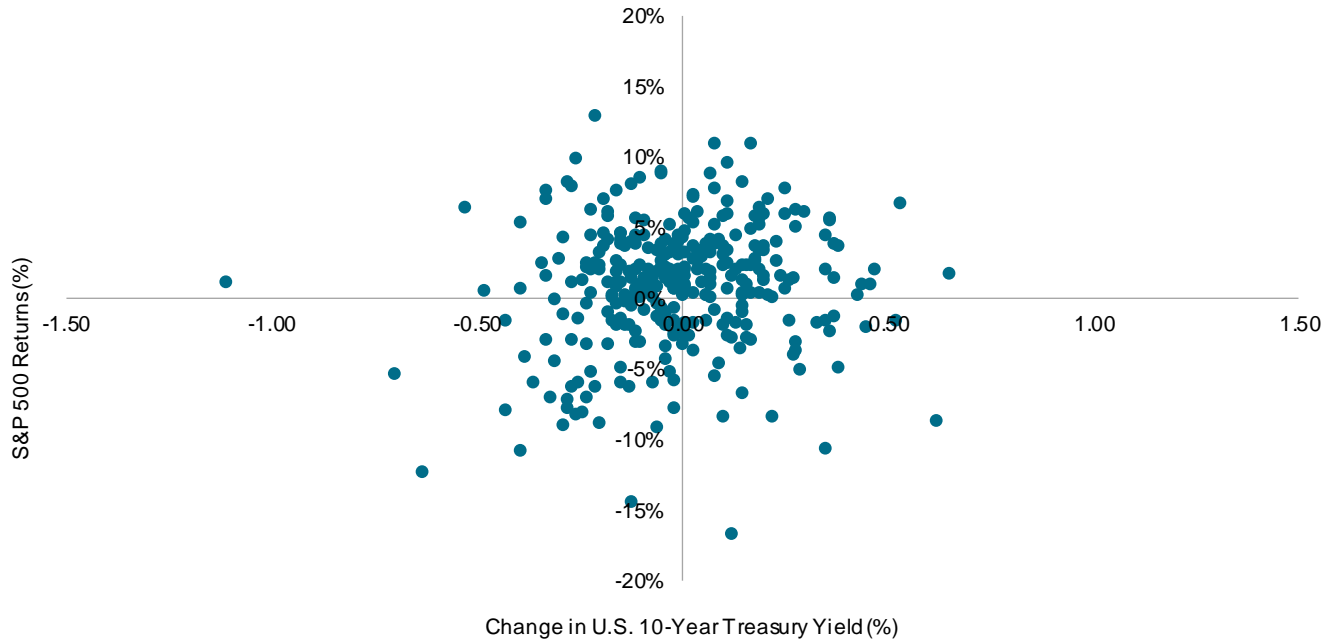


Source: Federal Reserve and S&P Dow Jones Indices LLC. Data from June 30, 1995, through June 30, 2022. Index performance based on total return in USD. Past performance is no guarantee of future results. Charts are provided for illustrative purposes.

This means that for most of recent history, rates were falling, and the stock market was rising – **precisely the opposite of what happened in the first half of 2022**, and precisely the opposite of what causes at least some investors to seek a defensive posture now. Importantly, these two trends were independent of one another, at least in the short run, as Exhibit 4

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[3] Lazzara, Craig J., "The Limits of History," S&P Dow Jones Indices, January 2013.

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illustrates. Knowing how rates behaved in a given month told us essentially nothing about the stock market's performance.

## Exhibit 4: S&P 500 Returns versus Changes in the U.S. 10-Year Treasury Yield



Change in U.S. 10-Year Treasury Yield (%)

Source: Federal Reserve and S&P Dow Jones Indices LLC. Data from June 30, 1995, through June 30, 2022. Index performance based on total return in USD. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

Exhibit 5 uses the same monthly data to show the frequency of each combination of market moves and interest rates.

## Exhibit 5: Stock Prices and Interest Rates by Month

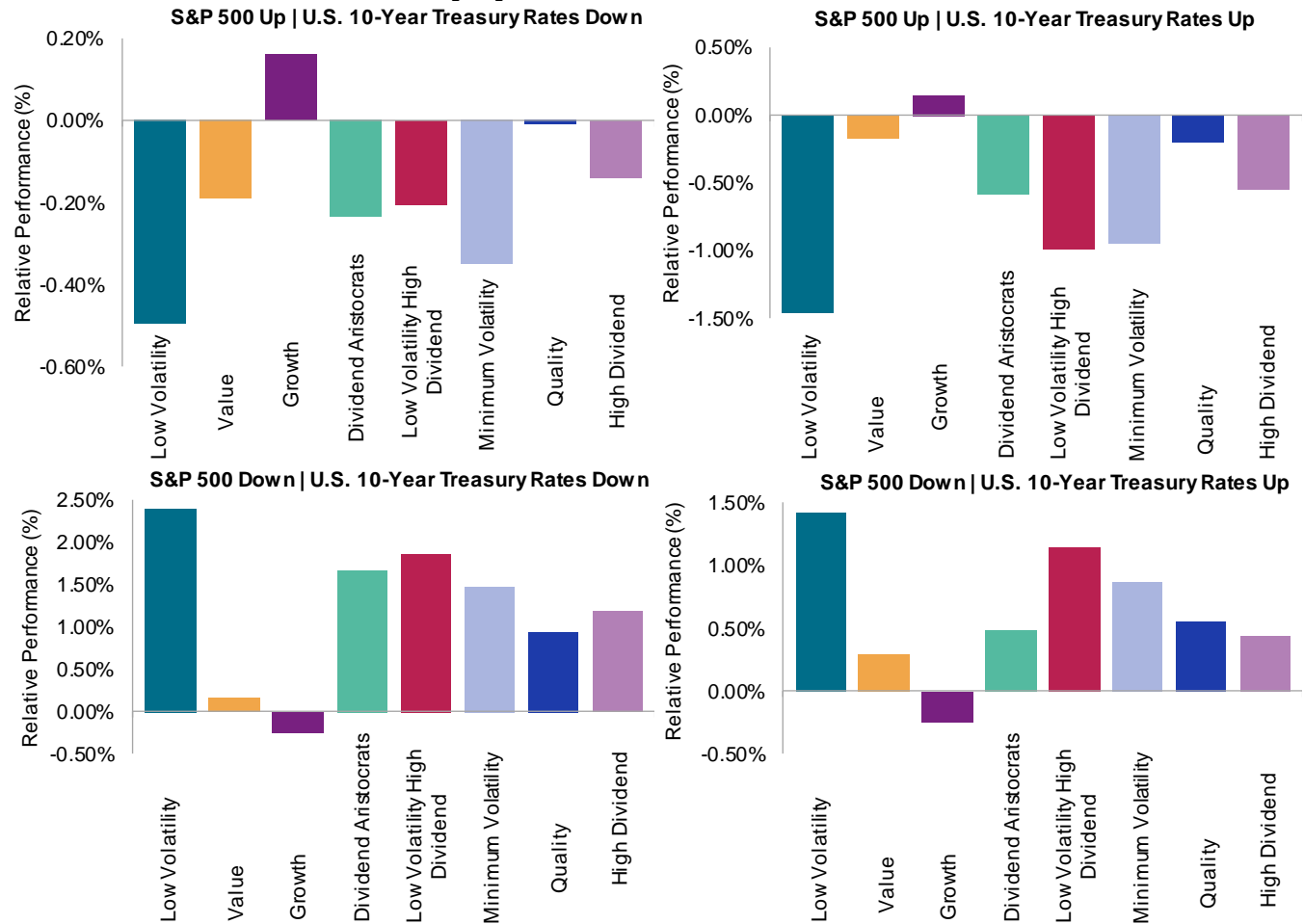| Interest Rates | S&P 500 | | |
|---|---|---|---|
| | Up | Down | Total |
| Rising Rates | 105 | 38 | 143 |
| Falling Rates | 104 | 69 | 173 |
| Static Rates | 5 | 3 | 8 |
| Total | 214 | 110 | 324 |

Source: Federal Reserve and S&P Dow Jones Indices LLC. Data from June 30, 1995, through June 30, 2022. Past performance is no guarantee of future results. Table is provided for illustrative purposes.

Our data span 324 months; the S&P 500 rose in 66% of them, and the U.S. 10-Year Treasury yield fell in 53%. Exhibit 5 lets us make some interesting observations about *conditional* relationships in the historical data. The probability of a falling stock market, conditional on rising rates, was only 27%. The probability of rising rates, conditional on a falling stock market, was 35%. **The combination we saw in**

**early 2022—rising rates and a falling stock market—was history's least likely scenario**, occurring in only 12% of the months in our database.[4]

Because the interaction of interest rates and the stock market is so uncertain, Exhibit 6 looks separately at the relative performance of our factor indices in the four main scenarios summarized in Exhibit 5. Each panel in the exhibit shows the average monthly performance of eight factor indices relative to that of the S&P 500.

## Exhibit 6: Best Performers Vary by Environment



Source: Federal Reserve and S&P Dow Jones Indices LLC.  Data from June 30, 1995, through June 30, 2022.  Past performance is no guarantee of future results.  The S&P 500 Low Volatility Index was launched April 4, 2011.  The S&P 500 Dividend Aristocrats® was launched May 2, 2005.  The S&P 500 Low Volatility High Dividend Index was launched Sept. 17, 2012.  The S&P 500 Minimum Volatility Index was launched Nov. 9, 2012.  The S&P 500 Quality Index was launched July 8, 2014.  The S&P 500 High Dividend Index was launched Sept. 21, 2015.  All data prior to index launch date is back-tested hypothetical data.  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.

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[4]   The probabilities are computed as follows: 66% = 214/324, 53% = 173/324, 27% = 38/143, 35% = 38/110, 12% = 38/324.

The most important thing to notice about these scenarios is that the direction of the stock market matters much more than the direction of the bond market.[5]  For example, if the S&P 500 rose, Growth was the best relative performer and Low Volatility was the worst, regardless of whether rates were rising or falling.  Similarly, if the S&P 500 fell, Low Volatility and Low Volatility High Dividend were the best relative performers, and Growth was the worst, again regardless of whether interest rates were rising or falling.  **Factor strategies are far more sensitive to the state of the equity market than to the state of the bond market**.[6]  That insight will inform the balance of this paper.

# Defining Defense

Defensive strategy indices are defined by their relative performance.  Defensive equity strategies aim **to mitigate losses in a declining market while also preserving some ability to participate in rising markets**.  We often summarize this by referring to the "two Ps"— *protection* (in down markets) and *participation* (in up markets), while stressing that neither P is perfect.  By that definition, of the indices examined in Exhibit 6, Growth is clearly *not* defensive, and the case for Value is marginal.  The others all show the defensive hallmark of outperforming falling markets and underperforming rising markets.[7]

Importantly (and perhaps counterintuitively), defensive indices are not necessarily less volatile than the benchmark from which they were derived.  They commonly are, but a defensive factor index *may* have a higher standard deviation of returns than its benchmark.  Exhibit 7 provides a simple example.

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[5]  Otherwise said, each panel looks more like the panel to which it is horizontally adjacent than the panel to which it is vertically adjacent.

[6]  See Chan, Fei Mei, "Rising Rates' Repercussions," S&P Dow Jones Indices, March 3, 2022.

[7]  Underperforming rising markets does not preclude outperforming over time.  For example, see Chan, Fei Mei and Craig J. Lazzara, "Is the Low Volatility Anomaly Universal?," S&P Dow Jones Indices, May 2019.

**Exhibit 7: Defensive Indices Need Not Be Less Volatile Than Their Benchmarks**

| Return (%) | | | |
|---|---|---|---|
| Period | Benchmark Index | Factor Index | Return Spread |
| 1 | 2.5 | 4.4 | 1.9 |
| 2 | 4.0 | 1.9 | -2.1 |
| 3 | 3.5 | 1.4 | -2.1 |
| 4 | 5.0 | 2.9 | -2.1 |
| 5 | 1.0 | -1.1 | -2.1 |
| 6 | -4.0 | -1.0 | 3.0 |
| 7 | -3.5 | -0.5 | 3.0 |
| 8 | 4.0 | 5.9 | 1.9 |
| 9 | -3.7 | -6.2 | -2.5 |
| 10 | -4.9 | -1.9 | 3.0 |
| 11 | 3.0 | 4.9 | 1.9 |
| 12 | -3.4 | -5.9 | -2.5 |
| Metric | Benchmark Index | Factor Index | Return Spread |
| Mean (%) | 0.29 | 0.40 | 0.11 |
| Standard Deviation (%) | 3.84 | 3.93 | - |
| Period | Factor Hit Rate | | Factor Value Added |
| Benchmark > 0 | 42.9 | | -0.39 |
| Benchmark < 0 | 60.0 | | 0.80 |

All indices are hypothetical.
Source: S&P Dow Jones Indices LLC.  Table is provided for illustrative purposes.

The (hypothetical) factor index in Exhibit 7 outperformed its (hypothetical) benchmark and was slightly more volatile.  Yet it is clearly a defensive index.  When the benchmark rises, the factor index is more likely to underperform than to outperform, and its average value added is negative.  The opposite occurs when the benchmark declines—the factor is more likely to outperform, and its average value added is positive.

# An Efficient Frontier Framework

Exhibit 8 provides some perspective on the risk and return of the factor indices we discussed above, all of which are subindices of the S&P 500.  With one exception, all outperformed the S&P 500 in the observed 27-year period.  In most cases, moreover, outperformance came with lower risk.  The insight that risk mitigation need not result in poor returns allows us to identify particular strategies as building blocks in a more defensive portfolio.  We will use Low Volatility, the most effective risk attenuator, as an illustration.

**Exhibit 8: While Most Strategy Indices Have Outperformed the S&P 500, Not All Did So with Less Risk**
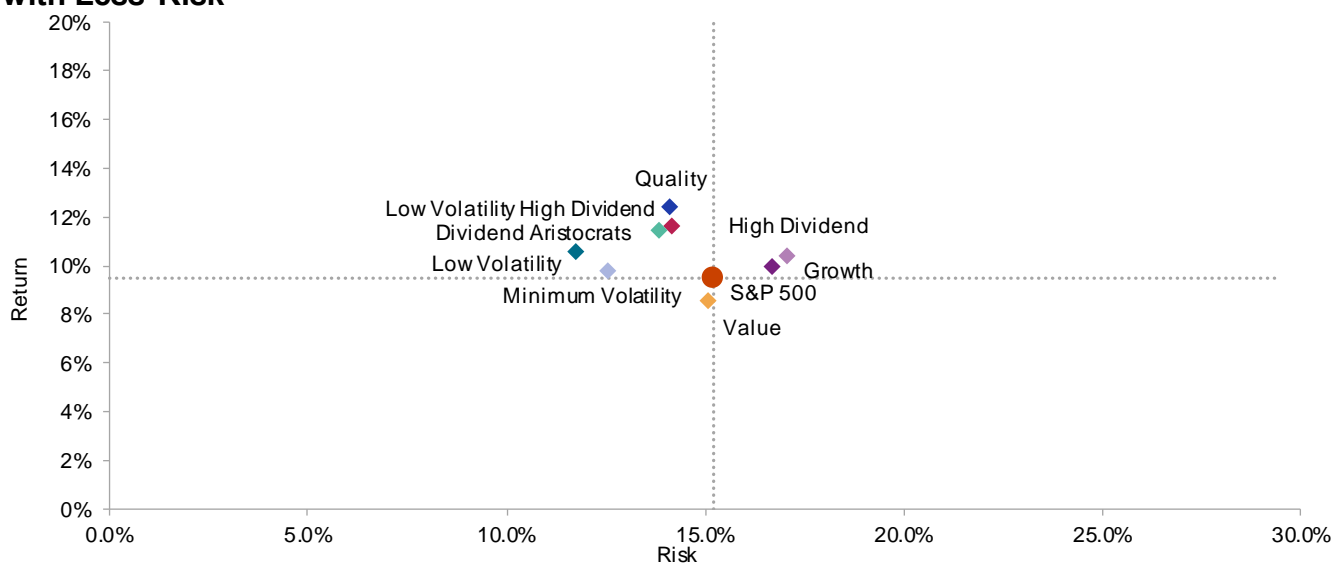


Source: S&P Dow Jones Indices LLC.  Data from June 30, 1995, through June 30, 2022.  The S&P 500 Low Volatility Index was launched April 4, 2011.  The S&P 500 Dividend Aristocrats® was launched May 2, 2005.  The S&P 500 Low Volatility High Dividend Index was launched Sept. 17, 2012.  The S&P 500 Minimum Volatility Index was launched Nov. 9, 2012.  The S&P 500 Quality Index was launched July 8, 2014. The S&P 500 High Dividend Index was launched Sept. 21, 2015.  All data prior to index launch date is back-tested hypothetical data.  Chart is 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.

Exhibit 9 shows two efficient frontiers, one constructed using the S&P 500 and bonds, the other utilizing the S&P 500 Low Volatility Index[8] and bonds.[9]  In the 27-year period from June 1995 through June 2022, Low Volatility outperformed the S&P 500, but with lower risk.[10]  It is therefore not surprising that an efficient frontier using the S&P 500 Low Volatility Index as the risky asset dominates a frontier using the S&P 500.  A 60/40 equity/bond allocation using Low Volatility experienced both lower risk and higher return than a 60/40 mix using the S&P 500.

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[8]  The S&P 500 Low Volatility Index, a defensive strategy index, is designed to measure the performance of the 100 least volatile stocks in the S&P 500.  For more details, see the complete methodology.

[9]  Efficient frontiers are constructed with indicated allocations rebalanced annually.

[10]  See Edwards, Tim, Craig J. Lazzara, and Hamish Preston, "Low Volatility: A Practitioner's Guide," S&P Dow Jones Indices, June 2018.

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**Exhibit 9: The Efficient Frontier Using the S&P 500 Low Volatility Index Was an Improvement in Both Risk and Return Compared to the Benchmark**
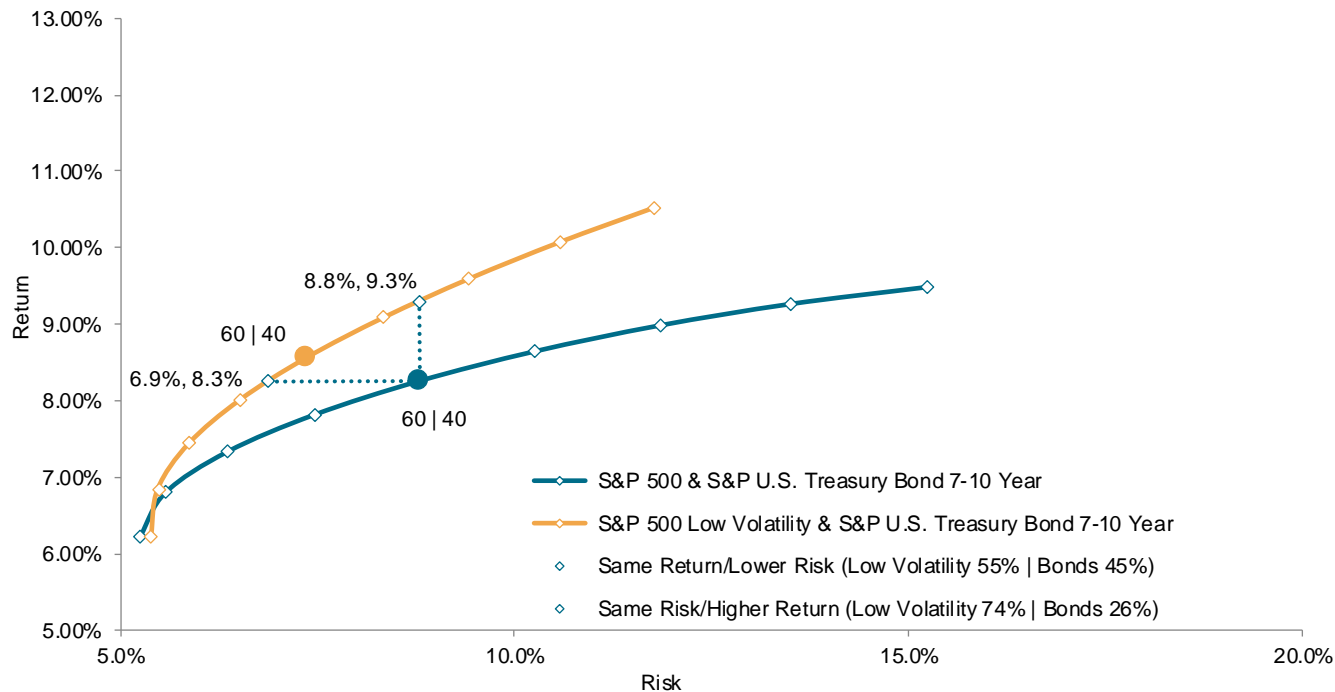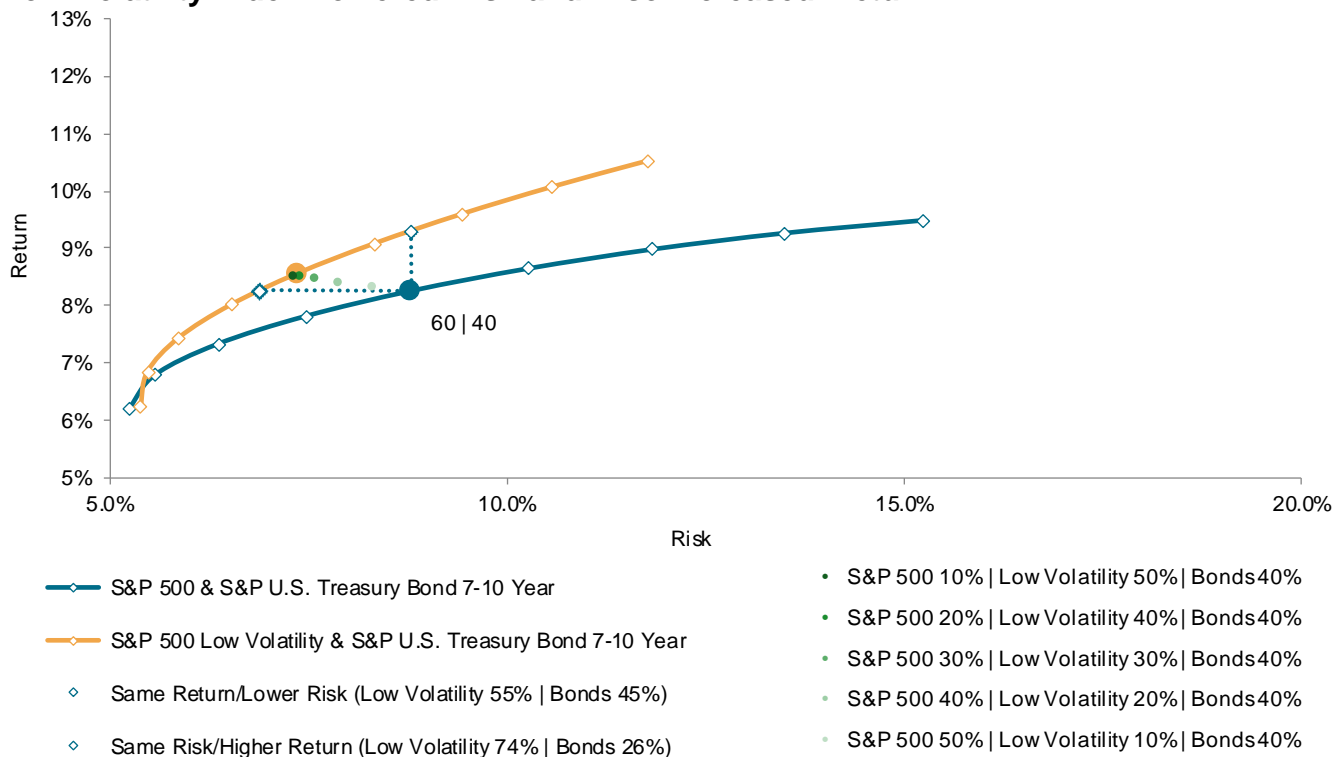


All index combinations are hypothetical.
Source: S&P Dow Jones Indices LLC. Data from June 30, 1995, through June 30, 2022. Past performance is no guarantee of future results. The S&P U.S. Treasury Bond 7-10 Year Index was launched March 24, 2010. All data prior to index launch date is back-tested hypothetical data. 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.

For the period summarized in Exhibit 9, a 60/40 mix using the S&P 500 as the equity asset produced a total return of 8.3% with a standard deviation of 8.8%. By using the S&P 500 Low Volatility Index as the equity vehicle, the same return could have been achieved at a lower risk level (6.9%). Holding risk constant, using Low Volatility would have produced a higher return (9.3%), and notably, this higher return would have required holding only 26% in bonds. **For investors who are concerned about future increases in interest rates, shifting to Low Volatility may be a particularly attractive option since it enables them to reduce their fixed income position.**

Assuming a static bond position (of whatever level), shifting any part of an equity allocation from the S&P 500 to Low Volatility has historically resulted in a reduction in overall risk and an increase in return. In Exhibit 10, the green dots show incremental 10% reallocations from the S&P 500 to Low Volatility, holding bond exposure constant at 40%. With every shift, the portfolio's plotted risk/return characteristics move upward and to the left, finally coming to rest on the Low Volatility-based efficient frontier. Moving to the dominant frontier produces a 16% reduction in risk and an additional compound annual return of 30 bps.

**Exhibit 10: In a 60/40 Equity/Bond Allocation, Any Shift from S&P 500 to the S&P 500 Low Volatility Index Lowered Risk and Also Increased Return**



All index combinations are hypothetical.
Source: S&P Dow Jones Indices LLC. Data from June 30, 1995, through June 30, 2022. Past performance is no guarantee of future results. The S&P 500 Low Volatility Index was launched April 4, 2011. The S&P U.S. Treasury Bond 7-10 Year Index was launched March 24, 2010. All data prior to index launch date is back-tested hypothetical data. 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 11 shows the performance of the S&P 500 and a Low Volatility-based defensive strategy through the lens of four market regimes. Between June 1995 and June 2022, the S&P 500 fell in 110 months and rose in 214 months. We split both negative and positive categories in half; proceeding down the rows of Exhibit 11, we find large declines, small declines, small gains, and large gains. Not surprisingly, bonds were the best performer during the S&P 500's worst 55 months and lagged by the most during the equity market's best 107 months. Comparing the last two columns shows that a balanced portfolio using Low Volatility as the equity vehicle offered additional protection compared to its S&P 500-based counterpart.

**Exhibit 11: Using Low Volatility Rather Than the S&P 500 Improved Balanced Portfolio Results**

| Market Regime (Monthly Return) | Number of Months | Return (%) | | | | |
|---|---|---|---|---|---|---|
| | | S&P 500 | Low Volatility Minus S&P 500 | Bonds Minus S&P 500 | S&P 500 60% \| Bonds 40% Minus S&P 500 | Low Volatility 60% \| Bonds 40% Minus S&P 500 |
| Less Than -2.88% | 55 | **-6.36** | 3.02 | 7.57 | 3.15 | 4.89 |
| Between 0 and -2.88% | 55 | **-1.48** | 0.95 | 2.04 | 0.81 | 1.39 |
| Between 0 and 2.67% | 107 | **1.33** | -0.19 | -1.06 | -0.40 | -0.52 |
| Greater Than 2.67% | 107 | **5.24** | -1.77 | -5.20 | -2.10 | -3.15 |

All index combinations are hypothetical.
Source: S&P Dow Jones Indices LLC. Data from June 30, 1995, through June 30, 2022. Past performance is no guarantee of future results. The S&P 500 Low Volatility Index was launched April 4, 2011. The S&P U.S. Treasury Bond 7-10 Year Index was launched March 24, 2010. All data prior to index launch date is back-tested hypothetical data. 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.

It is, of course, unrealistic to assume that an asset owner would shift his entire equity allocation to a single factor strategy. But the possibility of doing so provides a framework within which we can conceptualize strengthening defenses without increasing, and possibly even while decreasing, a portfolio's bond allocation.
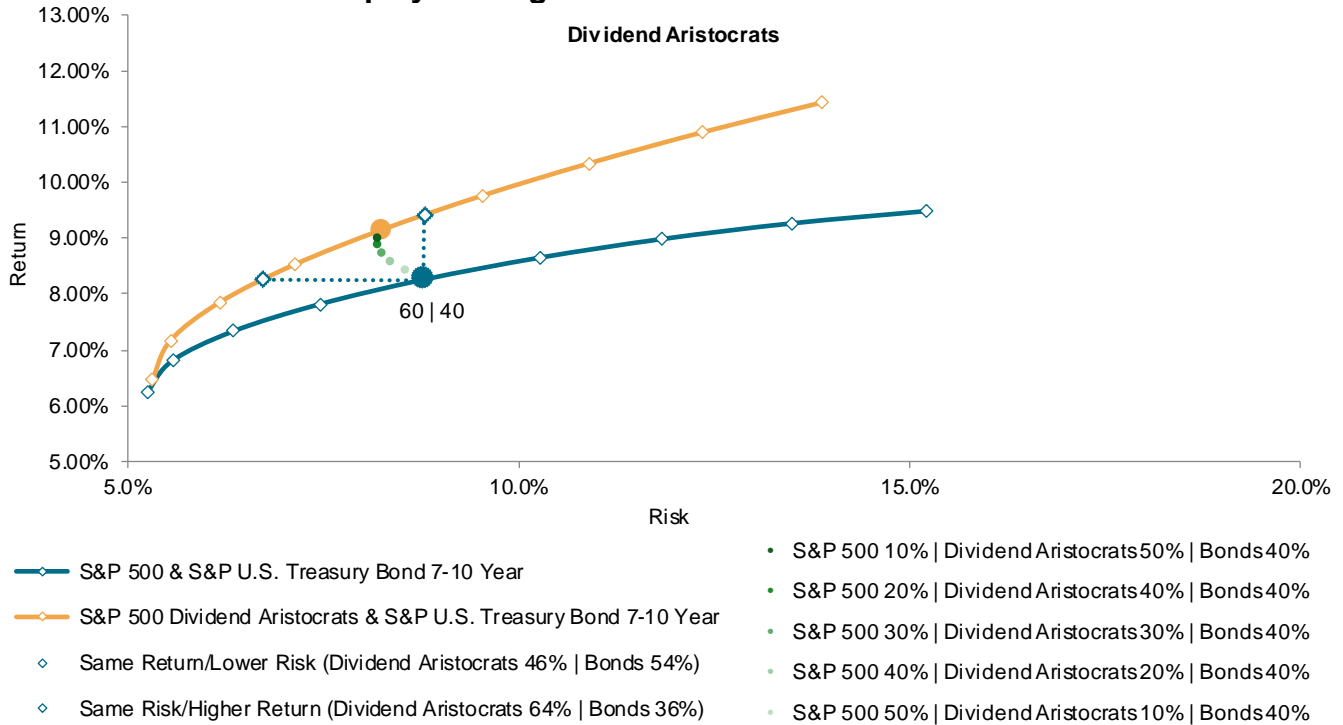
# Not Just Low Volatility

While low volatility is the archetypal low-risk strategy, any factor index with a similar defensive profile would shift the overall portfolio in the same way. For instance, both the S&P 500 Dividend Aristocrats[11] and the S&P 500 Quality Index[12] exhibited lower risk than the S&P 500, and both outperformed in the last 27 years. In Exhibit 12, we see that with the introduction of either strategy, the 60/40 point moves upward and to the left (although to a lesser degree than when Low Volatility is the defensive vehicle). Notably, with all three strategies, the addition of the factor index not only lowered risk but also led to higher returns.

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[11] The S&P 500 Dividend Aristocrats is designed to measure the performance of S&P 500 companies that have increased dividends every year for the last 25 consecutive years. For more details, see the complete methodology.

[12] The S&P 500 Quality Index is designed to track high-quality stocks in the S&P 500 by quality score, which is calculated based on return on equity, accruals ratio, and leverage. For more details, see the complete methodology.

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## Exhibit 12: Defensive Equity Strategies Produce Dominant Efficient Frontiers

**Dividend Aristocrats**



- S&P 500 & S&P U.S. Treasury Bond 7-10 Year
- S&P 500 Dividend Aristocrats & S&P U.S. Treasury Bond 7-10 Year
- ◇ Same Return/Lower Risk (Dividend Aristocrats 46% | Bonds 54%)
- ◇ Same Risk/Higher Return (Dividend Aristocrats 64% | Bonds 36%)

- S&P 500 10% | Dividend Aristocrats 50% | Bonds 40%
- S&P 500 20% | Dividend Aristocrats 40% | Bonds 40%
- S&P 500 30% | Dividend Aristocrats 30% | Bonds 40%
- S&P 500 40% | Dividend Aristocrats 20% | Bonds 40%
- S&P 500 50% | Dividend Aristocrats 10% | Bonds 40%

**Quality**



- S&P 500 & S&P U.S. Treasury Bond 7-10 Year
- S&P 500 Quality & S&P U.S. Treasury Bond 7-10 Year
- ◇ Same Return/Lower Risk (Quality 38% | Bonds 62%)
- ◇ Same Risk/Higher Return (Quality 65% | Bonds 35%)

- S&P 500 10% | Quality 50% | Bonds 40%
- S&P 500 20% | Quality 40% | Bonds 40%
- S&P 500 30% | Quality 30% | Bonds 40%
- S&P 500 40% | Quality 20% | Bonds 40%
- S&P 500 50% | Quality 10% | Bonds 40%

All index combinations are hypothetical.
Source: S&P Dow Jones Indices LLC. Data from June 30, 1995, through June 30, 2022. Past performance is no guarantee of future results. The S&P 500 Dividend Aristocrats was launched May 2, 2005. The S&P 500 Quality Index was launched July 8, 2014. The S&P U.S. Treasury Bond 7-10 Year Index was launched March 24, 2010. All data prior to index launch date is back-tested hypothetical data. Charts are 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 Defensive Advantage

Anyone who studies defensive factors will notice that, over long periods of time, many of them have outperformed the comprehensive cap-weighted indices from which their constituents are drawn, at lower levels of risk. (Exhibit 8 illustrated this for selected S&P 500-based factors.) Since we learn in elementary finance that risk and return are two sides of the same coin and that higher expected returns require a higher willingness to bear risk, the performance of defensive factors seems theoretically indefensible. Some academics, in fact, regard "the long-term outperformance of low-risk portfolios [as] perhaps the greatest anomaly in finance."[13]

There are a number of theoretical explanations for this anomaly, and we need not dwell on them here.[14] We do, however, want to acknowledge several practical relationships that have an important impact on the performance of defensive strategies.

– Market declines are typically periods of above-average volatility; rising markets are typically periods of below-average volatility.

– When volatility is above average, dispersion is typically above average, and vice-versa when volatility is below average.[15]

– Since dispersion measures the opportunity to add value, strategies that outperform when dispersion is relatively high are advantaged relative to strategies that outperform when dispersion is relatively low.[16]

Defensive strategies, as we have seen, typically outperform when the market declines and underperform when the market rises, which means that they are well positioned to benefit from changes in the market's level of dispersion.

In Exhibit 11, we divided the months in our database into four groups, depending on the performance of the S&P 500. Exhibit 13 shows the average level of dispersion for each of those sets of months.

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[13] Baker, Malcolm, Brendan Bailey, and Jeffrey Wurgler, "Benchmarks as Limits to Arbitrage: Understanding the Low-Volatility Anomaly," *Financial Analysts Journal*, January/February 2011, pp. 40-54.

[14] For example, see Edwards, Lazzara, and Preston, *op. cit.*, pp. 18-20.

[15] Chan, Fei Mei, Tim Edwards, Anu R. Ganti, and Craig J. Lazzara, "The Active Manager's Conundrum," S&P Dow Jones Indices, March 2020.

[16] Chan, Fei Mei and Craig J. Lazzara, "The Best Offense: When Defensive Strategies Win," S&P Dow Jones Indices, March 2015.

**Exhibit 13: Dispersion in the Worst Market Environment Was Significantly Higher Than Average**
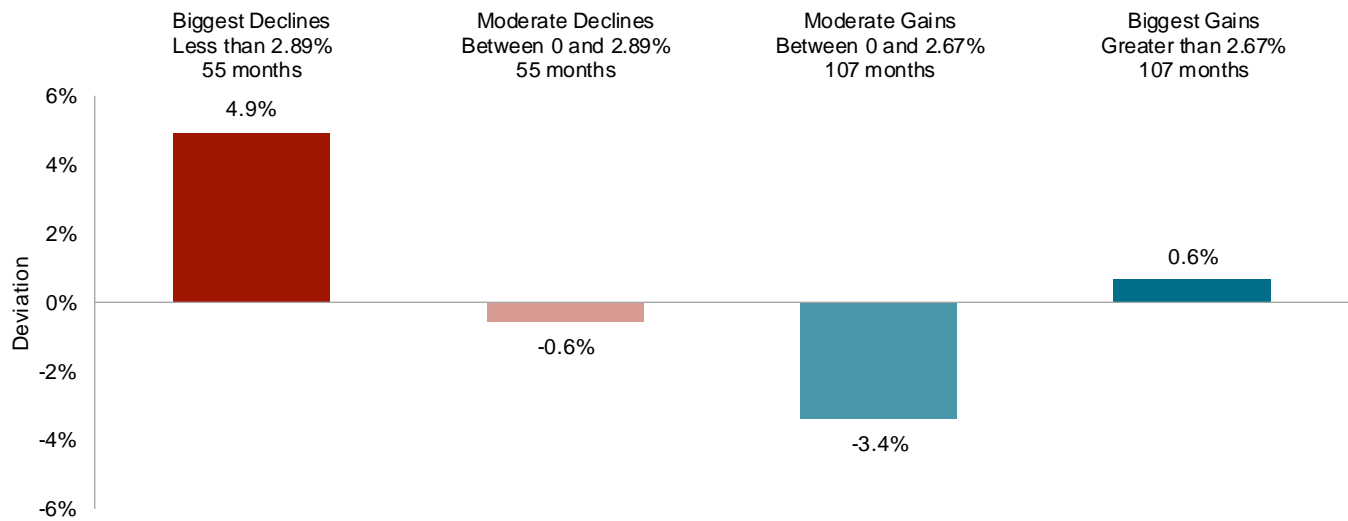


Source: S&P Dow Jones Indices LLC.  Data from June 30, 1995, through June 30, 2022.  Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

Dispersion is well above average when the market's performance is at its worst and below average when the market does well.  This means that **defensive strategies tend to outperform when the reward for outperforming is above average**.  They tend to underperform when the penalty for underperforming is below average.  Thus they gain more when they win than they lose when they lose.  This asymmetric pattern of relative returns helps explain the long-run advantage of defensive strategies.

The data in Exhibit 14 show how this asymmetry manifests in practice for the factor indices from Exhibit 8.  Without exception, relative performance spreads are largest in the environment with the biggest market declines, which is also the environment with the highest dispersion. This dynamic helps give defensive strategies their performance advantage.

**Exhibit 14: Return Differentials Are Much Wider in the Worst Market Environments with Highest Dispersion**

| Market Regime (Monthly Return) | Number of Months | S&P 500 Return (%) | Relative Return (%) | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | | | Low Volatility | Low Volatility High Dividend | Dividend Aristocrats | Minimum Volatility | High Dividend | Quality | Value | Growth |
| Less Than -2.88% | 55 | -6.36 | 3.02 | 2.47 | 1.78 | 1.75 | 1.33 | 1.19 | 0.38 | -0.45 |
| Between 0 and -2.88% | 55 | -1.48 | 0.95 | 0.63 | 0.57 | 0.69 | 0.37 | 0.41 | -0.07 | 0.05 |
| Between 0 and 2.67% | 107 | 1.33 | -0.19 | -0.09 | -0.09 | -0.07 | -0.08 | 0.02 | -0.09 | 0.04 |
| Greater Than 2.67% | 107 | 5.24 | -1.77 | -1.15 | -0.77 | -1.23 | -0.66 | -0.23 | -0.32 | 0.29 |

Source: S&P Dow Jones Indices LLC. Data from June 30, 1995, through June 30, 2022. Past performance is no guarantee of future results. The S&P 500 Low Volatility Index was launched April 4, 2011. The S&P 500 Dividend Aristocrats was launched May 2, 2005. The S&P 500 Low Volatility High Dividend Index was launched Sept. 17, 2012. The S&P 500 Minimum Volatility Index was launched Nov. 9, 2012. The S&P 500 Quality Index was launched July 8, 2014. The S&P 500 High Dividend Index was launched Sept. 21, 2015. All data prior to index launch date is back-tested hypothetical data. 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.

# Conclusion

> "Bad times have a scientific value. These are occasions a good learner would not miss."
> – Ralph Waldo Emerson

Market cycles are an inevitable part of investing, and investors are understandably wary of a possible downturn in the equity market. Today's interest rate trends may mean that bonds are a less appealing defensive asset than they have been historically. It is, however, possible to position allocations defensively with factor-based equity indices. **Combining well-chosen defensive factors with the S&P 500 and bonds has historically resulted in reduced volatility, as well as incremental returns.**

# Appendix

## Exhibit 15: Efficient Frontiers for Other Defensive Factors

**Low Volatility High Dividend (LVHD)**



- ━━◆━━ S&P 500 & S&P U.S. Treasury Bond 7-10 Year
- ━━◆━━ S&P 500 Low Volatility High Dividend & S&P U.S. Treasury Bond 7-10 Year
- ◇ Same Return/Lower Risk (Low Volatility High Dividend 44% | Bonds 56%)
- ◇ Same Risk/Higher Return (Low Volatility High Dividend 63% | Bonds 37%)

- • S&P 500 10% | LVHD 50% | Bonds 40%
- • S&P 500 20% | LVHD 40% | Bonds 40%
- • S&P 500 30% | LVHD 30% | Bonds 40%
- • S&P 500 40% | LVHD 20% | Bonds 40%
- • S&P 500 50% | LVHD 10% | Bonds 40%

**Minimum Volatility**



- ━━◆━━ S&P 500 & S&P U.S. Treasury Bond 7-10 Year
- ━━◆━━ S&P 500 Minimum Volatility & S&P U.S. Treasury Bond 7-10 Year
- ◇ Same Return/Lower Risk (Minimum Volatility 62% | Bonds 38%)
- ◇ Same Risk/Higher Return (Minimum Volatility 71% | Bonds 29%)

- • S&P 500 10% | Minimum Volatility 50% | Bonds 40%
- • S&P 500 20% | Minimum Volatility 40% | Bonds 40%
- • S&P 500 30% | Minimum Volatility 30% | Bonds 40%
- • S&P 500 40% | Minimum Volatility 20% | Bonds 40%
- • S&P 500 50% | Minimum Volatility 10% | Bonds 40%

All index combinations are hypothetical.
Source: S&P Dow Jones Indices LLC. Data from June 30, 1995, through June 30, 2022. Past performance is no guarantee of futu re results. The S&P 500 Low Volatility High Dividend Index was launched Sept. 17, 2012. The S&P 500 Minimum Volatility Index was launched Nov. 9, 2012. The S&P U.S. Treasury Bond 7-10 Year Index was launched March 24, 2010. All data prior to index launch date is back-tested hypothetical data. 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.

**Exhibit 15: Efficient Frontiers for Other Defensive Factors (cont.)**
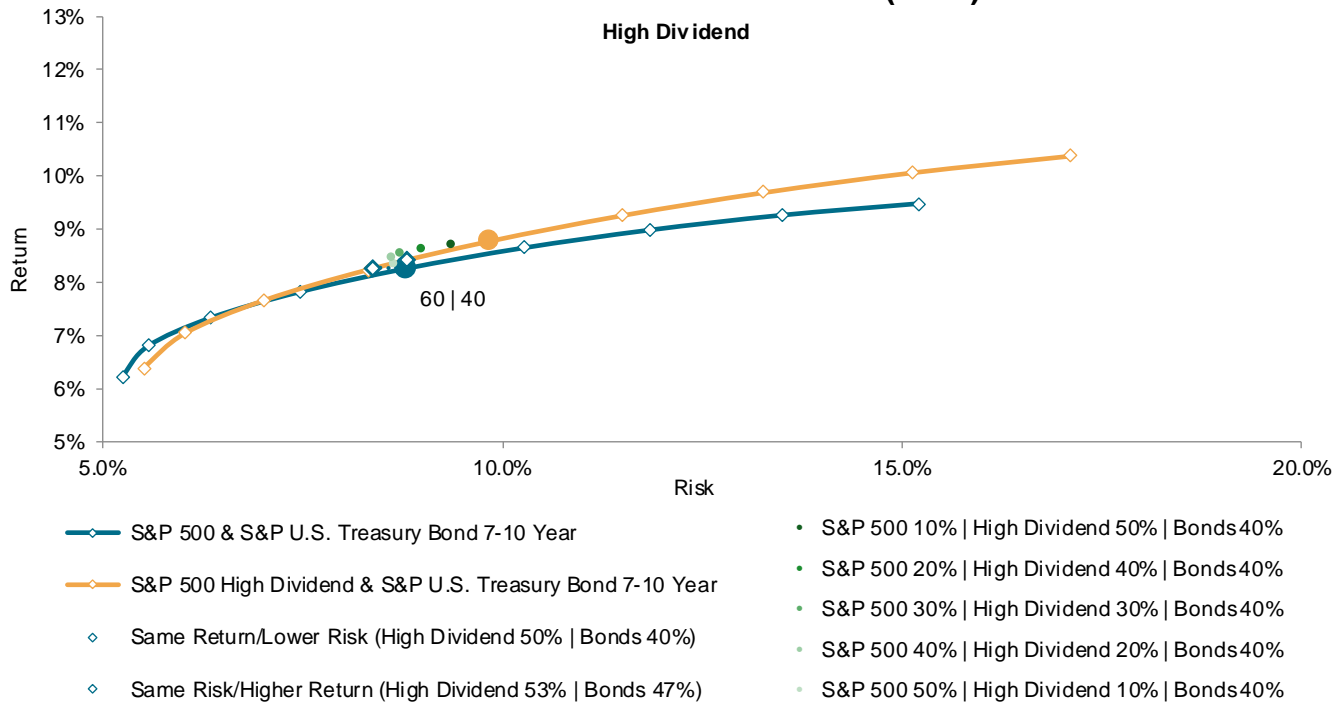


**High Dividend**

Legend:

— **S&P 500 & S&P U.S. Treasury Bond 7-10 Year**

— **S&P 500 High Dividend & S&P U.S. Treasury Bond 7-10 Year**

◇ Same Return/Lower Risk (High Dividend 50% | Bonds 40%)

◇ Same Risk/Higher Return (High Dividend 53% | Bonds 47%)

• S&P 500 10% | High Dividend 50% | Bonds 40%
• S&P 500 20% | High Dividend 40% | Bonds 40%
• S&P 500 30% | High Dividend 30% | Bonds 40%
• S&P 500 40% | High Dividend 20% | Bonds 40%
• S&P 500 50% | High Dividend 10% | Bonds 40%

All index combinations are hypothetical.
Source: S&P Dow Jones Indices LLC.  Data from June 30, 1995, through June 30, 2022.  Past performance is no guarantee of futu re results.
The S&P 500 High Dividend Index was launched Sept. 21, 2015.  The S&P U.S. Treasury Bond 7-10 Year Index was launched March 24,
2010.  All data prior to index launch date is back-tested hypothetical data.  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.

In contrast, the introduction of more aggressive (i.e., less defensive) equity strategies produced different results.  Exhibit 16 compares efficient frontiers using the benchmark versus using the S&P 500 Growth and the S&P 500 Value.[17]

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[17] The S&P 500 Style Indices divide the complete market capitalization of the S&P 500 into growth and value segments.  We measure growth
stocks using three factors: sales growth, the ratio of earnings change to price and momentum.  We measure value stocks using three factors:
the ratios of book value, earnings, and sales to price.  For more details, see the complete methodology.

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## Exhibit 16: Not All Strategies Offer Protection
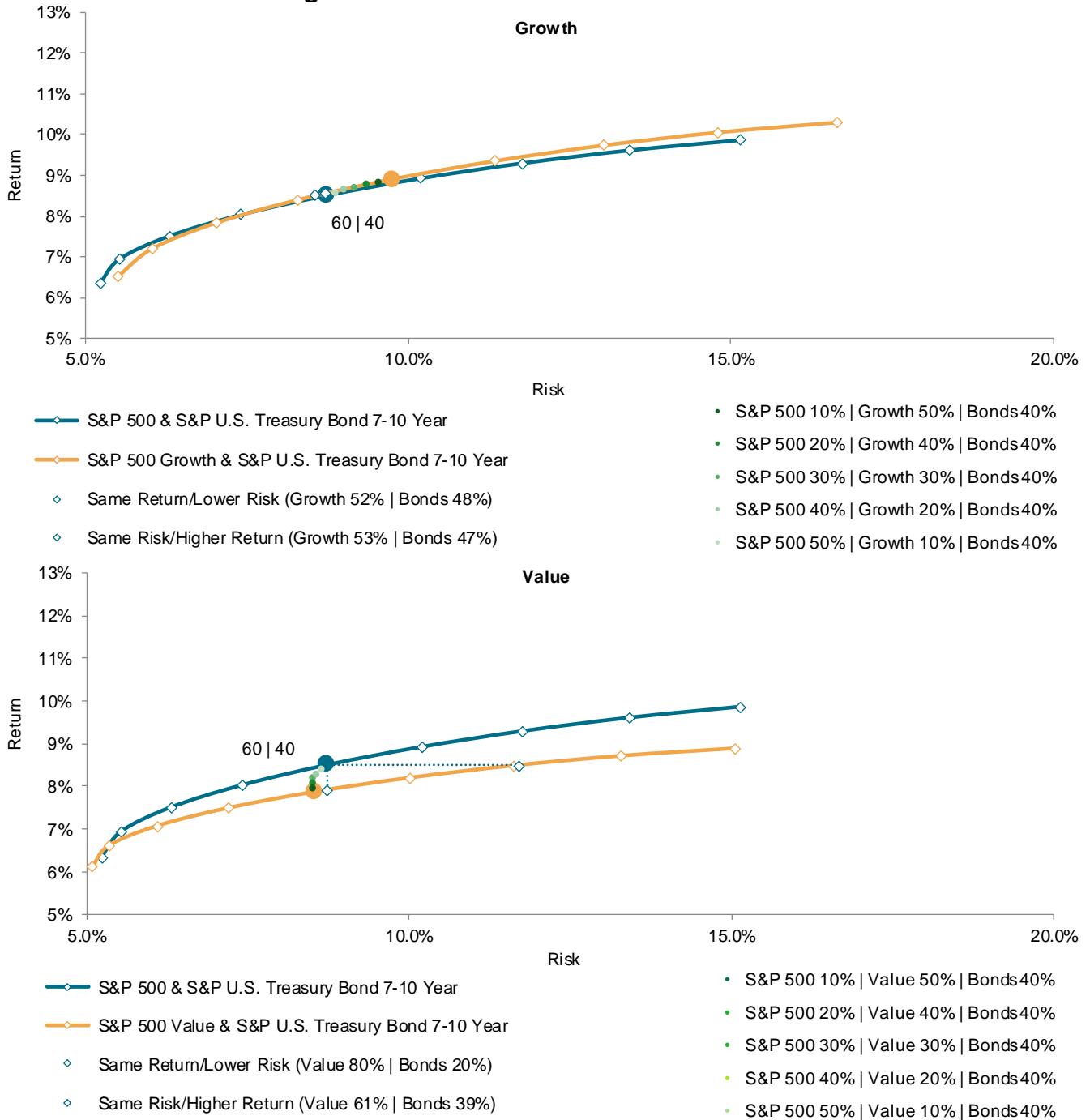
**Growth**



Risk

- S&P 500 & S&P U.S. Treasury Bond 7-10 Year
- S&P 500 Growth & S&P U.S. Treasury Bond 7-10 Year
- ◇ Same Return/Lower Risk (Growth 52% | Bonds 48%)
- ◇ Same Risk/Higher Return (Growth 53% | Bonds 47%)

- • S&P 500 10% | Growth 50% | Bonds 40%
- • S&P 500 20% | Growth 40% | Bonds 40%
- • S&P 500 30% | Growth 30% | Bonds 40%
- • S&P 500 40% | Growth 20% | Bonds 40%
- • S&P 500 50% | Growth 10% | Bonds 40%

**Value**



Risk

- S&P 500 & S&P U.S. Treasury Bond 7-10 Year
- S&P 500 Value & S&P U.S. Treasury Bond 7-10 Year
- ◇ Same Return/Lower Risk (Value 80% | Bonds 20%)
- ◇ Same Risk/Higher Return (Value 61% | Bonds 39%)

- • S&P 500 10% | Value 50% | Bonds 40%
- • S&P 500 20% | Value 40% | Bonds 40%
- • S&P 500 30% | Value 30% | Bonds 40%
- • S&P 500 40% | Value 20% | Bonds 40%
- • S&P 500 50% | Value 10% | Bonds 40%

All index combinations are hypothetical.
Source: S&P Dow Jones Indices LLC.  Data from June 30, 1995, through June 30, 2022.  Past performance is no guarantee of future results.
The S&P U.S. Treasury Bond 7-10 Year Index was launched March 24, 2010.  All data prior to index launch date is back-tested hypothetical
data.  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.

**Research**                                                                                             18

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# Performance Disclosure/Back-Tested Data

The S&P 500 Low Volatility Index was launched April 4, 2011. The S&P 500 Dividend Aristocrats was launched May 2, 2005. The S&P 500 Low Volatility High Dividend Index was launched September 17, 2012. The S&P 500 Minimum Volatility Index was launched November 9, 2012. The S&P 500 Quality Index was launched July 8, 2014. The S&P 500 High Dividend Index was launched September 21, 2015. The S&P U.S. Treasury Bond 7-10 Year Index was launched March 24, 2010. All information presented prior to an index's Launch Date is hypothetical (back-tested), not actual performance, and is based on the index methodology in effect on the index launch date. However, when crea ting back-tested history for periods of market anomalies or other periods that do not reflect the general current marke t environment, index methodology rules may be relaxed to capture a large enough universe of securities to simulate the target market the index is designed to measure or strategy the index is designed to capture. For example, market capitalization and liquidity thresholds may be reduced. In addition, forks have not been factored into the back-test data with respect to the S&P Cryptocurrency Indices. For the S&P Cryptocurrency Top 5 & 10 Equal Weight Indices, the custody element of the methodology was not considered; the back-test history is based on the index constituents that meet the custody element as of the Launch Date. Complete index methodology details are available at [www.spglobal.com/spdji](www.spglobal.com/spdji). Back-tested performance reflects application of an index methodology and selection of index constituents with the benefit of hindsight and knowledge of factors that may have positively affected its performance, cannot account for all financia l risk that may affect results and may be considered to reflect survivor/look ahead bias. Actual returns may differ significantly from, and be lower than, back-tested returns. Past performance is not an indication or guarantee of future results.

Please refer to the methodology for the Index for more details about the index, including the manner in which it is rebalanced, the ti ming of such rebalancing, criteria for additions and deletions, as well as all index calculations. Back-tested performance is for use with institutions only; not for use with retail investors.

S&P Dow Jones Indices defines various dates to assist our clients in providing transparency. The First Value Date is the firs t day for which there is a calculated value (either live or back-tested) for a given index. The Base Date is the date at which the index is set to a fixed value for calculation purposes. The Launch Date designates the date when the values of an index are first considered live: index values provided for any date or time period prior to the index's Launch Date are considered back-tested. S&P Dow Jones Indices defines the Launch Date as the date by which the values of an index are known to have been released to the public, for example via the company's public website or its data feed to external parties. For Dow Jones-branded indices introduced prior to May 31, 2013, the Launch Date (which prior to May 31, 2013, was termed "Date of introduction") is set at a date upon which no further changes were permitted to be made to the ind ex methodology, but that may have been prior to the Index's public release date.

Typically, when S&P DJI creates back-tested index data, S&P DJI uses actual historical constituent-level data (e.g., historical price, market capitalization, and corporate action data) in its calculations. As ESG investing is still in early stages of development, certain datapoints used to calculate S&P DJI's ESG indices may not be available for the entire desired period of back-tested history. The same data availability issue could be true for other indices as well. In cases when actual data is not available for all relevant historical periods, S&P DJI may employ a process of using "Backward Data Assumption" (or pulling back) of ESG data for the calculation of back-tested historical performance. "Backward Data Assumption" is a process that applies the earliest actual live data point available for an index constituent company to all prior historical instances in the index performance. For example, Backward Data Assumption inheren tly assumes that companies currently not involved in a specific business activity (also known as "product involvement") were never involved historically and similarly also assumes that companies currently involved in a specific business activity were involved historically too. The Backward Data Assumption allows the hypothetical back-test to be extended over more historical years than would be feasible using only actual data. For more information on "Backward Data Assumption" please refer to the [FAQ](FAQ). The methodology and factsheets of any index that employs backward assumption in the back-tested history will explicitly state so. The methodology will include an Appendix with a table setting forth the specific data points and relevant time period for which backward projected data was used.

Index returns shown do not represent the results of actual trading of investable assets/securities. S&P Dow Jones Indices maintains the index and calculates the index levels and performance shown or discussed but does not manage actual assets. Index returns do not reflect payment of any sales charges or fees an investor may pay to purchase the securities underlying the Index or investment funds that are intended to track the performance of the Index. The imposition of these fees and charges would cause actual and back-tested performance of the securities/fund to be lower than the Index performance shown. As a simple example, if an index returned 10% on a US $100,000 investment for a 12-month period (or US $10,000) and an actual asset-based fee of 1.5% was imposed at the end of the period on the investment plus accrued interest (or US $1,650), the net return would be 8.35% (or US $8,350) for the year. Over a three -year period, an annual 1.5% fee taken at year end with an assumed 10% return per year would result in a cumulative gross return of 33.10%, a total fee of US $5,375, and a cumulative net return of 27.2% (or US $27,200).

# General Disclaimer