

# Leveraged ETFs

Our quantitative strategy at Cumberland Advisors is a trading model that combines fundamental indicators and quantitative analysis into a binary output – either fully invested or all in cash. The strategy trades the S&P 500 in two versions: unleveraged and leveraged. Specifically, the leveraged portfolio uses a leveraged ETF as our vehicle to track 3X the market movement. As many may wonder whether one should use a leveraged ETF, we would like to express our opinions on leveraged ETFs today.



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First, what is a leveraged ETF? It is simply an ETF using derivatives and debt to track and amplify the return of an index. However, a leveraged ETF does not expose investors to traditional margin risk; rather, investors just pay the ETF cost. A leveraged ETF resets each day and targets to track an index's daily movement. A leveraged ETF is usually considered a trading tool. It is typically held for less than a week at most, and oftentimes just daily. Investors are generally told not to buy and hold this type of security due to "time decay," a term that is often misused when applied to leveraged ETFs. Time decay is a term used to describe the loss of value of an option as time approaches the expiration date. However, leveraged ETFs are not subject to option expirations. What

“time decay” really refers to, in connection with leveraged ETFs, is the compounding effect. For example, if the market went up 10% on day 1 and went down 10% on day 2, one would lose 1% at the end of day 2; with 3X leverage, one would go up 30% on day 1 and down 30% on day 2, being left with a 9% loss at the end:

$$1 - (1+0.1) \times (1-0.1) = 0.01 \quad (1)$$

$$1 - (1+0.3) \times (1-0.3) = 0.09 \quad (2)$$

Time has nothing to do with the math above. It is compounding that magnifies the leveraged number. In other words, anything that increased 30% and then decreased 30% would have the same outcome regardless of leverage. Imagine that equation (2) represented a scenario where the market went up 30% on day 1 and down 30% on day 2 – one would be left with 9% loss without any leverage or so-called “time decay” effect. Another example: If the market dropped 1% a day for 10 consecutive days, one would suffer a 9.56% loss, while the loss would be 26.26% with 3X leverage:

$$1 - (1-0.01)^{10} \approx 0.0956 \quad (3)$$

$$1 - (1-0.03)^{10} \approx 0.2626 \quad (4)$$

Again, the math demonstrates that time is not the reason for the significant difference; compounded return is the master behind the scene. To understand the power of compounding, let’s take a look at a famous motivational poster that some people have as their desktop – if you improve just 1% a day, you will be much better in a year:

$$1.01^{365} = 37.8$$
$$0.99^{365} = 0.03$$

Chart 1. 1% a day difference

Now that we have clarified the mathematical misconception, let's dig into the more important question: Should one buy and hold leveraged ETFs? The chart below compares the 3X leveraged ETF SPXL against the benchmark S&P 500.

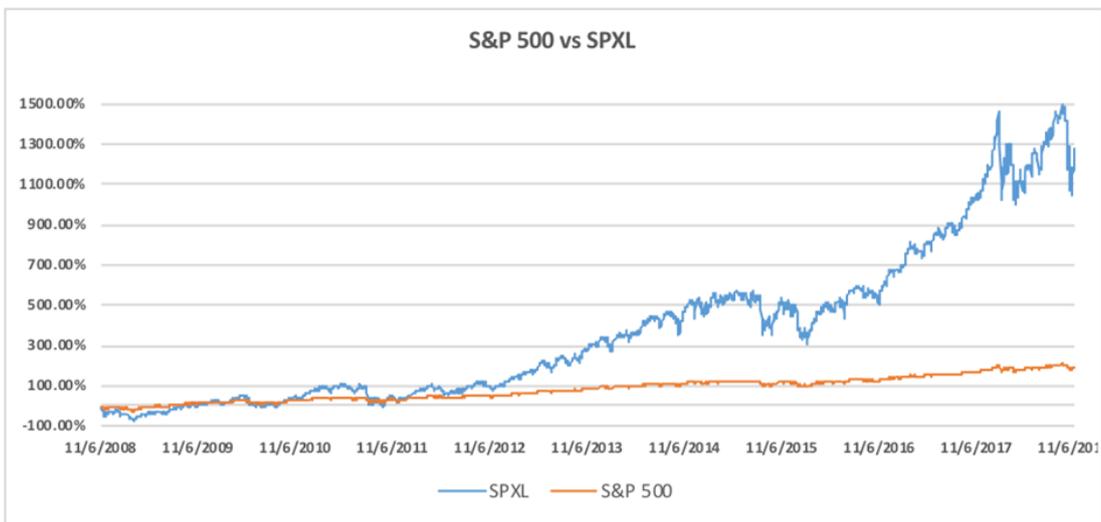


Chart 2. S&P 500 vs. SPXL, 11/5/2008–11/9/2018. Data source: Bloomberg

Clearly, the 3X ETF has substantially outperformed the S&P 500 since its inception on November 5, 2008. However, not every investor would have had the stomach for the volatility that was experienced along the way. Leverage can be a powerful tool to take advantage of a bull market if used properly, but one must possess extensive risk management skills. At Cumberland Advisors, we prioritize risk control by keeping our focus on risk-adjusted returns.

If you are interested in obtaining information about our quantitative strategy, please email me.

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# Causality

On day 1 our econometrics professor warned us to be careful with correlation: A strong correlation doesn't necessarily mean causality. This is the case with the VIX. It's closely related to the S&P 500 with a negative correlation, but the relationship may not be causal. I will never forget the example our professor gave us: The number of people who have drowned by falling into a swimming pool, it turns out, is highly correlated with the number of movies Nicolas Cage has filmed. Unlike school vending machines that can be causally linked to childhood obesity, Nicolas Cage didn't need a scientific study to prove his innocence.

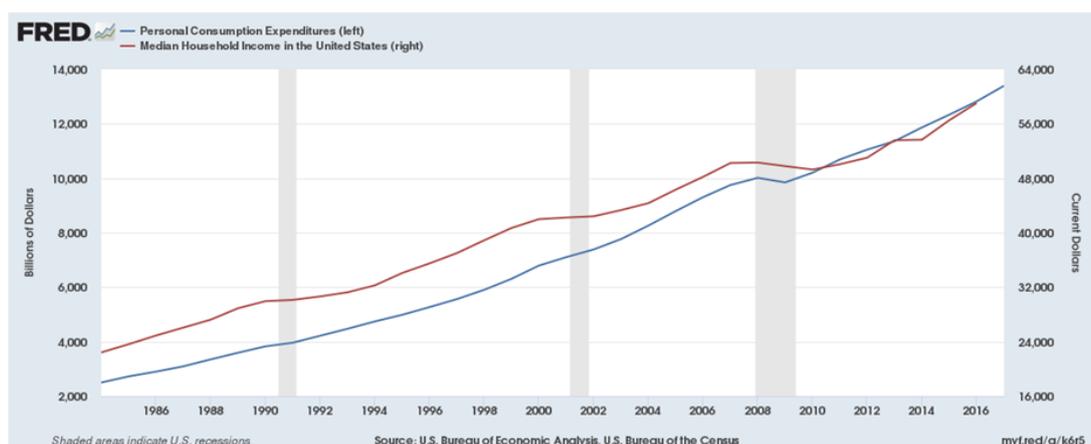
However, investors sometimes mistakenly assume causality between seemingly related events. If a rise in VIX is accompanied by some down days in the stock market, did the VIX cause stocks to fall? To answer this question, we need to know how the VIX is calculated. The VIX uses factors from the options market, one of which is the observed forward index price calculated by out-of-the-money options in the short term. But this correlation calls for caution about endogeneity: The VIX is derived from traders' perceptions about the future, but actual futures prices also affect traders' perceptions. How can we be sure that the VIX causes stock price to change? If anything, VIX is more likely the effect than the cause in this relationship. Analogously, the more firemen are sent to a fire (effect), the bigger the fire is (cause). From the perspective of future perceptions, VIX appears more likely to correspond to the firemen who respond to the fire in numbers according to its size than to the fire itself.

What is causation as opposed to correlation, then? Here's an example of causation: Consuming alcohol can cause a hangover the next morning. Unfortunately, causality is not as easy to identify in finance as it is in the case of having too much to drink. Oftentimes, what appears to be causation turns out to

be just correlation. But why is causation so important for investors? The reason is simple: If a variable can cause stock prices to change, then it is a predictor. Who wouldn't like to know tomorrow's stock prices? If we have causation, we have a way to anticipate what's coming. Why is it so difficult to identify a causal relationship? It is not because there is a limited supply of crystal balls; instead, the stock market is too complex. The stock market is sensitive to all information pertaining to the future. Therefore, it's not just one variable but many that affect the stock market. Those variables can be as simple as some new product or quarterly earnings, or more intricate ones such as a tax bill or an interest rate change.

At this point we seem to be mired in a paradox: If there are so many factors that can cause stock prices to change, why is it so difficult to identify one? The answer once again falls upon the complexity of the market. Investors and financial engineers have studied the stock market extensively. Although there have been many models, such as the Fama-French three-factor model, created to attempt to explain stock prices, unfortunately, no model yet invented captures the complex interactions of the stock market. This limitation makes it extremely difficult to test any variable against the so-called benchmark. Currently, one of the most-used ways to mitigate this problem is to test one variable at a time against a bundle of existing factors. Nevertheless, our modern research methodologies still only allow us to conclude with a probability rather than certainty. To complicate matters further, the stock market is dynamic. This challenges any model used to predict the stock market. In other words, a factor may have a causal relationship with the stock market at a certain time but not at all times. The explanation is straightforward. If a factor were known to cause stock prices to change, then investors would use that factor repeatedly. By Goodhart's Law, that factor would not be rendered ineffective over time.

Finally, the key difference between causation and correlation is simple. Causation means A happens before B, while correlation suggests A and B both happen at the same time. Let's use the figure below, for instance. By rule of thumb, household income is likely to lead personal expenditures, which may explain why there is a slowdown in income preceding each decrease in expenditures.



*Personal Consumption Expenditures and Median Household Income in the United States. Source: St. Louis Fed.*

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