Trend, Volatility, and Returns
D. Weilmuenster

Section I

Exchange Traded Funds (ETFs) have grown rapidly in the past few years to become some of the most prominent trading vehicles. This phenomenal growth is apparent not only in the number and breadth of countries, industries, and commodities that ETFs cover, but also in the diversity of styles of ETFs available to investors and traders. By "styles", I mean primarily those inverse and leveraged ETFs that enable traders to open straightforward long positions to profit from expected declines in various markets, or to multiply market returns without the explicit use of margins in traders' individual accounts. This article will illustrate answers to four important, and commonly asked, questions regarding the long term performance of inverse and leveraged ETFs by using the actual returns of 12 inverse and leveraged ETFs associated with six different major indices (three for sectors, three for broader markets).

It's important to understand these answers because the new opportunities presented by inverse and leveraged ETFs have been accompanied by confusion regarding their long term returns in comparison to their stated performance objectives. Almost all such funds state those objectives in terms such as "seeks daily investment results, before fees and expenses, that correspond to twice (200%) the daily performance of the S&P 500® Index"[1] or "seeks daily investment results, before fees and expenses, of 300% of the inverse (or opposite) of the price performance of the Russell 1000® Financial Services Index ("Financial Index")."[2]

Naturally, the mind tends to focus on the leverage factors in these statements. But, the objectives are not guarantees of performance, and there is also that little phrase "before fees and expenses" to consider. And, most importantly, the funds' objectives apply to daily performance, not to longer term returns over a month or a quarter. The remainder of this article focuses on the impact of this last point.

Before diving into the effects of leverage on long term ETF performance, however, let's step back for a moment to understand how daily returns, and the volatility of those daily returns, combine to determine compounded returns over an extended period. Leverage will simply magnify the effect of these basic factors.

We'll start by taking a look at the returns of some selected stocks over the market's most recent run from 2009-03-06 through 2009-05-08. In Table 1, stocks are first grouped according to their Average Daily Return and then sorted from lowest to highest

[1] SSO, from ProShares: http://www.proshares.com/funds/sso.html

[2] FAZ, from Direxion: http://www.direxionshares.com/etf/fbe_3x_shares.html

Volatility[3] within each group. Average Daily Return and Volatility are calculated over the 44 trading days from Mar-06 through May-08.

In every case but one[4], *increasing volatility* at a fixed average daily return yields a *lower long term return* (the return from 2009-03-06 through 2009-05-06). This is true regardless of (1) whether the trend for a stock is up (positive average daily return) or down, (2) the industry of the stock, or (3) the trend of the overall market.

This is not a coincidence. It follows directly from the compounding of variable (volatile) returns over an extended period of time. We're all familiar with the fact that losing 10% on a stock one day, and gaining 10% the next, does not return the position to breakeven. Instead, it will be down by 1% (0.90*1.10 – 1). Higher volatility means that a stock will experience more of these "compounding deficits" which will either dampen upward trends, or sharpen downward trends.

Symbol	Name	Average Daily Return	Volatility of Daily Return	Return 2009-03-06 – 2009-05-06
RT	Ruby Tuesday Inc (Ga)	5.46%	11.10%	736.84%
TEN	Tenneco Inc	5.46%	13.60%	627.91%
BRY	Berry Petroleum Co Cl A	2.89%	6.19%	224.39%
GIFI	Gulf Island Fabrication	2.89%	6.52%	220.04%
WYNN	Wynn Resorts Ltd	2.89%	7.92%	208.18%
PENX	Penford Corp	2.89%	10.29%	184.62%
AZZ	Azz Inc	1.58%	4.33%	91.65%
MGA	Magna Internat Inc	1.58%	4.40%	91.75%
PENN	Penn National Gaming Inc	1.58%	4.69%	90.46%
GNA	Gerdau Ameristeel	1.58%	6.02%	84.27%
ZUMZ	Zumiez Inc	1.58%	6.18%	83.83%
LYV	Live Nation Inc	1.58%	6.97%	79.58%
UMPQ	Umpqua Holdings Corp	1.58%	7.81%	75.25%
DF	Dean Foods Company	-0.14%	2.81%	-7.71%
HRS	Harris Corporation	-0.14%	3.25%	-8.05%
SSW	Seaspan Corp	-0.14%	7.34%	-18.70%
APEI	American Public Education Inc	-0.26%	3.48%	-13.18%
BKC	Burger King Holdings Inc	-0.26%	3.98%	-14.14%

Table 1 Long Term Returns with Constant Average Daily Return

[3] "Volatility" here is the Standard Deviation of Daily Returns, which is slightly different from another view of volatility called Historical Volatility. If statistics isn't your native language, http://en.wikipedia.org/wiki/Standard_deviation is a brief, useful explanation of Standard Deviation.

[4] The one exception is AZZ, and it's a very slight deviation from the rule, probably from rounding errors.

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How do long term returns compare for stocks that have the same volatility, but different average daily returns (trend)? It's not surprising that *long term returns increase with higher average daily returns*. But, intuition might not predict that this is true *even if volatility is large compared to the average daily return*. See Table 2 for selected stock results that illustrate this rule, again for 2009-03-06 through 2009-05-08.

Symbol	Name	Average Daily Return	Volatility of Daily Return	Return 2009-03-06 – 2009-05-06
NU	Northeast Utilities	0.14%	1.57%	6.00%
UNS	Unisource Energy Corp	0.17%	1.57%	7.05%
JNK	SPDR Lehman High Yield Bond ETF	0.56%	1.57%	27.12%
ERC	Evergreen Managed Inc Fd	0.56%	1.57%	27.20%
MKC	McCormick & Company Inc	0.06%	2.01%	1.88%
THS	TreeHouse Foods Inc	0.14%	2.01%	5.42%
PG	Procter & Gamble Co	0.29%	2.01%	12.82%
ATK	Alliant Techsystems Inc	0.76%	2.01%	38.15%
EPIQ	Epiq Systems Inc	-0.18%	3.10%	-9.44%
VOD	Vodafone Group Plc	0.29%	3.10%	11.04%
CB	Chubb Corp	0.35%	3.10%	14.41%
VRX	Valeant Pharmaceuticals	0.41%	3.10%	17.35%
STE	Steris Corp	0.60%	3.10%	27.56%
SGP	Schering-Plough Corp	0.66%	3.10%	30.86%
E	ENI SpA ADS	1.01%	3.10%	52.33%
TKTM	Ticketmaster	1.46%	6.22%	74.30%
ATAC	Atc Tech Corp	1.84%	6.22%	106.25%
CVI	CVR Energy Inc	1.86%	6.22%	106.44%
WCG	Wellcare Health Plans Inc	2.74%	6.22%	203.46%

Table 2 Long Term Returns with Constant Volatility

Although the above examples are useful to develop a "feel" for the independent effects of average daily returns (trend) and volatility over long timeframes, in the real world both factors change simultaneously, and continuously. How do they then interact dynamically to produce long term returns?

There is a simple equation that combines these two variables to estimate the answer with a high degree of accuracy over a wide range of market conditions. *The equation does not forecast returns. It explains, or estimates, the return over a chosen timeframe based on the average daily return and volatility over that same timeframe. It is an estimate because it sacrifices some accuracy by using a couple of assumptions to simplify the math.* I won't bore you by deriving the equation here, but it requires little more than high school algebra and knowing how to calculate volatility.

Instead, let's build confidence in the equation by comparing its estimate of returns to over 1,400 randomly selected actual stock returns from 2003 through 2008. The returns are measured over 63 trading days, one quarter of the year. Figure 1 graphs the actual

returns versus the estimates, and shows a high level of agreement between the two. (The blue line shows where all of the points would fall if the estimate were 100% correct.) The estimate and actual values begin to diverge only at very extreme long term returns, low and high.

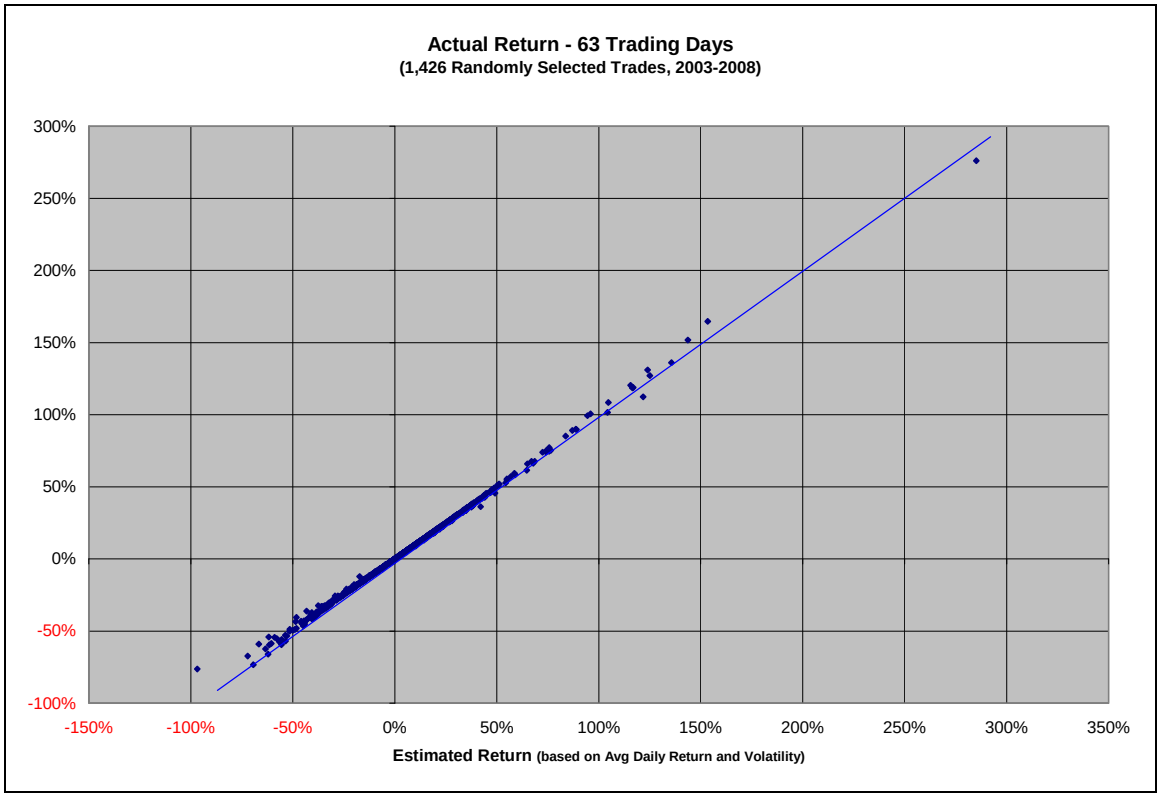

Figure 1

So far, we've seen that understanding the long term (compounded) return of a traded instrument requires us to consider both average daily return, and the volatility of those returns. We've explored the independent effect of each factor, and shown that it's possible to combine both factors into a single equation to estimate long range performance accurately over widely varying market conditions, e.g., from 2003 through 2008.

In subsequent sections of this article, we'll use an adaptation of this estimator to study several interesting questions regarding the long term returns of inverse or leveraged ETFs.

Section II

In the first part of this article, we reviewed several aspects of compounded returns over extended timeframes in qualitative terms. To address questions about the long term returns of inverse and leveraged ETFs, I'll take advantage of an analytic approach shown by Equation 1 at the conclusion of this article (shown for the mathematically inclined.) It estimates the returns of inverse or leveraged ETFs in terms of the trend and volatility of their underlying indices.

The estimator makes very clear the qualitative observations that we reviewed in the first part of this article:

- If average daily return is constant, then compounded returns decline with increasing volatility.

- If volatility is held constant, then compounded returns increase with increasing average daily returns.

It says even more about inverse or leveraged ETFs, whose daily returns are intended to be a fixed multiple of the daily returns of a chosen underlying index, before fees and expenses. For SSO, that multiple is 2 times (2x) the daily return of the S&P 500® Index. For FAZ, that multiple is -3 times (-3x) the daily return of Russell 1000® Financial Services Index. The multiple is also called the leverage of the ETF. Here are some fundamental properties of returns that the estimator shows us:

- Returns for *both* inverse and long ETFs, leveraged and unleveraged, *decline with increasing volatility in the underlying index.*

- The *decline in return is proportional to the square of the leverage factor.*

    - For ETFs leveraged at a ±1 level (e.g., SPY or SH), the volatility "drag" is multiplied by 1, i.e., the volatility drag is the same as for the underlying index.
    - But, for ETFs leveraged ±2x, (e.g., QLD or DUG), the drag is multiplied by 4,
    - And, for ETFs leveraged ±3x, the multiplier is 9!

    This means that long term returns can be much less than those implied by the daily leverage factor.

- *However,* strong trends in the underlying index can override the volatility drag, and provide returns for inverse or leveraged ETFs which are even greater than those suggested by the daily leverage factor.

We'll call the relative strength of trend versus volatility for the underlying index the "balance of power" for the index and its associated ETFs. This "balance of power" is central to understanding the long term returns of inverse and leveraged ETFs. It can vary substantially over time for a given index and its associated ETFs. *Remember that balance of power has nothing to do with the direction of the trend. Instead, it shows whether trend or volatility dominate long term returns, regardless of the direction of the trend.*

Because we're basing some broad statements about returns on this estimator, let's compare its output to some actual returns to be confident of its accuracy. Again, we'll look at actual returns[5] vs. estimated returns over 63 trading days (one quarter of the trading year), for every day for which history is available.

Figure 2 shows results for 3 ETFs that are based on the S&P 500 index: SSO (2x), SDS (-2x), and SH (-1x). And, Figure 3 shows results for DIG (2x) and DUG (-2x), both based on the Dow Jones U.S. Oil & Gas $^{(SM)}$ Index. In each case, the blue line shows where the points would appear if the estimator were 100% correct.

The estimated 63-day returns fit the actual returns remarkably well, considering that the estimator relies on some simplifying assumptions regarding the distribution of daily returns, and does not include (1) the effects of fees and expenses, and (2) deviations of funds' daily returns from their objectives. DIG and DUG illustrate how divergences can become noticeable, however, in extreme conditions such as returns below -50%.

[5] ETF returns are adjusted for dividends and distributions that the estimator doesn't address.

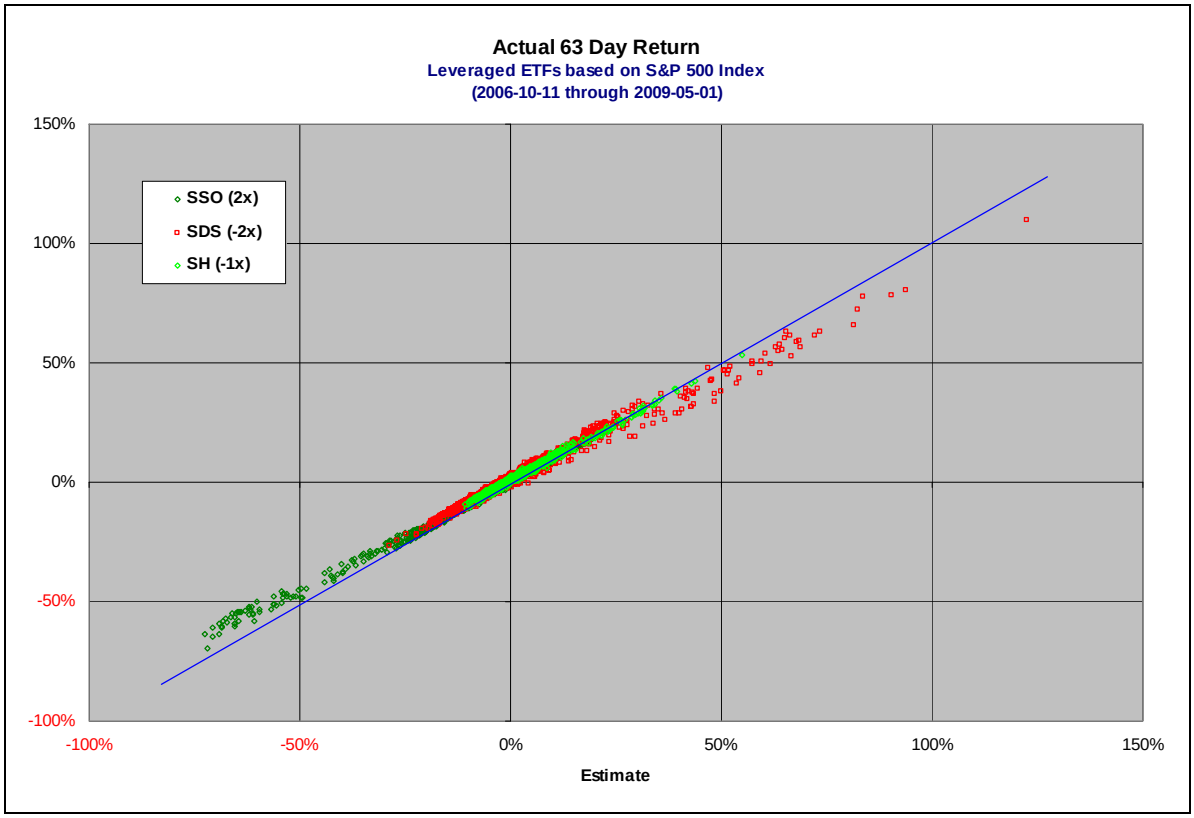
Actual 63 Day Return
Leveraged ETFs based on S&P 500 Index
(2006-10-11 through 2009-05-01)
SSO (2x)
SDS (-2x)
SH (-1x)
150%
100%
50%
0%
-50%
-100%
-100%
-50%
0%
50%
100%
150%
Estimate

Figure 2

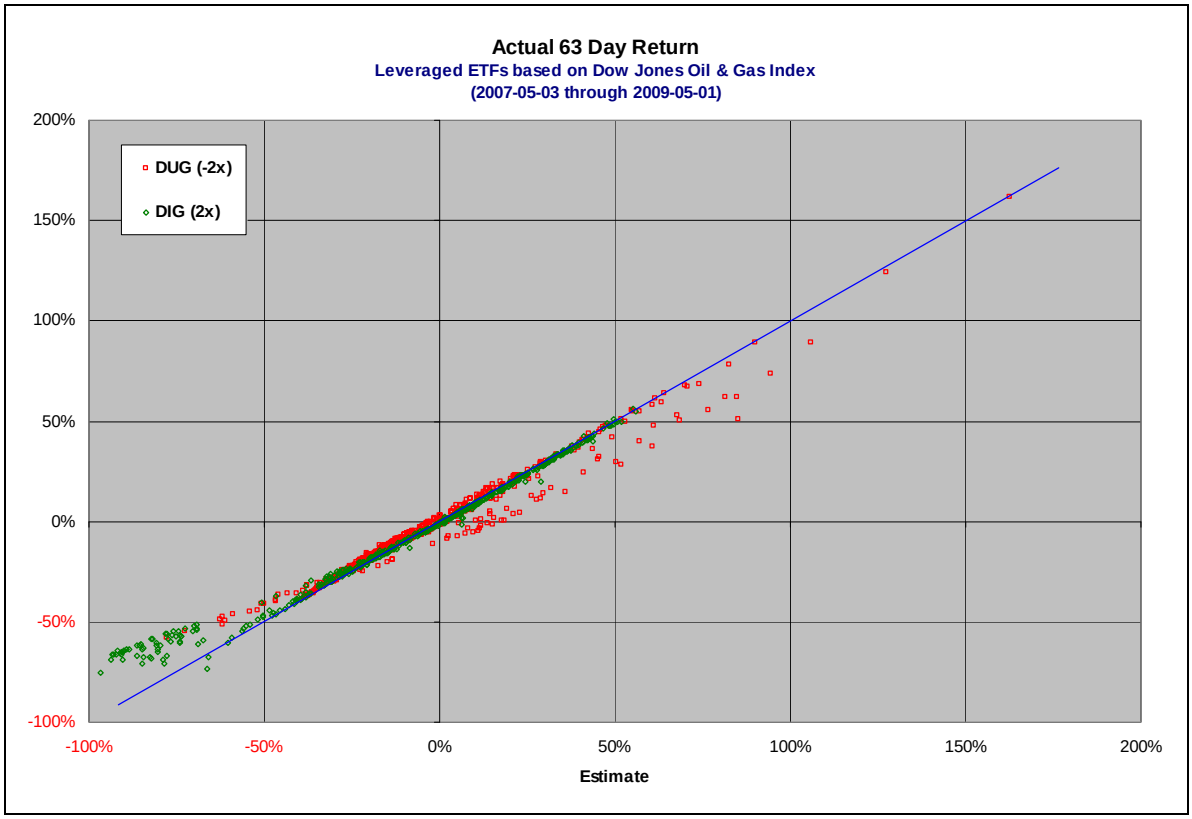

Figure 3

To show how widely the balance of power between trend and volatility can vary over time, Figure 4 charts that balance of power over the most recent 63 trading days for the S&P 500 Index starting in 1993. Positive values (green) show that trend is dominating volatility. Negative values (red) show that volatility is dominating trend.

For example, for almost all of 1995, trend dominated volatility. The opposite was true for most of 1999 and 2000 when volatility dominated trend. The large spike in Jul-2002 when trend dominated volatility was near the bottom of that bear market. And, for 2004-2007, when the S&P 500 seemed to rise in multiple fits and starts, the balance of power bounced between trend and volatility multiple times. Then, of course, late 2008 arrived and the picture changed almost daily.

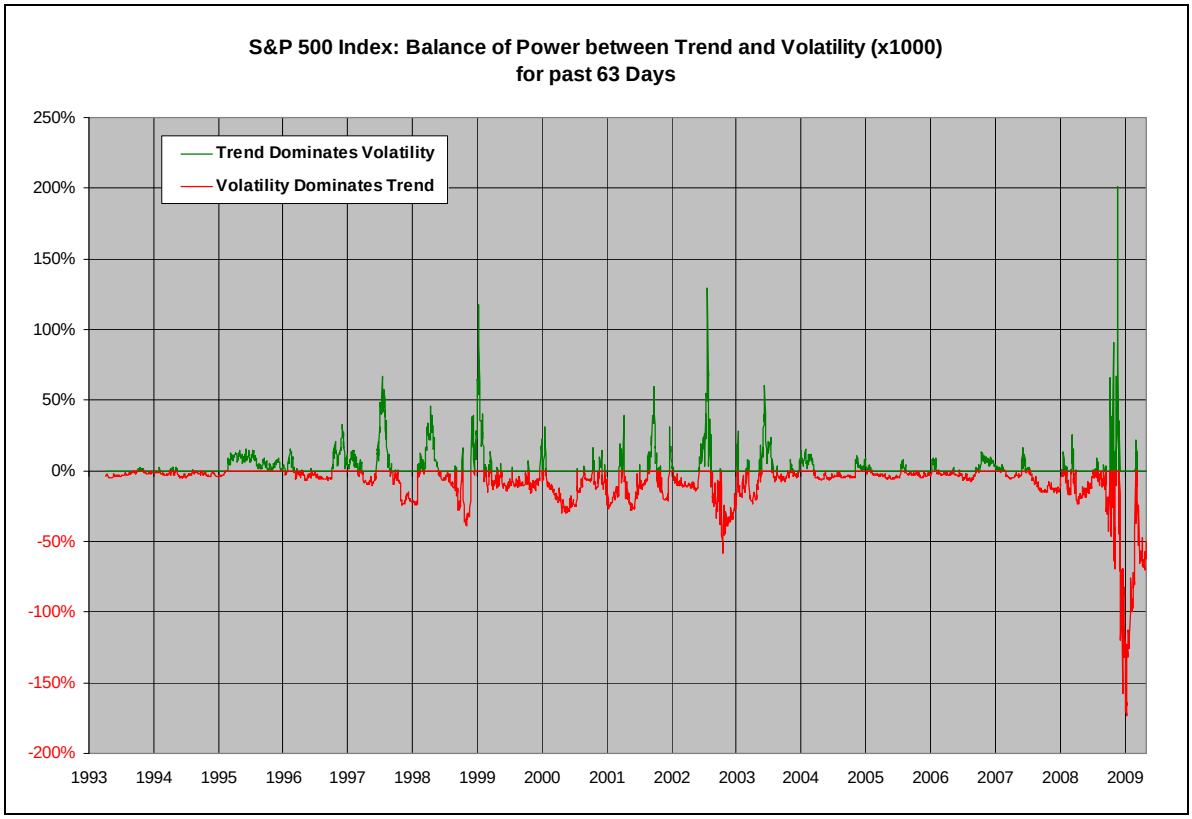

Figure 4

With the above background in hand, let's move on to several particular questions about the long term performance of inverse and leveraged ETFs.

How does an Lx (e.g., 2x or -3x) leveraged ETF perform relative to L times the performance of the underlying index over the same timeframe?

This is perhaps the most prevalent question regarding leveraged ETFs in articles and discussion groups of the last 6-9 months. It has arisen partly from misinterpreting the performance objectives of leveraged ETFs. Many traders or investors simply assumed, for example, that a *2x* objective on a daily basis translates to and *2x* return over a longer timeframe. Then they discovered that in practice it does not, often by a substantial degree.

However, this comparison is a legitimate consideration when judging whether it's better to trade an *Lx* leveraged ETF rather than executing an alternative strategy to achieve *L* times the return of the underlying index. (Remember that the leverage factor, *L*, is negative for inverse ETFs.) Alternatives include leveraged trades in futures, options, or, when available, an applicable +1x ETF such as SPY or QQQQ.

We can modify the estimator at the end of the article to estimate the difference between the return of an *Lx* leveraged ETF and *L* times the return of the underlying index. (For example, how does the return of a long position in DUG relate to 2x the *inverse* return of the Dow Jones Oil and Gas Index?) The key implications of that modified estimator are:

- The balance of power between the trend and the volatility of the underlying index again plays a prominent role. And, that balance of power can be positive or negative. So, the return of an *Lx* leveraged ETF may be less than, or greater than, *L* times the return of the underlying index.

- The difference between the return for a long leveraged ETF and *L* times the underlying index return should be smaller than the difference between the return of an inverse ETF and *L* times the return of the same underlying index. For instance, a 2x leveraged ETF multiplies the balance of power by 2, but the -2x ETF based on the same underlying index has a multiple of 6.

To illustrate, Figure 5 shows the 63-day return of SSO minus 2x the 63-day return of the S&P 500 index. Figure 6 shows the 63-day return of SDS minus 2x the 63-day *inverse* return of the S&P 500 Index (which is the same as subtracting -2x the 63-day return of the index). The difference between SSO and SDS returns and 2x the relevant S&P 500 Index return move generally in parallel, although not always with the same sign, and differences for SDS (the inverse ETF) are exaggerated compared to those for SSO. And, there are periods in which the 63-day return of SSO or SDS is either better or worse than 2 times the relevant return of the S&P 500 Index over 63 days. For example, SSO has recently underperformed 2x the S&P 500 Index by a few percent. During the implosion of the S&P 500 Index in late 2008, SDS underperformed 2x *inverse* of the S&P 500 over 63 days by 10 to 30%. But, there were occasions in early 2008, and the first half of 2007, when SDS outperformed 2x the *inverse* of the S&P 500 Index.

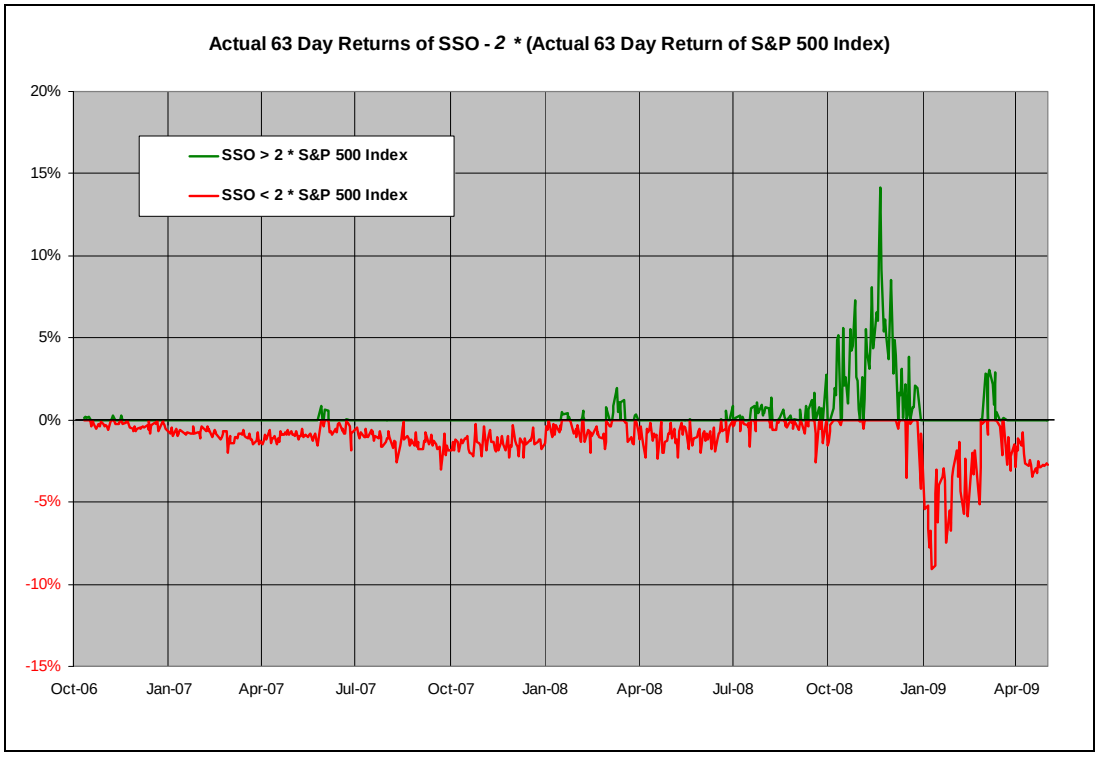

Figure 5

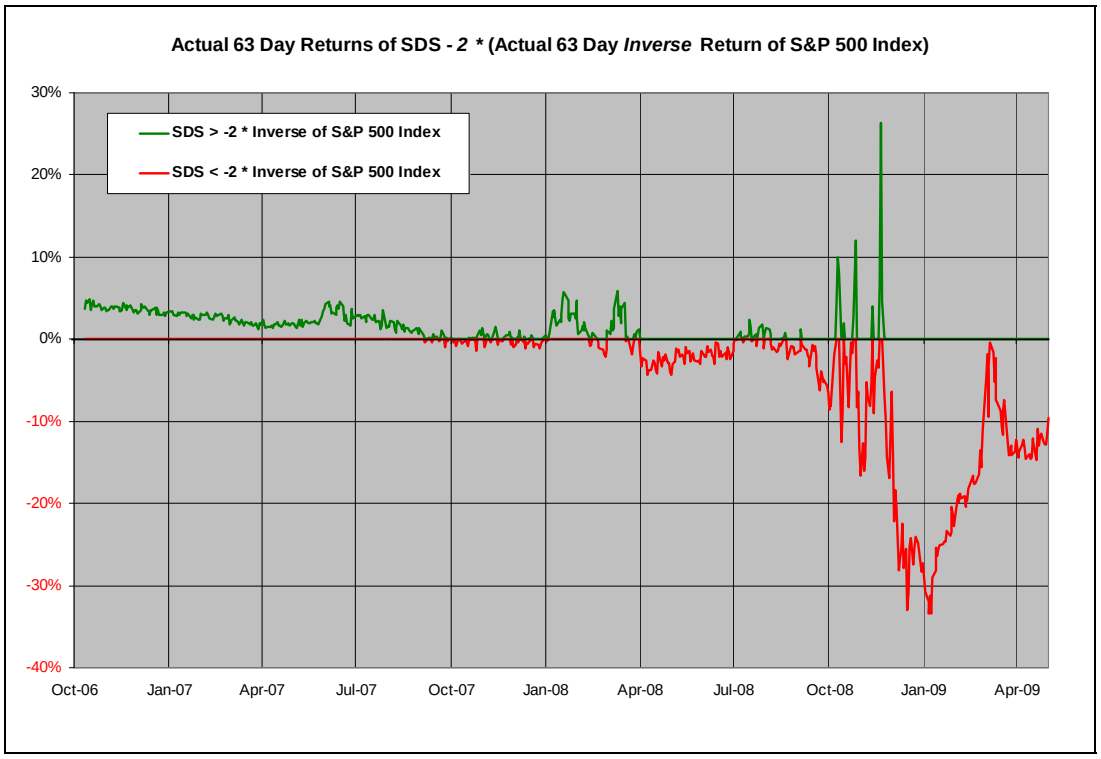

Figure 6

Although the above is interesting, what we'd really like to know is "If I guess right on the direction of the trend of the underlying index, how does the leveraged ETF perform compared to *L* times the return of the underlying index? And, if I guess wrong, will the leveraged ETF lose more or less than *L* times the underlying return?"

For this question, we'll look at 63 trading day returns for every day for which there is history for the following six indices and their associated ±2x leveraged ETFs from ProShares.[6] There are three sector indices and three broad market indices in the selection.

Index	Long ETF	Inverse ETF	Observations
Dow Jones US Financials	UYG	SKF	504
Dow Jones US Industrial	UXI	SIJ	503
Dow Jones US Oil & Gas	DIG	DUG	504
Nasdaq 100 Index	QLD	QID	643
Russell 2000 Index	UWM	TWM	509
S&P 500 Index	SSO	SDS	643
Grand Total			3,306

Table 3

[6] This is not a recommendation regarding ProShares. Their leveraged ETFs have some of the longest histories, broadest coverage, and highest liquidity, so they are good candidates for research.

Here are the average returns for the long leveraged ETFs minus 2x the returns of their underlying indices, both for the last 63 trading days, summarized by whether the underlying index was up, or down, over those 63 days:

Index Up/Down	Index	Avg: Long ETF RTN63 - 2 * RTN63 of Index	% of Days when Long ETF RTN63 is Higher
Up	DJ US Financials	-5.68%	6.6%
	DJ US Industrial	-1.84%	13.2%
	DJ US Oil & Gas	-1.78%	24.9%
	Nasdaq 100 Index	-1.91%	6.4%
	Russell 2000 Index	-2.07%	3.1%
	S&P 500 Index	-0.96%	6.3%
Up Total		-1.86%	10.6%
Down	DJ US Financials	-0.38%	40.0%
	DJ US Industrial	0.57%	35.8%
	DJ US Oil & Gas	-1.93%	27.2%
	Nasdaq 100 Index	-0.01%	37.4%
	Russell 2000 Index	-0.79%	25.0%
	S&P 500 Index	-0.36%	32.4%
Down Total		-0.44%	33.4%
Grand Total		-1.01%	24.3%

Table 4

For example, on days when the DJ US Industrial index had a positive return over the past 63 trading days, the average of the 63-day return for UXI was 2x the return of the index *minus* 1.84%. *But,* on 13.2% of the observed days when this index was up over 63 days, the UXI exceeded 2x the return of the index. In all of our examples, the long leveraged ETF underperformed 2x the return of the underlying index when the index was up over 63 days. They also underperformed 2x the return of the underlying index when the index was down over 63 days, but not dramatically. *However, the last column reminds us that these relationships aren't true in every case.*

Next are the average returns for the inverse ETFs – 2x the *inverse* returns of their underlying indices for the last 63 trading days:

Index Up/Down	Index	Avg: Inverse ETF RTN63 - 2 * *Inverse* RTN63 of Index	% of Days when Inverse ETF RTN63 is Higher
Down	DJ US Financials	-19.22%	24.2%
	DJ US Industrial	-2.53%	34.9%
	DJ US Oil & Gas	-19.00%	10.3%
	Nasdaq 100 Index	-2.49%	45.2%
	Russell 2000 Index	-7.31%	22.4%
	S&P 500 Index	-5.15%	37.2%
Down Total		-9.58%	29.1%
Up	DJ US Financials	-9.25%	55.7%
	DJ US Industrial	0.65%	60.4%
	DJ US Oil & Gas	0.11%	50.6%
	Nasdaq 100 Index	1.23%	75.6%
	Russell 2000 Index	-2.53%	39.8%
	S&P 500 Index	0.98%	72.6%
Up Total		-0.06%	62.7%

Table 5

For example, when the Nasdaq 100 Index was down over 63 days, the QID *underperformed* 2x the *inverse* return of the Nasdaq100 by -2.49%, on average. But, in the same circumstance, QLD *outperformed* 2x the *inverse* return of the index on 45.2% of the days observed. The inverse ETFs consistently underperformed 2 times the *inverse* return of the underlying indices when those indices were down for the past 63 trading days. And they underperformed by a much wider margin than did the long leveraged ETFs when compared to 2x the return of the underlying indices during positive 63-day periods. When the indices were up, however, the inverse ETFs sometimes had smaller losses, sometimes greater losses, than 2x the *inverse* of the underlying indices. *Just as for the long leveraged ETFs, this relative performance is not always true in every situation, as shown by the last column to the right.* For example, SIJ (-2x) outperformed 2x the *inverse* return of the Dow Jones US Industrial Index 34.9% of the time when the index was down over 63 days.

Will returns from leveraged Long ETFs always move in the same direction as their underlying indices? Will returns from inverse ETFs always move in the opposite direction from their underlying indices?

The answer is sometimes yes, and sometimes no. The balance of power between trend and volatility is multiplied by very different factors for the underlying index and the inverse or leveraged long ETFs, so trend could dominate for one return, and volatility

could dominate for another return, all on the same day, looking back over the same period.

Table 6 shows that this is not such a rare occurrence for returns over 63 trading days.

Index Up/ Down	Index	Long ETF	Inverse ETF	Obser-vations	% of Days when Long ETF RTN63 had same sign as Underlying Index	% of Days when Inverse ETF RTN63 had opposite sign from Underlying Index
Down	DJ US Financials	UYG	SKF	443	100.0%	75.2%
	DJ US Industrial	UXI	SIJ	321	100.0%	90.0%
	DJ US Oil & Gas	DIG	DUG	243	100.0%	63.8%
	Nasdaq 100 Index	QLD	QID	270	100.0%	85.2%
	Russell 2000 Index	UWM	TWM	348	100.0%	77.6%
	S&P 500 Index	SSO	SDS	358	100.0%	90.5%
Down Total				1,983	100.0%	80.7%
Up	DJ US Financials	UYG	SKF	61	68.9%	95.1%
	DJ US Industrial	UXI	SIJ	182	89.0%	97.3%
	DJ US Oil & Gas	DIG	DUG	261	92.7%	100.0%
	Nasdaq 100 Index	QLD	QID	373	93.6%	98.7%
	Russell 2000 Index	UWM	TWM	161	85.7%	98.8%
	S&P 500 Index	SSO	SDS	285	92.6%	97.2%
Up Total				1,323	90.5%	98.3%
Grand Total				3,306	96.2%	87.7%

Table 6

These results reflect the realities of history to date for inverse and leveraged ETFs during which volatility has often dominated trend, but the values in the blue font could be much closer to 100% in highly persistent bull or bear markets. (However, the values in the dark grey font will remain at or near 100% for nearly every market condition, due to the mathematics of compounding.)

Could one force the volatility effect to work in favor of a trade by shorting inverse or leveraged ETFs?

By now, you probably know the answer, "It depends on the balance of power between trend and volatility." Volatility is just one part of the equation, and trend is the other. The history with leveraged ETFs so far is that volatility has dominated. Let's illustrate that effect by showing 63 trading day returns obtained by "Shorting the Long ETF", and going "Long the Inverse ETF". E.g., one shorts SSO, and compares that to buying SDS, or one shorts DIG, and compares that to buy DUG.

Index Up/ Down	Index	Long ETF	Inverse ETF	Obser-vations	Average RTN63 for 'Short the Long ETF'	Average RTN63 For 'Long the Inverse ETF'	% Days when 'Short the Long ETF' > 'Long the Inverse ETF'
Down	DJ US Financials	UYG	SKF	443	32.46%	12.86%	77.9%
	DJ US Industrial	UXI	SIJ	321	26.45%	24.49%	70.7%
	DJ US Oil & Gas	DIG	DUG	243	32.07%	11.13%	88.5%
	Nasdaq 100 Index	QLD	QID	270	27.51%	25.01%	60.0%
	Russell 2000 Index	UWM	TWM	348	24.15%	16.05%	81.6%
	S&P 500 Index	SSO	SDS	358	22.07%	16.57%	67.3%
Down Total				1,983	27.43%	17.42%	74.3%
Up	DJ US Financials	UYG	SKF	61	-3.28%	-18.21%	57.4%
	DJ US Industrial	UXI	SIJ	182	-9.50%	-10.70%	63.2%
	DJ US Oil & Gas	DIG	DUG	261	-18.36%	-20.02%	59.4%
	Nasdaq 100 Index	QLD	QID	373	-13.60%	-14.29%	48.5%
	Russell 2000 Index	UWM	TWM	161	-6.29%	-10.89%	77.6%
	S&P 500 Index	SSO	SDS	285	-8.36%	-8.33%	36.1%
Up Total				1,323	-11.48%	-13.41%	54.0%
Grand Total				3,306	11.86%	5.08%	66.2%

Table 7

History to date shows that this "non-intuitive" strategy has fared well because the returns from "Shorting the Long ETF" on average exceed those from being "Long the Inverse ETF". But, the comparison is not perfect. Notice, for example, that a Short of QLD outperformed a Long of QID in a down market only 60% of the time. In a highly persistent bull or bear market in which trend dominates volatility, the above results would tend to be the opposite of what we've seen so far.

How should one interpret the relationship of inverse or leveraged ETFs to their 200-Day Moving Average (MA200)?

The relationship of inverse and leveraged ETFs to their 200-Day Moving Averages is difficult to predict based on where the underlying index lies relative to its MA200. History has shown that many different combinations of the three "Close vs. MA200" relationships can occur. See the Table 8, where "1" means that the Close is above the MA200, and "-1" means that the Close is below the MA200. For example, there have been 85 days to date on which the Russell 2000 Index, UWM (2x), and TWM (-2x) have *all* been below their MA200. The only combination that hasn't occurred is when the underlying index closes *below* its MA200 and the Long leveraged ETF closes *above* its MA200, regardless of where the Inverse leveraged ETF lies.

It's clear from our research covering stocks and ETFs that Long reversion to the mean strategies fare better above the 200-day moving average, and Short reversion to the mean strategies perform better below the 200-day moving average ("Reversion to the mean" strategies identify short term deviations from long term trends, and then trade on the assumption that the deviations will fade away, i.e. the stock will "revert to the mean"). This may be a self-fulfilling prophecy developed over years of experience among market participants, but it repeats itself time and again over different reversion to the mean strategies.

There's not yet enough history on inverse and leveraged ETFs to show conclusively whether they follow the same patterns of behavior. Remember that the values of the inverse and leveraged ETFs are driven almost entirely by the performance of their underlying indices, and so may not have independent patterns of behavior in regard to their own 200-day moving average.

The best bet is to refer to the underlying indices for directional guidance, long or short, for reversion to the mean strategies, unless future research shows otherwise.

Index	Index Close vs. MA200	Long ETF Close vs. MA200	Inverse ETF Close vs. MA200	Obser-Vations
DJ US Oil & Gas	-1	-1	-1	125
			1	99
	1	-1	-1	15
		1	-1	128
DJ US Financials	-1	-1	-1	85
			1	282
DJ US Industrial	-1	-1	-1	41
			1	287
	1	-1	-1	20
		1	-1	18
Nasdaq 100	-1	-1	-1	54
			1	238
	1	-1	-1	32
			1	1
		1	-1	181
Russell 2000	-1	-1	-1	85
			1	258
	1	-1	-1	13
		1	-1	16
S&P 500	-1	-1	-1	36
			1	341
	1	-1	-1	11
			1	9
		1	-1	108
			1	1

Table 8

Conclusions

Trades in inverse and leveraged ETFs over extended timeframes can produce results quite different from what one might expect. Results depend strongly on the future balance of power between the trend and volatility of the underlying indices, and those effects are very difficult to forecast.

If you are seeking a multiple of the long term return of a particular index, vehicles other than inverse or leveraged ETFs may be more reliable. These include the use of futures, options, or directly leveraged trades in ±1x ETFs, such as SPY, SH, or QQQQ (Although SH is an inverse ETF, its leverage, *L*, is -1, so it will mirror the *inverse* of the S&P 500 Index fairly well over most trend and volatility scenarios).

But, the alternative methods may be impractical for a number of reasons, for example, it's not possible to open a short position in QQQQ in a retirement account. Or, perhaps there are no ±1x ETFs associated with an index. In such cases, a long term long position in an inverse or leveraged ETF can still be a profitable trade, but it requires more management than a "standard" position.

- Before entering the position, try to get a handle on the recent balance of power between trend and volatility by looking at how the inverse or leveraged ETF has performed relative to its underlying index (multiplied by the appropriate leverage factor). Underperformance could be a signal that volatility has the upper hand and conditions aren't right for trading the ETF. Overperformance could indicate that trend is "in control", so the risks of volatility drag are lower than normal.

- Once in the position, monitor the same relative performance: ETF vs. an appropriate multiple of the underlying index. If you have a winner, and the ETF is outperforming the underlying index, maybe it's a good time to take some profits off the table. The same might be true if you're in a winner, but it's starting to fall behind the underlying index. And, if the trade is near a breakeven, or running at a loss, and its beginning to fall behind the underlying index, consider reducing the position's size, or closing it altogether.

And last, but certainly not least, don't let the uncertainties regarding long term returns from inverse and leveraged ETFs divert your attention from the very useful role that they can play as short term trades or hedges. That's where they excel.

Perhaps the sum of this article should then be: "Choose the right tool for the job".

Estimator for Compounded Return of Inverse or Leveraged ETFs

$$G \approx n * L * \overline{R} + (n/2) * L^2 * [(n-1) * \overline{R}^2 - \sigma_R^2]$$

where :

G = compounded return of an inverse or leveraged ETF, over *n* days

L = leverage of the ETF (e.g., -1, or 2, or -3)

$\overline{R}$ = average daily return (trend) of the underlying index, over *n* days

σ_R = standard deviation of daily returns (volatility) of the underlying index, over *n* days

Equation 1

This estimate relies on a couple of simplifying assumptions about the daily returns of the underlying index, *so it approximates ($\approx$) the exact answer*.

A key advantage of this estimator is that it boils returns down into the effects of just trend and volatility, albeit at the loss of some accuracy.

Notice that when L = 1, then the equation estimates the return of the underlying index itself.