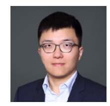
Volatility Spikes May Not Be Good Sell Signals

Better for investors to stay calm in times of market turbulence.

April 2022

KEY INSIGHTS

- Since 2000, extreme share price movements due to ‘black swan’ events have occurred more frequently, creating a problem of ‘fat tail risks’ for investors.
- For longer-term investors, keeping calm and sitting tight may be a good option when market volatility spikes, as happened after Russia invaded Ukraine.
- We showed that 18-month returns tended to be above average following a spike in volatility due – there is a natural tendency for markets to rebound.



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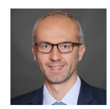

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Recently, stock market volatility has spiked as a result of the Russia-Ukraine conflict, the subsequent sanctions from western countries, elevated inflation levels, the tightening of central bank monetary policies, and the Chinese ADR panic sell-off. In this note we consider what actions investors might take to mitigate the risk to their portfolios. For longer term investors, keeping calm and sitting tight may be their best option.

Black Swan Events Show Up More Often in Headline News

Theoretically, if daily equity returns follow a normal distribution, then a 3.35 sigma (standard deviation) daily price movement is an outcome or event that should only occur around once in every decade. In the history of the S&P 500 Index, however, days of 3.35 sigma price movements have occurred more often than a normal return distribution would suggest. (Figure 1). This feature

“Black Swan events show up more often...

S&P 500: Number of Extreme Daily Price Changes By Decade

(Fig. 1) Average of 3.35 Sigma Daily Price Changes

	1950's	1960's	1970's	1980's	1990's	2000's	2010's	2020's (2 years)
S&P 500 index	1	2	3	13	7	60	11	17

Period: 01/01/1950 – 12/31/2021.
Sources: Haver Analytics/Bloomberg Finance L.P. Analysis by T. Rowe Price. We took an expanding window of historical daily returns data for the S&P 500 from 1928 (constructed from the S&P 90 index prior to inception of the S&P 500 in March 1957) to the start of each decade in order to calculate daily return z-scores for that decade. We prefer this methodology to one in which the 3.35 sigma return threshold is held constant throughout the period covered by Figure 1 since an expanding window does not allow future, unknown returns to be used in the calculation of the number of tail risk events per decade.

of equity returns is sometimes referred to as the problem of 'fat tails' or extreme outcomes facing equity investors. Extreme events occur more often than many investors might expect.

Figure 1 also shows that extreme share price movements have occurred more frequently since the year 2000 than might have expected based on the entire post-war history of such events. This increase in frequency reflects a succession of extreme events including the 2000/2001 IT bubble, the global financial crisis in 2007/2008 followed by the great recession, the Fed's 'taper tantrum' in 2013, and most recently, the coronavirus pandemic that began in 2020. Investors who have based their portfolio construction on a normal distribution assumption need to quickly revisit their processes to include fat tails. The increase in the number of extreme outcomes naturally raises the question "What can, or should, investors do to lower the risk of their portfolios during these now more frequent periods of market stress or turbulence?

It Pays to Stay Invested During Stress Periods

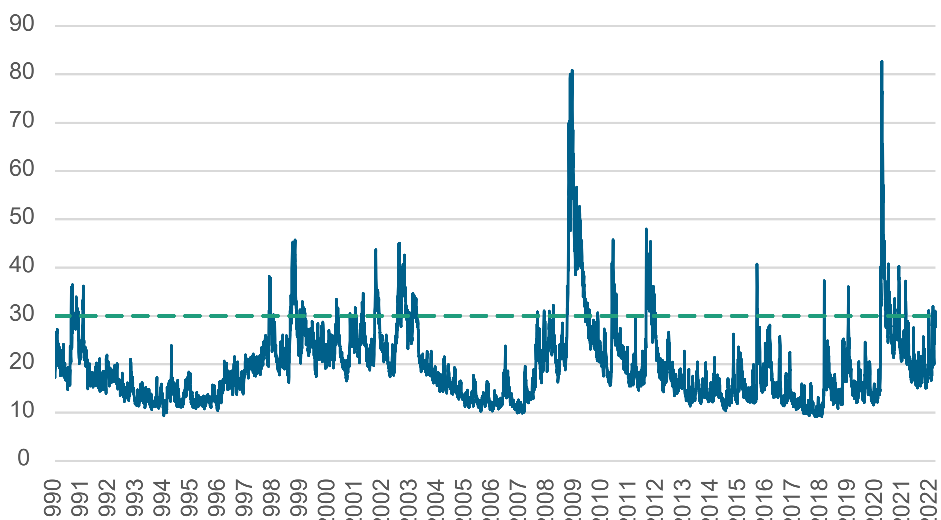
To help answer the question of what should investors do when volatility spikes, we looked at the history of daily price changes in the S&P 500 over the past thirty plus years (since 1990). We first divided the observations of daily S&P returns into two groups: 1) Days with heightened implied volatility levels, as measured by the VIX index.[1] We chose 30 as the VIX threshold since it represents the 90th percentile for the period, and 2) Other days, when the VIX fell below the chosen threshold.

Next, we analyzed the cumulative returns of the S&P 500 index over a subsequent period of up to 18 months, conditioned on the starting level of VIX. The results of this calculation are shown in Figure 3. For this historic period, the cumulative 18-month return when the starting level of VIX was above 30 (90th percentile)

> "we analyzed the cumulative returns of the S&P 500 index over a subsequent period of up to 18 months...

VIX: A 'Greed & Fear' Gauge for Equity Investors

(Fig. 2) Daily observations and 90th percentile threshold (1 Jan 1990 to 15 Mar 2022)



As of March 15, 2022.
Sources: Haver Analytics/Bloomberg Finance L.P. Analysis by T. Rowe Price.

[1] The Chicago Board Options Exchange's CBOE Volatility Index, or VIX, is a real-time index of the market's expectations for volatility over the coming 30 days, derived from option pricing. Many investors employ VIX to measure the general level of risk, fear, or stress in the market when making their investment decisions.

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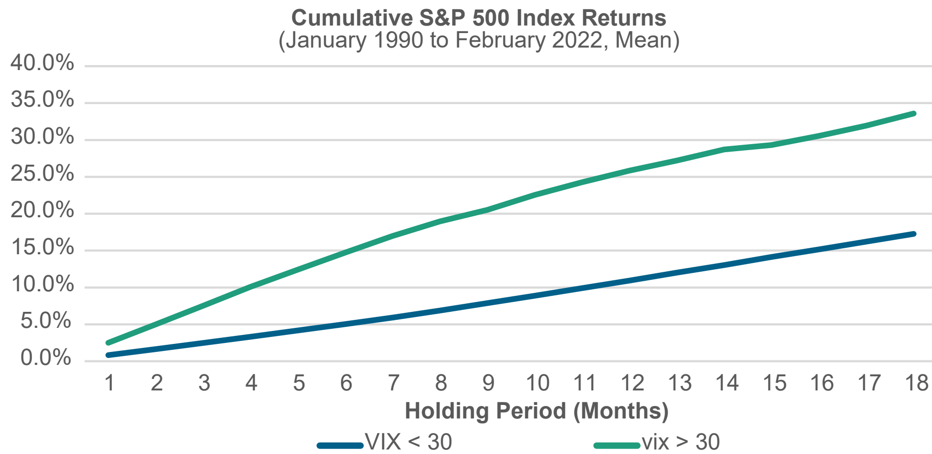
Cumulative S&P 500 Index Returns Over 18-months Based on VIX

(Fig. 3) Conditioned by starting level of VIX less than or greater than 30.



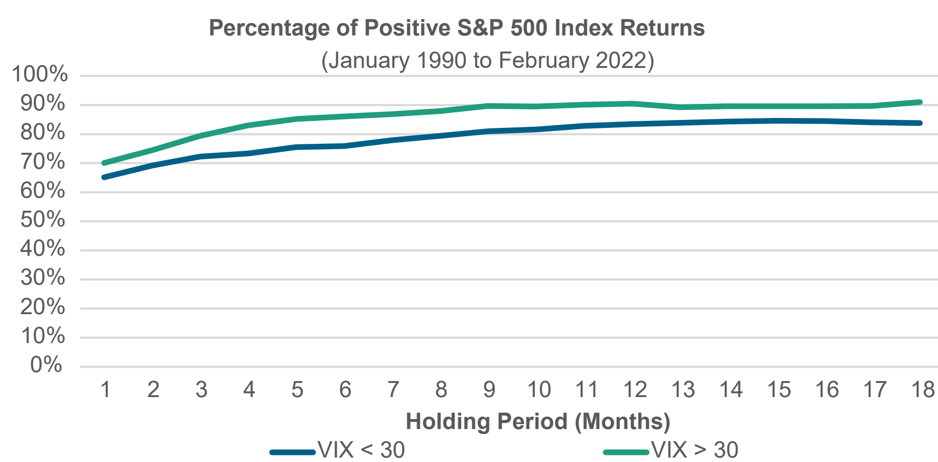
Past performance is not a reliable indicator of future performance.
As of March 15, 2022.
Sources: Haver Analytics/Bloomberg Finance L.P. Analysis by T. Rowe Price.

has on average been around double the return for periods when the starting point for VIX was below 30. Moreover, the probability of achieving a positive cumulative return over a 12-month period was over 90% when the starting point for VIX was above 30, while the probability was closer to 80% when the starting point for VIX was below 30 (Fig. 4).

Our analysis suggested that spikes in volatility did not make good sell signals. Returns tended to be above average in the 18 months following a spike in volatility since there is a natural tendency for markets to rebound, having become oversold during the correction. In our view, investors need to stay disciplined and not sell in a panic close to a market bottom. Those that do so often succeed

Probability of Achieving a Positive 12-month Return Based on VIX

(Fig. 4) Conditioned by starting level of VIX less than 30, or greater than 30.



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only in locking in their losses. Market timing is always difficult, even more so in periods of extreme stress and turbulence. An investor who sells and moves into cash may be late to re-enter the market. From another angle, periods with heightened volatility can potentially provide good longer-term entry points for investors, summed up in the phrase "Be greedy when others are fearful."

As mentioned in the introduction, it was the geopolitical tensions in eastern Europe following Russia's invasion of Ukraine that was one of the major factors behind the recent market turbulence. Does it pay to invest in periods when geopolitical tensions escalate? To answer this question, we employed a Geopolitical Risk Index (GPR) that was developed by Dario Caldara and Matteo Lacoviello at the Federal Reserve Board. Their GPR Index reflects the results of an automated text-search of the electronic archives of 10 newspapers, starting in 1985 and is shown in Figure 5.

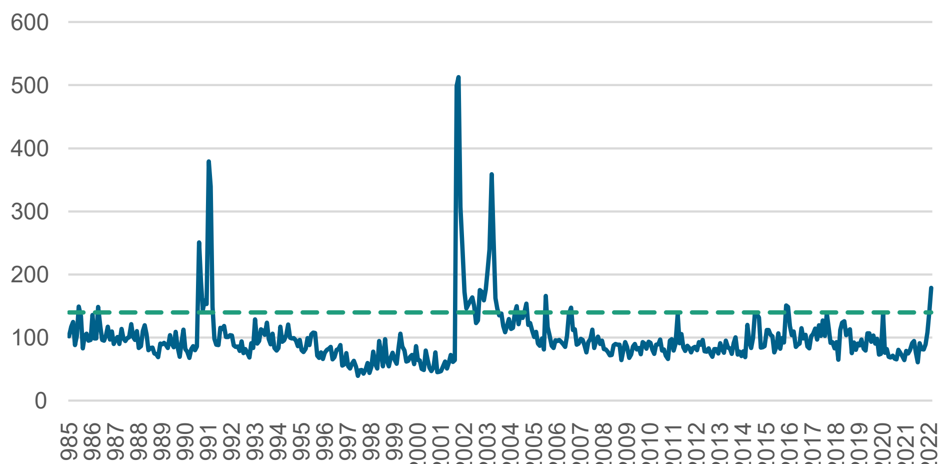
Similar to the treatment of the VIX analysis, we picked 140 as the threshold to partition the history as it represents the 90th percentile. However, on repeating the analysis of Figures 3 and 4 above, we didn't find historical evidence that heightened geopolitical risks can lead to strong forward returns. Thus, in our view, investors should pay more attention to surges in market implied volatility (VIX) rather than to geopolitical risks on a standalone basis, reflected by the volume of media discussions of Russia/Ukraine. We believe that the reason why periods with heightened geopolitical risk do not as a rule provide good entry points for investors is that few of us have an edge on the duration and severity of geopolitical developments, so it might not be wise to use a gauge of geopolitical risk as a market timing signal.

When Investing, Time Is Your Friend

While investors often tend to evaluate their financial success over a relatively short time frame, such as quarterly or annually, in practice their real investment horizon is typically much longer than that. As an investor, once you extend your time horizon to match your financial plan, then your potential deviation from the median outcome is likely to be reduced significantly. This is illustrated by Figure 8 which shows the 1-, 3-, 10- and 20-year average and median returns for the S&P 500, together with

Federal Reserve Board (FRB) Geopolitical Risk Index

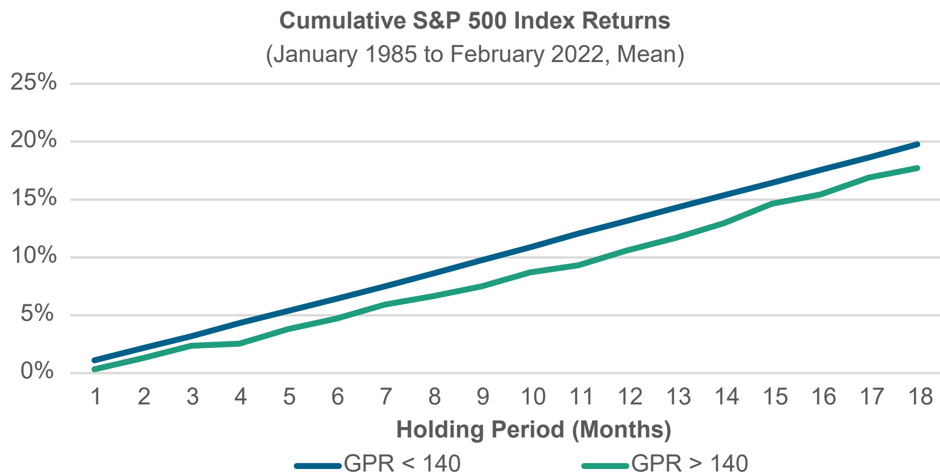
(Fig. 5) Daily observations and 90th percentile (1 January 1985 to 15 March 2022)



As of March 15, 2022.
Sources: Federal Reserve Board. Analysis by T. Rowe Price.

Cumulative S&P 500 Index Returns Over 18-months & FRB Geopolitical Risk Index (GPR)

(Fig. 6) Conditioned by FRB Geopolitical Risk Index less or greater than 140.



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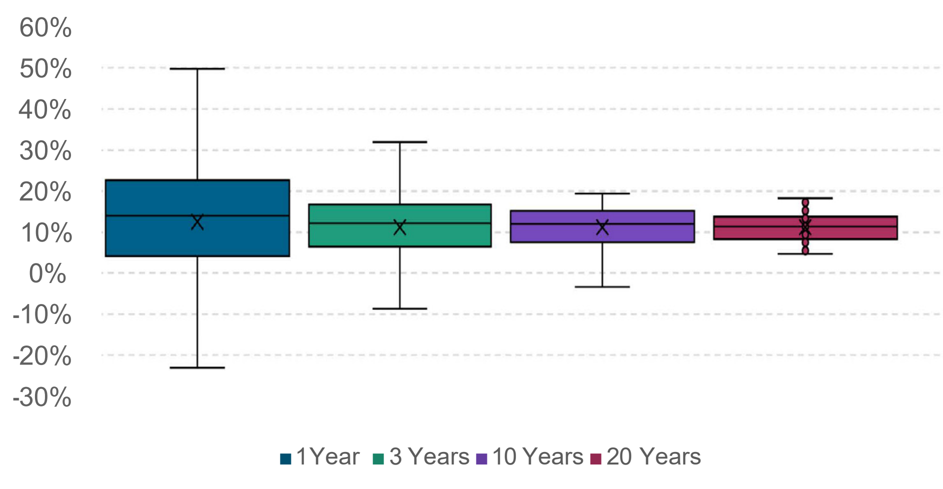
Sources: Federal Reserve Board. Analysis by T. Rowe Price.

Over Longer Investment Horizons Return Uncertainty Diminished

(Fig. 7) Average return (horizontal line) and median return (x) by holding period. Box equals +/- one standard deviation. Vertical line represents minimum and maximum return.



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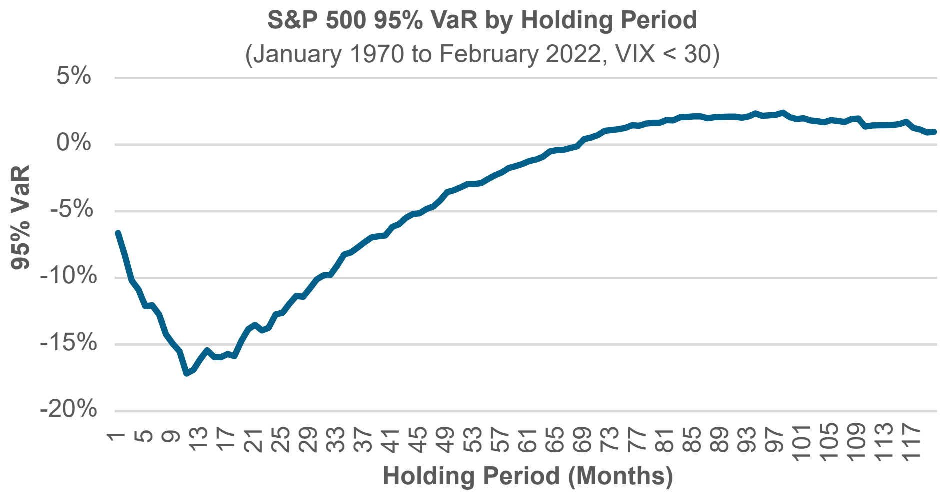
Sources: Haver Analytics/Bloomberg Finance L.P. Analysis by T. Rowe Price.

their standard deviation (represented by the height of the box), and extreme values (represented the vertical line). Merely extending the investment horizon from twelve months to three years is seen to reduce the uncertainty of future returns significantly. Longer investment horizons reduced volatility in investment outcomes.

> sitting tight and waiting for the market turbulence to pass may be a good option.

Risk of Losing Money Diminished With The Length of The Investment Horizon

(Fig. 8) S&P 500 95% Value-at-Risk (VaR) by Holding Period (in months)



As of March 15, 2022.
Sources: Haver Analytics/Bloomberg Finance L.P. Analysis by T. Rowe Price.

Finally, even when we focus on worst-case scenarios as measured by the Value at Risk at the 95% confidence level over various time periods (Figure 8), we can see that the risk of losing money via a large drawdown diminished as the investment horizon was lengthened.

Concluding Thoughts

We are living in a world with extreme outcomes arising frequently from multiple sources: worldwide healthcare crises, rising geopolitical and social tensions, deglobalization and hardening of spheres of interest, increasing wealth inequality, tightening monetary and fiscal policies, and elevated inflation pressures.

Earlier we asked the question "What should investors do to lower the risk of their portfolios during periods of market stress?" Our answer based on the above analysis is that for investors who can afford to take a longer-term view, sitting tight and waiting for the market turbulence to pass may be a good option. Rather than succumb to the temptation to engage in market timing with all its potential difficulties and pitfalls, a commitment to positive 'inaction' may be preferable. Remember that short-term events tend to have only a small impact on long-term returns. So we believe maintaining a strategic equity allocation rather than rushing to sell during each short-term market decline may be a better way to achieve long-term portfolio objectives.

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