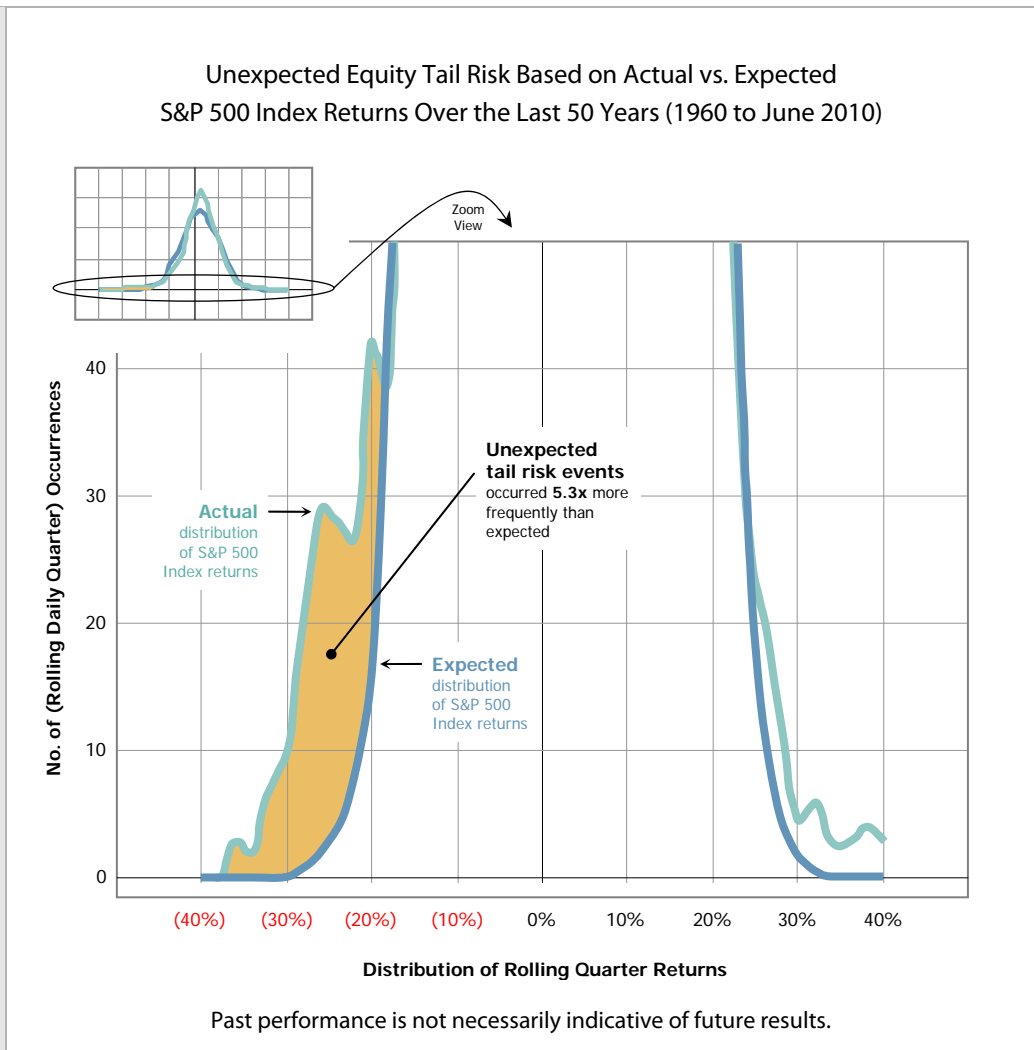


Tail Risk: About 5x Worse Than You May Think

After enduring the (40%) global equity market collapse of 2008, investors large and small are eager to reexamine the perils posed by equity market “tail risk” events. For our analysis into this topic, we examined 50-years of historical S&P 500 Index data and compared the actual tail risk frequency and magnitude to the expectations of a typical investor operating under modern portfolio theory. The difference between the two is surprising, and it suggests that investors have significantly underestimated tail risk frequency and severity.

The following chart plots a histogram of the S&P 500’s *actual* rolling compound 65-day returns (i.e., quarters), and the *expected* distribution of returns based on a normal distribution assumption with the same return and variance using standard Monte Carlo methods.

As the chart reveals, investors unaware of this asymmetric left-tail risk profile have persistently underestimated the inherent risks of the stock market.



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What Is Tail Risk?

“Tail risk” or “left-tail risk” refers to an investment’s most extreme downside performance periods. Most notably, these events *exceed* expectations of frequency, duration, and/or magnitude of losses for which an investor has planned or for which the investor is being compensated. These unexpected and uncompensated risks cause harmful wealth destruction and capital shortfalls. For this reason, it is vital that investors develop a realistic assessment of an investment’s true tail risk probabilities.

The underlying mechanism of all tail risk performance periods, whether in equities or other asset classes, is an asymmetry of investor demand that leads to excessively fast and/or consistent flows of capital. These capital flows may move from one asset class to another, from one sector within an asset class to another, from one economy to another, or to some degree all of the above simultaneously. Examples are many. Capital may leave equities and run to the safety of bonds, triggering an excessive fall in stock prices. Capital may run from low quality credit to high, from long duration to short, or from the Euro to the dollar in a serial or momentum-driven fashion.

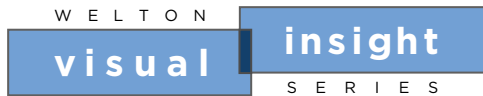
Importantly, the timing and magnitude of these capital flow events is difficult to predict. These movements may occur very rapidly, and just as suddenly the same market may quickly stabilize as investor demands equalize. What will be the next cause? It cannot be predicted reliably. Will the next “credit flight” or “flight to quality” be a “flight from sovereignty?” No one knows. While predictions make good theater, investors should acknowledge the challenge of accurately predicting these unavoidable occurrences, while simultaneously designing better compensations for the realistic risks they have assumed.

Why Examine Expected and Actual Return Distributions for the S&P 500?

For our analysis, we examined not only *actual* S&P 500 tail risk events over the past half-century, but we also modeled investors’ *expectations* as well. Why?

Many investors assume equity market returns conform to a symmetric, bell-shaped (or “normal”) distribution curve. In fact, many commercially available asset allocation software packages make a similar assumption. This assumption translates into a sense that equity markets reliably drift higher over time, and that extreme highs and lows generally balance out because they occur with equal frequency. Given this assumption’s prevalence, we felt it was important to model this scenario as well. To do this, we created an “Expected”

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return distribution for the S&P 500 Index using standard Monte Carlo simulation methods based on a normal distribution assumption with inputs derived from actual S&P 500 data for the previous 50-years.

We also plotted the “Actual” distribution of returns for the S&P 500 over the same period, and as the chart reveals, equity returns *do not* conform to the expected bell-shaped return distribution. Instead, the S&P 500’s returns are asymmetrically weighted to the left-tail side – in other words, the frequency and magnitude of severe downside periods is significantly higher than investors may expect.

Why Do Markets Disproportionately Penalize Investors on the Downside?

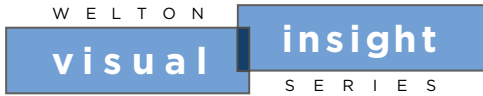
First, it is worth establishing that the equity market’s tail risk signature is both well-known and persistent over time. Our analysis is not anomalous, and is easily replicated using any reasonably long period of historical market data. Second, it is also worth noting that this “tail risk” effect is not just confined to the S&P 500, nor is it confined to equities exclusively. Rather, this phenomenon is seen widely across capital markets and real assets.

The next question, of course, is “why?” What is the underlying reason for this enduring phenomenon? Much of the answer can be traced to investor behavior itself. There is simply a recurrent asymmetry in investor demand for income, capital appreciation, and safety that has been cataloged and described for centuries. If capital flows can be viewed as currents on a vast open economic sea, these flows are ever-changing. Investor demands are continually buffeted or carried by changing currents in liquidity demand, inflation, and political stability both absolute and relative to other economies to name only a few. For example, a commonly cited asymmetry is that investors consistently respond more swiftly and in greater numbers to bad news than good. Think about fear-driven “flight to quality” moves causing capital stampedes to safety. By comparison, bull markets tend to rise more gradually, and so upside tail occurrences are comparatively less frequent.

What’s the Cost of Failing to Mitigate Equity Tail Risk Exposure?

Even those investors who are familiar with the notion of excess left-tail risk almost always underestimate its frequency and severity, and these estimation errors can have a very significant impact on investment returns. For example, a single outsized loss event in the range of 20-30%, which is far less than occurred during 2008-2009, can erase several years of planned investment growth and permanently reduce an investor’s expected

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long-term performance, whether for pension retirement payouts, private wealth accumulation or charitable resource growth.

Looking back over 50-years of data stretching back to 1960 through June 2010, our analysis suggests that the average investor encountered severe rolling quarterly losses 5.3x more frequently on average than they would have expected. Viewed over the course of an average decade, investors would have expected about 6.5 such tail events, whereas actual S&P 500 performance consisted of 34. These results suggest that the average investor, or the software code embedded within their asset allocation software, may be harboring unrealistically favorable expectations about the true nature of equity market tail risk probability.

The following table shows that severe rolling quarter losses occurred 5.3x (169÷32) more frequently than expected.

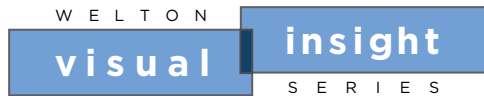
| Severe Quarterly Losses | No. of Quarterly Occurrences | | |
|-------------------------|------------------------------|--------------------------|-------------------------------|
| | Actual S&P 500 Returns | Expected S&P 500 Returns | Unexpected Tail Risk Events * |
| (20%) | 42 | 17 | +25 |
| (22%) | 27 | 8 | +19 |
| (24%) | 28 | 4 | +24 |
| (26%) | 29 | 2 | +27 |
| (28%) | 20 | 1 | +19 |
| (30%) | 10 | | +10 |
| (32%) | 7 | | +7 |
| (34%) | 2 | | +2 |
| (36%) | 3 | | +3 |
| (38%) | | | |
| (40%) | 1 | | +1 |
| Total | 169 | 32 | +137 |

*Visually depicted as the gold region in the chart on page 1.

Actual frequency of severe losses occurred **5.3x** more frequently than expected.

Past performance is not necessarily indicative of future results.

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How Can Investors Mitigate Equity Tail Risk?

There are at least three actionable remedies that investors can begin considering to mitigate equity tail risk. We will call them *pay*, *refine*, and *harness*.

“Pay” – Counter Equity Tail Risk Using Active Hedging Tactics

One approach is to pursue an active hedging strategy to surgically mitigate the risk inherent with long-only equity Beta. For example, investors may choose to: buy “insurance” in the form of a VIX index or other volatility-based product; purchase puts in an ongoing overlay; or engage in customized swaps. These and other active hedging techniques act to transfer excess risk to a counterparty willing to charge the investor for accepting this risk. Because there is no free lunch with risk transfer to sophisticated counterparties, the obvious downside is that this is expensive, not only because of profit margins on the hedges but because the risks themselves are significant. Other downsides to the active hedging option include complexity, the introduction of exogenous counterparty and calculation risks, and the fact that these strategies have a long-term cost, especially during benign market conditions.

“Refine” – Diversify One’s Long-Only Equity Exposure with “Active Equity” Hedge Funds

A second approach is to exchange long-only equity exposure for “active equity” hedge fund exposure. Here, we define “active equity” hedge fund styles to refer to the composite performance of most broad hedge fund indices, or as the composite performance of those styles with historically high equity Betas such as long/short equity or event driven. The merits of diversifying among “active equity” managers can be seen by reviewing historical hedge fund indices. These statistics reveal that over the long-term these managers have delivered equity-equivalent returns, but with approximately half the volatility and drawdown of the broader markets.

These managers are still drawing much of their performance from underlying equity market return drivers as noted by their high Betas and correlations, but they are doing so in a more refined and risk controlled fashion. One reason for this ability is because these managers are not rigidly bound to broad equity market benchmarks. This grants them useful discretion to both mitigate risk and capitalize on opportunities. For example, long/short managers may choose to stay in cash during treacherous market conditions. They may even be able to profit from market declines due to their ability to go short as well as long. By comparison, long-only equity fund managers too often bear the burden of dual objectives: benchmark adherence, and performance. This conflict imposes perverse incentives, such as being fully invested in markets with few

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opportunities for fear of style drift, while rarely demonstrating the requisite manager alpha to overcome their management fees.

“Harness” – Add Multi-Asset Strategies That Can Harness Returns from Excess Capital Flows

The two remedies above share a common focus on mitigating equity tail risk by either countering or refining equity Beta. The unspoken premise in both cases is that equity Beta remain the cornerstone of portfolio construction for capital appreciation. However, another actionable remedy is to broaden one’s sources of capital appreciation to include investment strategies that generate returns differently, strategies capable of harnessing the excessive and extended capital flows themselves, the same recurrent capital flow mechanism that, in excess, creates “tail risk” periods.

A handful of investment strategies, including managed futures and global macro, specialize in capturing returns from excessively strong, fast or sustained capital flows, whether moving between asset classes or among segments within asset classes. These two strategies are uniquely suited to this task because they are multi-asset strategies, i.e., they invest across all major asset classes where capital flows: equity indices, commodities, interest rates and currencies. They also employ a deep variety of investment strategies and seek opportunities across a wide range of investment timeframes.

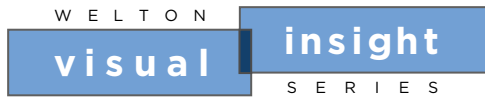
These strategies are well suited to mitigating equity tail risk because during periods of severe or prolonged equity market stress, these strategies demonstrate *increasingly negative* correlations to the wider markets. In addition, unlike the active hedging techniques previously described (i.e., *pay*), these strategies have strong positive and risk-adjusted return expectations. Unlike the active equity remedy (i.e., *refine*), these strategies have no underlying correlation or reliance on equity Beta, making them true portfolio diversifiers.

Conclusion

Even just a few excess risk events, or “tail risks,” can have a profound impact on wealth creation during an investor’s lifecycle. In the presence of realistic volatility and tail risk events, investors expecting 8% returns per year could very easily achieve compound returns of only 4-5% per year after decades of real world experience. The compounded difference between these two is staggering, as are the implications of shortfalls. Proactive mitigation of equity tail risk is a proven technique for increasing the likelihood that investors, consultants and wealth advisors will be successful in achieving their targeted expected returns.



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Contact

California | New York
+1 (831) 620-6607
inquiries@welton.com

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