

The Shape of Things to Come

The Value of Non-Normal Distributions



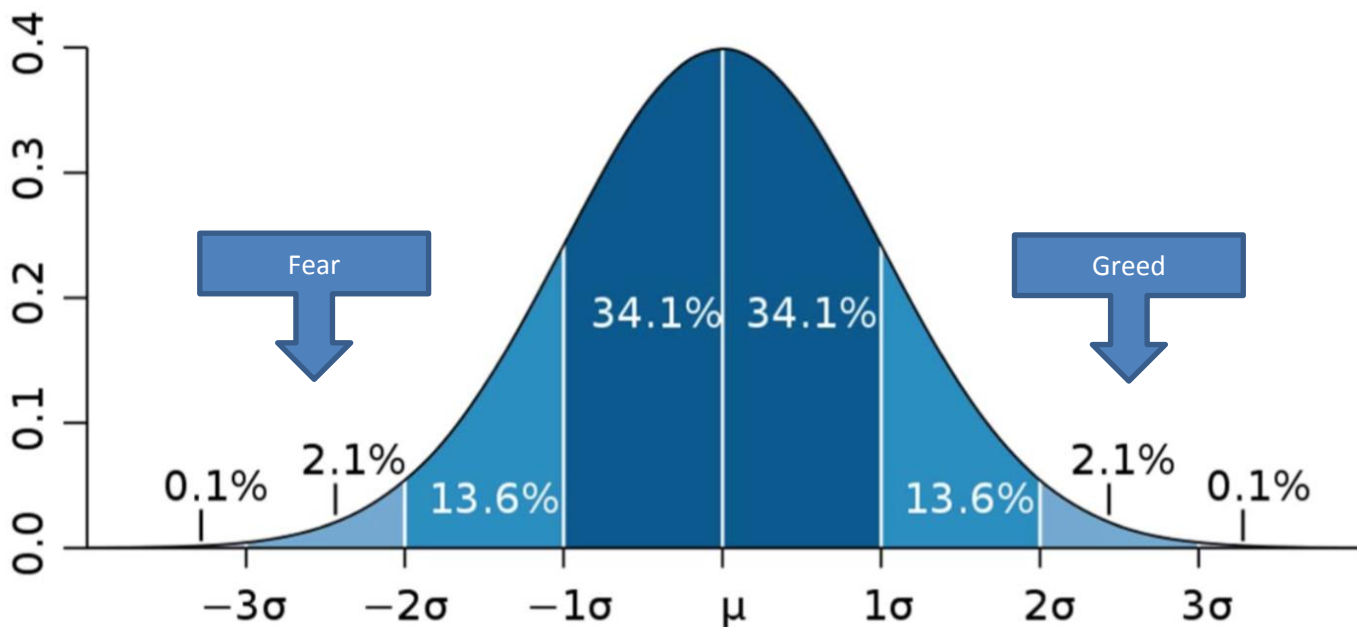
In this, the fourth and final post on our series on the mathematics of investing, we discuss **distribution of returns** and how investors react to “tail” events.

Everything we discussed in the previous posts in our Math Matters series, “Compound Growth”, “The Importance of Avoiding Large Losses”, and “Volatility Is a Drag”, culminates with this post on the shape of the distribution of returns.

In the image below we see the textbook definition of a normal, Gaussian distribution. Most of the occurrences fall near the mean value, while a few data points occur far from the mean. If a set of data over a long period of time falls into this pattern, then we can make assumptions about future occurrences with a high degree of accuracy.

However, in the real world two unfortunate facts collide with this theory and are impediments to an investor’s long-term success:

1. When these tail events do occur, investors tend to make poor choices,
2. Actual market returns do not fit the nice, clean, symmetric layout of the normal distribution.



Source: Wikipedia

It is often said that two things drive the market: fear and greed. That might not be true all of the time, but it does appear to be true when markets are at their extremes. A recent study by DALBAR found that the average investor did much worse than the broad market. Moreover, the biggest gaps in underperformance tended to happen when markets were experiencing “tail” events.

TOP 10 MONTHS WITH THE MOST ACUTE UNDERPERFORMANCE

Rank	Month	S&P 500 Return	Average Equity MF Investor Return	Underperformance
1	October, 2008	-16.80%	-24.21%	-7.41%
2	March, 2000	9.78%	3.72%	-6.06%
3	October, 1987	-21.54%	-26.87%	-5.33%
4	January, 1987	13.47%	9.35%	-4.12%
5	August, 1998	-14.46%	-18.47%	-4.01%
6	September, 2008	-8.91%	-12.75%	-3.84%
7	November, 2000	-7.88%	-11.33%	-3.45%
8	April, 1997	5.97%	2.75%	-3.22%
9	November, 1997	4.63%	1.48%	-3.15%
10	July, 1989	9.03%	5.91%	-3.12%

Source: "Quantitative Analysis of Investor Behavior, 2015," DALBAR, Inc. www.dalbar.com

Anyone with market experience will recognize the culprits: panic selling in a bear market, chasing after "hot" stories in a bull market, selling low and buying high...all of these are quantified in the above table. And in the previous posts on the mathematics of investing, we've seen how hard it is to overcome these mistakes once they happen. Sadly, investors are often their own worst enemy.

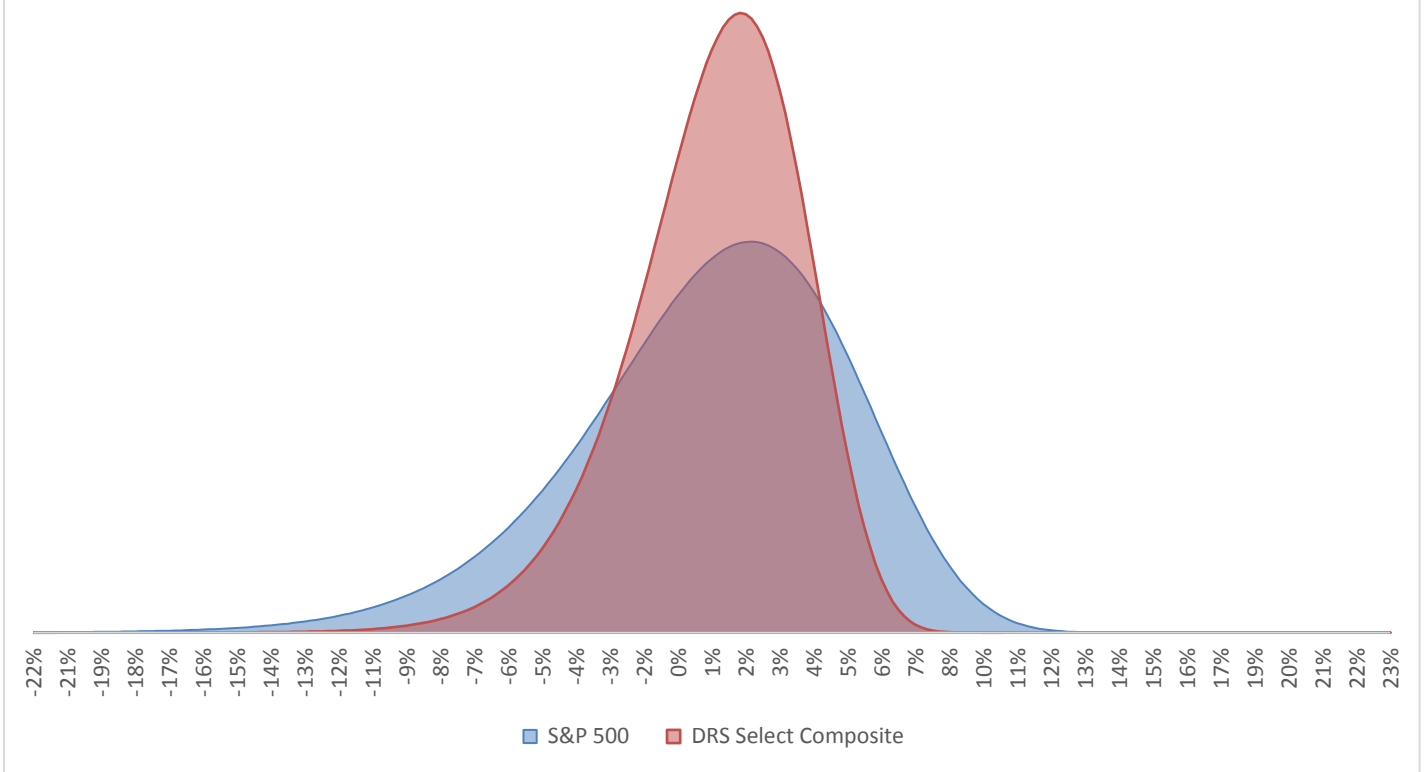
The second issue is that actual market returns don't fit the idealized normal distribution.

In this illustration below, we see the return distribution for the Swan Defined Risk Strategy, as represented by the Select Composite, superimposed over that of the S&P 500 for the period July 1997 to December 2015.

It has two characteristics that mark its deviation from the normal distribution:

- 1) the S&P 500 has negative skewness, meaning the left-hand, negative tail is more extreme than the right-hand, positive tail; and
- 2) the distribution has positive excess kurtosis, meaning that the volatility that does occur tends to be driven by those extreme market events.

Swan DRS & S&P 500: July 1997 - Dec 2015



Source: Swan Global Investments

We see how the DRS has effectively minimized the impact of the tail events by pushing more of the observations towards the mean. While a distribution like this might be called “safe and boring” by some, we believe these types of results are best suited for long-term success.

In this post and the previous posts in this series we have established that extreme losses and high volatility are harmful to investors from both a mathematical as well as a behavioral standpoint. And yet in the graph above we see that the actual market conditions are worse than what would have been predicted by a “normal” distribution.

Faced with these challenges, how should investors proceed?

At Swan Global Investments, we would argue that these problems are best avoided by implementing a strategy that seeks to reduce the impact of the tails and volatility as much as possible. If returns could be moved from the tails of the distribution to the middle range of the distribution, the investor would be better off.

Across these four blog posts, and our white paper “[Math Matters: Rethinking the Math Behind Investment Returns](#)”, we established four key points to achieving better investment results over time. They are:

1. The importance and power of compounding
2. The value of avoiding large losses
3. The importance of variance drain
4. The value of a non-normal distribution of returns

Moreover, as an investment strategy the Defined Risk Strategy was meant to be a manifestation of these principles.

The DRS should be viewed as a long-term, strategic solution and one that we believe has the best chance of helping investors stay invested and reach their goals over time.

To learn more about Swan’s [Defined Risk investment approach](#) or for more details regarding [historical performance](#) utilizing put options to hedge a portfolio since 1997, please contact Swan at 970-382-8901.



About the author:

Marc Odo, CFA®, CAIA®, CIPM®, CFP®, Director of Investment Solutions, is responsible for helping clients and prospects gain a detailed understanding of Swan’s Defined Risk Strategy, including how it fits into an overall investment strategy. Formerly Marc was the Director of Research for 11 years at Zephyr Associates.

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