Understanding Leveraged ETFs Through the Lens of Optimized RSI Parameters and Position Sizing with Genetic Optimization

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Context: In recent years, the participation of everyday people in the stock market has surged to record levels. But along with this influx of retail participants comes familiar challenges: understanding risk, avoiding emotional decision-making, and achieving maximized returns. To amplify gains, many retail investors turn to leveraged products such as margin borrowing or options, both of which can be risky. Margin loans and brokerage liabilities expose investors to borrowing costs and sudden margin calls, while options can quickly lose value over time and are much harder to price and trade fairly. Leveraged exchange-traded funds (LETFs), a relatively newer product, offer a different way to take on leverage, avoiding these common pitfalls. However, despite their accessibility and ease-of-use, LETFs are still not widely used.

Problem: The conventional view by financial experts is that leveraged products—whether margin, options, or LETFs—are best suited for short-term trading and not for long-term investing. This view comes from the idea that volatility in markets steadily erodes their value when held over time. While margin and options have been studied extensively, LETFs have received less attention outside of theoretical models. In particular, we still know little about how they actually perform under different holding periods and trading strategies. This leaves open an important question: Can LETFs be used effectively for more than just short-term trades, or do they inevitably underperform when held for longer?

Method: To explore this, I studied leveraged S&P 500 ETFs using a genetic-optimization-based simulation approach. In the simulation environment, the "DNA" of each individual would represent a trading strategy's parameters. Decisions such as when to take risk, how much risk to take, and how frequently to trade are all encoded into their DNA. After each population grows and evolves through living in the testing data, they would then be tested on new, unseen data to see how well they fare in real-world conditions. To make testing more rigorous, I simulated LETF performance from even before such products existed, extending data back to 1989 to cover multiple market cycles. This allowed me to examine how these strategies, and more importantly LETFs, would have fared not just in the recent bull market, but also in periods of different market environments and fluctuating market regimes.

Results & Caveats: Despite the fact that buying and holding leveraged ETFs can generate higher raw performance during trending bull markets, findings show that the associated risks far outweigh any potential rewards an investor might receive. In fact, the vast majority of the optimized strategies held no base position **(median = 0% & mean = 6% portfolio allocation)**, and chose to fully commit to trading instead. Across 25 runs (1989–2025), the strategy beat the market **75.02%** of the time, however larger-than-market losses in 2001 and 2008 muted the long-run edge. Market exposure was steady (**$\beta \approx 0.87$**), with the average risk-adjusted alpha being **+1.97% per year** and a standard deviation of **.92%**. Although noisy, **the results are statistically significant (t=10.49, p=1.91*E-10).**

Regardless, most of these optimized strategies embraced an active trading approach instead of buy-and-hold leveraged positions, meaning their outperformance was tied to short-term capital gains taxes. Although retail investors could implement such a strategy in a tax-deferred/tax-free account, actively managing an ensemble of biannually calibrated strategies would be highly difficult. Implementation would be much easier in a mutual fund or hedge fund portfolio, however the 1.92%/1.03% alpha is unlikely to be enough to make up for the tax drag of short term capital gains. In essence, the broader lesson is simply that chasing higher returns through leveraged ETFs is rarely worth the added risks. Patience, stability, and taking advantage of long-term compounding remain the most reliable path towards building wealth.