Insight
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Taking the Sting Out of Tail Risk

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In extreme markets, the beneficial effects of portfolio diversification can be diminished — and we'd like to add our thanks to the year 2020 for reminding us of that fact. Confronted by extreme markets, some investors persist with uncomfortably risky strategies and hope that all will somehow be okay. Other investors react with excess caution, forsaking the possibility of future gains by following an overly conservative strategy. But alternatives do exist. Tactically deploying a basket of "tail risk"[1] assets can cushion against the worst of market moves while still allowing investors to continue to hold growth assets in their portfolios.

A Nimble Strategy for Rational and Emotional Markets

Diversification will remain a cornerstone of designing an efficient portfolio. It fulfils a role in most market conditions, delivering a smoother journey and allowing more return to be earned for the same level of risk.

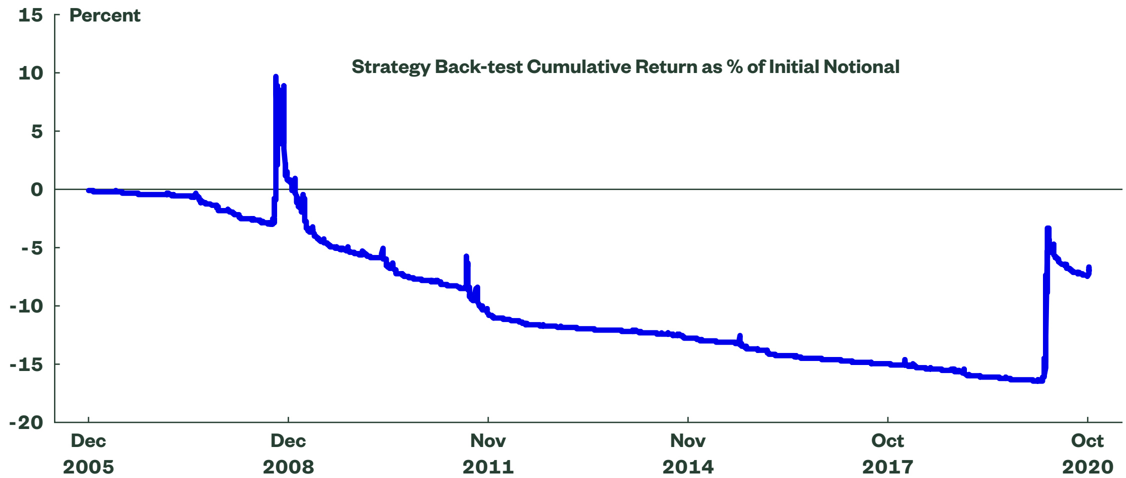
However, managing the risk of extreme market events requires an explicit tail risk strategy. Such a strategy does not replace diversification, but rather complements it. The critical difference is that, while a diversification strategy is "always on," a strategy to manage tail risk is best deployed nimbly rather than consistently.

Allocating to assets such as gold, long government bonds, and medium dated volatility futures for short periods of elevated market stress can smooth the path of returns, providing confidence to investors to retain healthier allocations to growth assets through time. The merits of each of these tail risk assets, as well as considerations on how to time such allocations, are addressed below.

Traditional Downside Protection

For the most part, allocating to assets that provide a surge of returns in extreme market conditions can mean foregoing returns during more typical conditions. Figure 1 displays how an "always on" tail risk hedge — such as continuously buying downside protection using "put"[2] options — tends to give away significant upside.

Figure 1
Back-test Performance of a Monthly Rolled 15% OTM[3] Put Strategy
Back-test Cumulative Return as a Percentage of Initial Notional



Source: State Street Global Advisors, Morgan Stanley QDS Research, December 30, 2005 through October 30, 2020.
The data displayed is a hypothetical example of back-tested performance for a 15% OTM Put strategy. This presentation is for illustrative purposes only and is not indicative of the past or future performance of any Street State Global Advisors product.
Back-tested results are not indicative of the past or future of any SSGA product. Results displayed represent a back-test of a hypothetical 15% OTM Put strategy. Results were achieved by means of the retroactive application of a hypothetical strategy which was developed with the benefit of hindsight. All data shown above does not represent the results of actual trading, and in fact actual results could differ substantially. There is the potential for loss as well as profit. Please reference the back-tested methodology appendix for a description of the methodology used as well as an important discussion of the inherent limitations of back-tested results.

Behavior During Market Stress

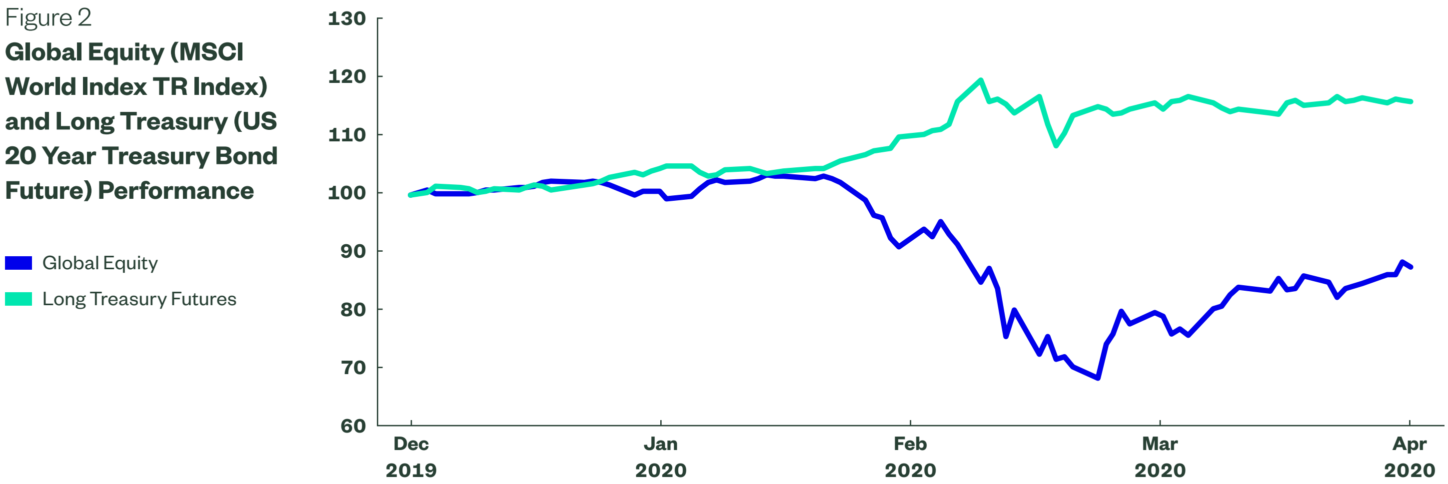
In contrast to traditional downside protection strategies, a tail risk strategy combining a timing component with a selection of assets that do well in stressed environments can be an effective means to mitigate market drawdowns.

Government Bonds

Despite rock-bottom yields and an increase in long-term correlations with equities, government bonds can still provide strong downside protection during crisis periods. While there was a brief period in March of 2020 when the short-term rush for liquidity resulted in stocks and government bonds falling together, the negative correlation between equities and safe-haven government bonds remains intact. Figure 2 displays the short-term price movements of global developed equities and long US treasuries.

In the four weeks that it took equities to fall by one-third, 10 year Treasury yields fell by close to a full percentage point, to just over 0.5%, before recovering slightly. Even German government bond yields, already well entrenched in negative territory, fell a further 0.4% to -0.8%. Today, investors may be less inclined to hold government bonds for the long term because of yields that are close to, or below, zero.[4] Nonetheless, the attractive correlation benefits can still be harnessed in a more nimble manner.

Figure 2
Global Equity (MSCI World Index TR Index) and Long Treasury (US 20 Year Treasury Bond Future) Performance



Source: MSCI, Bloomberg, State Street Global Advisors, December 31, 2019, to April 30, 2020.

Gold

Likewise gold, whose amorphous nature causes endless debate on its fair value, regularly displays its mettle when uncertainty is elevated. And in a climate with real yields on government bonds deep in negative territory, the opportunity cost of holding an asset that doesn't generate cashflow becomes less of a concern as investors seek havens in times of elevated risk. We may even see gold steal share (from government bonds) as downside protection during future market sell-offs.

Medium-Term Volatility Futures

While not an asset to be held for a sustained period, volatility — purchased as emotion begins to overwhelm markets — can deliver meaningful returns. The VIX index is theoretically usable for this purpose, but medium-term volatility futures fare better because of their lower decay rates and more stable behavior.

These attractive characteristics are not always visible when just looking at average performance over time. However, as Figure 3 demonstrates, average performance across all market conditions differs substantially from average performance in more stressed periods.[5]

Figure 3
Performance in All Months Versus the Months in Which MSCI World Declines More than 5%
2006–2020

		Median Calendar Monthly Returns (2006–2020*)		
		Long Treasury Bonds	Gold	VIX 3 Months Maturity
All Months	**178**	**0.01%**	**0.4%**	**-2.9%**
Months in which MSCI World Falls >5%	18	3.7%	3.0%	19.2%
		Hit Rate (No. of Positive Months)		
		72%	78%	100%

* YTD October 30, 2020.
Source: State Street Global Advisors, Bloomberg. All returns in USD, and reference relevant futures prices.
Calculations are based on actual futures data for Bonds, Gold and VIX during stress periods as defined by monthly decline of 5% or more in Global Equity Markets. Global Equity Markets are represented by MSCI World TR Index.

While Figure 3 displays a utopian level of market timing, the message is clear: Exposure to these asset classes can provide some cushion during times of stress.

Even with a less prescient level of market timing, the benefits can be substantial. Figure 4 shows the performance during the weeks after equities experienced falls in excess of 5% (non-overlapping).

Figure 4
Performance in All Weeks Versus the Weeks Following MSCI World Declines of More than 5%
2006–2020

		Median Weekly Returns (2006–2020*)		
		Long Treasury Bonds	Gold	VIX 3 Months Maturity
All Weeks	**777**	**0.11%**	**0.33%**	**-0.77%**
Weeks in which MSCI World Falls >5%	24	Median Weekly Returns, 1 Week Delay		
		-0.2%	2.1%	2.1%
		Hit Rate (No. of Positive Weeks, 1 Week Delay)		
		50%	58.3%	54.3%

* YTD October 30, 2020.
Source: State Street Global Advisors, Bloomberg. All returns in USD, and reference relevant futures prices.
Calculations are based on actual futures data for Bonds, Gold and VIX during stress periods as defined by weekly decline of 5% or more in Global Equity Markets. Global Equity Markets are represented by MSCI World TR Index.

Interestingly, long government bonds show flat performance in the weeks following a 5% fall. This would seem to reflect a faster reactivity of bonds vis-à-vis gold. During the weeks when the >5% equity falls occurred, long bonds returned an average of 1.6%.

Just like diversification plays a role in normal market conditions, diversification adds value within a tail risk basket. Individually, treasuries, gold, and volatility futures won't always provide a boost to returns during a period of stress, but collectively, they are more likely to, particularly in the more severe episodes.

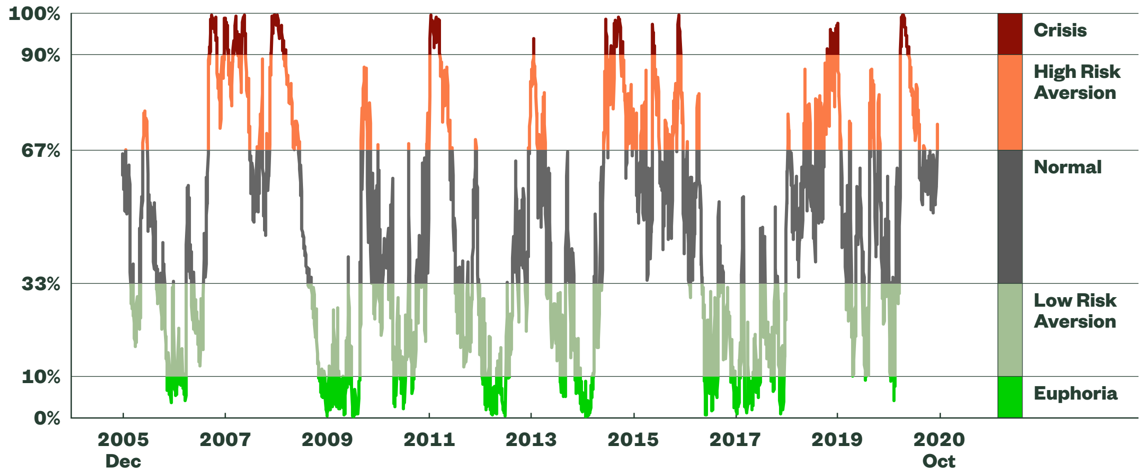
Identifying Periods of Market Stress

Knowing the value that tail risk assets can bring in times of stress is of limited benefit unless one can identify these periods when they are occurring. In other words investors need to be able to differentiate between normal conditions and stressed conditions in real time.

State Street's Market Regime Indicator (MRI) has been constructed to perform this very task, providing an assessment of global risk appetite. The MRI gleans and amalgamates forward-looking market information about stress from global equity, currency, and debt markets. Specifically, by evaluating implied volatility levels in currency and equity markets as well as spreads on risky debt, the MRI is attuned to the prevailing risk sentiment.

The MRI can be used to inform decisions about when to deploy and, equally important, when to remove a basket of tail risk assets. Figure 5 shows the path of the Market Regime Indicator for the last fifteen years. When deciding whether to deploy a tail risk basket, the focus is on identifying periods exhibiting higher levels of stress, i.e., the periods above the 67% line.

Figure 5
Daily Market Regime Indicator
2005–2020



Source: State Street Global Advisors, as of October 30, 2020. The data displayed is not indicative of the past or future performance of any State Street Global Advisors product. The portion of results through March 31, 2011, represents a back-test of the MRI model, which means that those results were achieved by means of the retroactive application of the model which was developed with the benefit of hindsight. Data displayed beyond this date is not back-tested, but is still generated by the model referenced. All data shown above does not represent the results of actual trading, and in fact, actual results could differ substantially, and there is the potential for loss as well as profit. The Market Regime Indicator (MRI) is a quantitative framework that attempts to identify the current market risk environment based on forward-looking market indicators. We believe the factors used, equity implied volatility, currency pairs implied volatility and bond spreads, are good indicators of the current risk environment as they are responsive to real-time market impacts and in theory should include all current and forward views of those markets. These factors are combined to create a single measure and used to identify one of five risk regimes: Euphoria, Low Risk, Normal, High Risk, and Crisis. A slight calculation change was made as of June 28, 2019.

When the MRI crosses the 67% line and enters what we term a "High Risk Regime," this is a good trigger point for deploying tail risk protection. Once protection has been deployed, the next question is when to remove it — as retaining protection for too long can result in performance drag. A re-crossing below the 67% line, denoting a return back to more typical levels of risk appetite, is one such trigger point.

Opportunities may sometimes arise to take profits on gains in tail risk assets. At more extreme levels of risk-aversion we enter territory often (but not always) associated with oversold conditions. This can represent a trigger point for removal of the tail risk basket, ideally with an ensuing profit.

Figure 6 outlines a back-test displaying how an equally weighted basket of three tail risk assets, in conjunction with the timing conditionality as provided by the MRI, would have performed in recent years. While the medium-term volatility futures dominate in terms of sensitivity to stress in the markets,[6] both long government bonds and gold play a complementary role in providing diversification to movements in VIX futures during stress events.[7]

Figure 6
Back-Tested Performance of Tail Risk Assets
Timing Conditionality Provided by the MRI

Year	Signal Days	Long Gov Perf (%)	Gold Future Perf (%)	VIX Fut Perf (%)	Basket Performance (%)
2006	23	0.8	-13.8	20.9	2.3
2007	80	8.2	14.3	39.6	20.5
2008	99	-1.4	-2.1	76.4	24.5
2009	28	-6.4	0.7	-13.4	-6.2
2010	30	-1.0	-1.0	-5.4	-2.3
2011	44	2.6	15.4	6.3	9.4
2012	4	-3.5	2.8	-10.7	-3.9
2013	39	-5.6	-13.1	5.9	-4.0
2014	43	3.5	0.2	-5.1	-0.5
2015	105	1.1	-3.7	-25.8	-9.1
2016	44	4.8	14.2	-15.6	0.7
2017	0	0.0	0.0	0.0	0.0
2018	89	-1.1	4.4	5.3	4.0
2019	41	1.1	2.2	-19.7	-5.9
2020	41	1.8	4.0	1.5	3.1

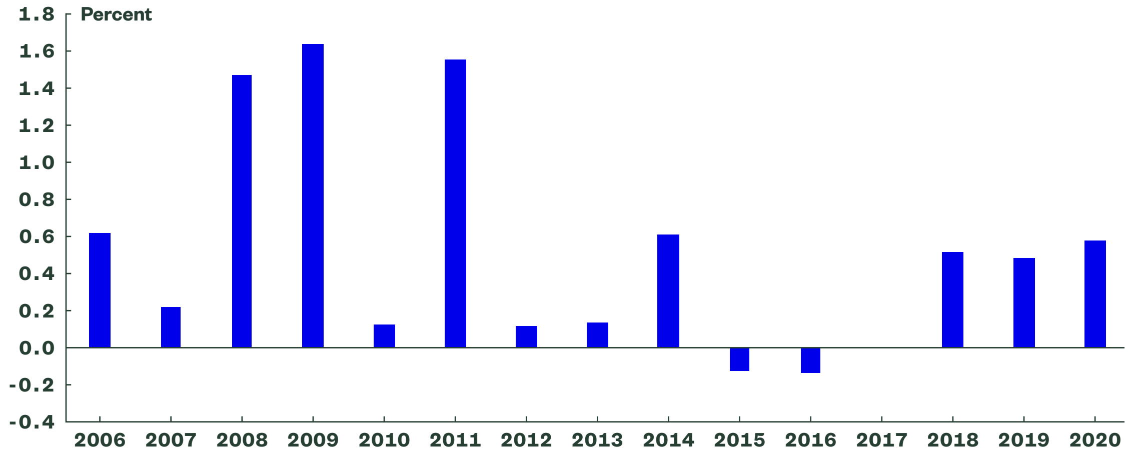
2020 representative of YTD 30 October.
Source: State Street Global Advisors, Bloomberg. All returns in USD, and reference relevant futures prices.
The data displayed is a hypothetical example of back-tested performance for a tail risk asset strategy with timing conditionality provided by the MRI. This presentation is for illustrative purposes only and is not indicative of the past or future performance of any SSGA product.
Back-tested results are not indicative of the past or future of any SSGA product. Results displayed represent a back-test of a hypothetical tail risk asset strategy with timing conditionality provided by the MRI. Results were achieved by means of the retroactive application of a hypothetical strategy which was developed with the benefit of hindsight. All data shown above does not represent the results of actual trading, and in fact, actual results could differ substantially. There is the potential for loss as well as profit. Please reference the back-tested methodology appendix for a description of the methodology used as well as an important discussion of the inherent limitations of back-tested results.

To demonstrate the meaningful impact tail risk assets can have on a portfolio, Figure 7 shows the drawdown improvement each year in a portfolio comprising 50% global equity/40% bonds/ 10% cash versus one that sells the Cash in favor of a 10% allocation to an equally weighted tail risk basket when triggers dictate, consistent with the MRI triggers used in Figure 6.

Figure 7

Back-test of a Drawdown Improvement from the Addition of a 10% Tail Risk Basket

Versus a 50% Global Equity/40% Bonds/ 10% Cash Portfolio



Source: State Street Global Advisors, as of October 30, 2020.

The data displayed is a hypothetical example of back-tested performance for a strategy that provides drawdown improvement via the addition of a 10% tail risk basket. This presentation is for illustrative purposes only and is not indicative of the past or future performance of any SSGA product.

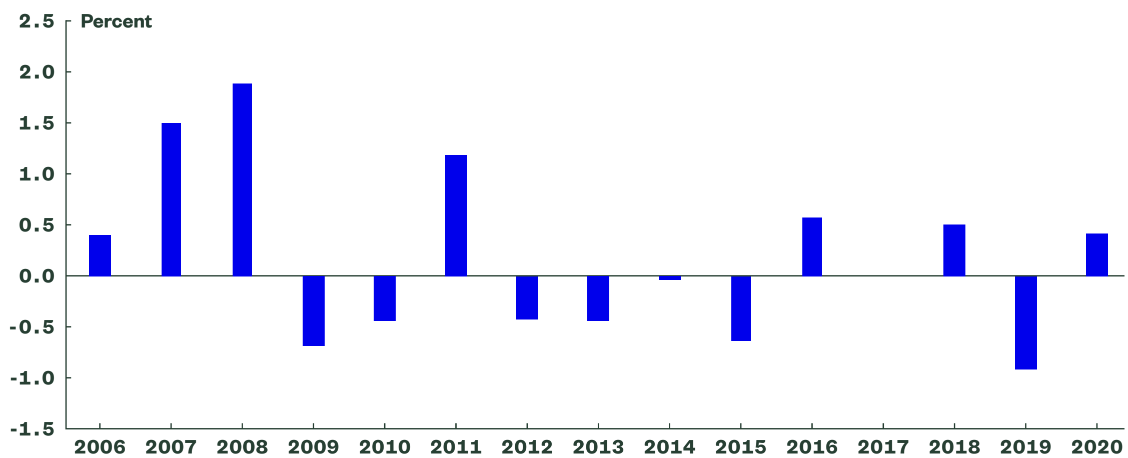
Back-tested results are not indicative of the past or future of any SSGA product. Results displayed represent a back-test of a hypothetical strategy that provides drawdown improvement via the addition of a 10% tail risk basket. Results were achieved by means of the retroactive application of a hypothetical strategy which was developed with the benefit of hindsight. All data shown above does not represent the results of actual trading, and in fact, actual results could differ substantially. There is the potential for loss as well as profit. Please reference the back-tested methodology appendix for a description of the methodology used as well as an important discussion of the inherent limitations of back-tested results.

While cushioning the downside during times of stress is a good outcome for investors, a tail risk strategy can add to returns as well. Figure 8 illustrates the impact on excess returns in the same two portfolios. More often than not, excess returns have been marginally positive for the portfolio including the tail risk basket. The excess returns would likely be even larger if, instead of a 50% global equity/40% bonds/10% cash portfolio, we were to take a 50% Global Equity/50% Bonds portfolio and sell equities to fund the tail risk basket.

Figure 8

Back-test of Excess Returns from the Addition of a 10% Tail Risk Basket

Versus a 50% Global Equity/40% Bonds/ 10% Cash Portfolio



Source: State Street Global Advisors, as of October 30, 2020.

The data displayed is a hypothetical example of back-tested performance for a strategy that generates excess returns via the addition of a 10% tail risk basket. This presentation is for illustrative purposes only and is not indicative of the past or future performance of any SSGA product.

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Plan for the Storm When the Sun is Shining

The best time to plan for crises is in advance, rather than in the midst of one. Having a prepared strategy to re-direct a portion of assets toward a tail risk basket when conditions deteriorate can not only soften on the downside, but also provide confidence to retain exposure to the upside that equities can bring. A tail risk strategy that delivers even a modest excess return is an added bonus.

Long treasuries, gold, and volatility can play a vital role in extreme market conditions, but thought must be given to timing entry and exit points. Disciplined execution is critical because returns are very sensitive during periods of elevated market volatility. A nimbly deployed tail risk strategy may benefit many investors in navigating future crises.

The tail risk asset strategy described here is similar to those used in several of State Street's Flexible Asset Allocation strategies, offered by our Investment Solutions Group. For detailed information on these strategies, including performance information, please contact your State Street representative.

Appendix: Back-Testing Methodology

Tail Risk Strategy aims to capture performance of equal-weighted exposure to VIX Medium-Term Futures, US Long Treasury Futures, and Gold Futures during stress periods in the market as identified by ISG's Market Regime Indicator. Underlying instrument representing VIX Futures performance in back test is S&P 500 VIX 3-Months Futures Total Return Index, for US Long Treasury it's 20 Year US Treasury Bond Futures and Gold Futures on spot price per Troy Ounce in USD. ISG Daily MRI is monitored continuously to trigger entry and exit points for the strategy. Equal-weighted futures basket is bought morning the day after ISG Daily MRI enters a high-risk regime as of the close of the previous trading day. Futures basket is sold once exit signal is triggered by proprietary rules-based on MRI. Exit signal tries to balance the risk of exiting too soon while markets are still under stress versus the risk of losing profits as market trends reverse. It captures approximate transaction costs in back-testing to reflect the cost of buying and selling futures in the market.

The back-testing presented in this paper was undertaken by the State Street Global Advisors Investment Solutions Group (ISG).

The back-tested performance results presented here do not represent the results of actual trading using clients' assets but were achieved by means of the retroactive application of the stated tail risk strategies against actual historical data within the universes listed.

This process was designed with the benefit of hindsight, and thus, the performance results should not be considered as indicative of the skill of the advisor or its investment professionals. The back-tested performance was compiled after the end of the period depicted and does not represent the actual investment decisions of the advisor. These results do not reflect the effect of material economic and market factors on decision making. In addition, back-tested performance results do not involve financial risk, and no hypothetical trading record can completely account for the impact of financial risks associated with actual investing.

Not all products are available to all investors. Please contact State Street Global Advisors for further information.

Endnotes

1 Tail risk is a form of portfolio risk that arises when the possibility that an investment will move more than three standard deviations from the mean is greater than what is shown by a normal distribution. Tail risks include events that have a small probability of occurring, and occur at both ends of a normal distribution curve.

2 A put gives the owner the right, but not the obligation, to sell the underlying stock at a set price within a specified time.

3 Out of the money.

4 See "Portfolio Protection — Rethinking the Role of Government Bonds."

5 Defined as months in which MSCI World falls >5%.

6 Stress as represented by steep decline in global equity and credit markets. VIX futures jump in line with a sharp jump in the VIX Index during stress events. It's more sensitive to other two instruments in the basket, i.e., gold and bonds.

7 VIX futures may be first to react, and gold and bonds futures may follow with lower correlation to VIX futures. By the time gold and bond futures may start moving up reacting to stress event, VIX futures may run out of steam or may start retracting the performance captured earlier.

About State Street Global Advisors

For four decades, State Street Global Advisors has served the world's governments, institutions and financial advisors. With a rigorous, risk-aware approach built on research, analysis and market-tested experience, we build from a breadth of active and index strategies to create cost-effective solutions. As stewards, we help portfolio companies see that what is fair for people and sustainable for the planet can deliver long-term performance. And, as pioneers in index, ETF, and ESG investing, we are always inventing new ways to invest. As a result, we have become the world's third-largest asset manager with US $3.47 trillion* under our care.

* This figure is presented as of December 31, 2020 and includes approximately $75.17 billion of assets with respect to SPDR products for which State Street Global Advisors Funds Distributors, LLC (SSGA FD) acts solely as the marketing agent. SSGA FD and State Street Global Advisors are affiliated.