Investment Strategy Proposal: Evaluating Volatility-Based Strategies in a SPY-Dominated Market

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Executive Summary

This proposal investigates a series of volatility-regime-based trading strategies that use the VIX futures term structure as a market timing signal. Specifically, it evaluates the performance of these strategies relative to a baseline systematic SPY dip-buying strategy. While the baseline strategy remains the top performer in terms of risk-adjusted returns, we investigate whether hybrid approaches can offer a more resilient and diversified alternative.

Our findings indicate that pure volatility strategies underperform, largely due to structural inefficiencies, high volatility and exposure to extreme drawdowns. In contrast, a hybrid model such as the Long SPY Long VIX (LSLV) strategy, which dynamically adjusts SPY and volatility exposure based on prevailing regimes, demonstrates a more balanced, volatility-aware approach. This strategy helps investors manage risk more effectively while offering diversification beyond traditional equity beta.

This work builds on the framework developed by Fransson and Almqvist (2020), who illustrated how signals from the VIX term structure can inform volatility trading decisions. By replicating their core logic with updated historical data, we critically re-evaluate the robustness of their strategy under current market conditions and compare it to the baseline approach.

I. Data

We examine daily open and close prices for the following instruments: SPDR S&P 500 ETF (SPY), CBOE Volatility Index (VIX), S&P 500 VIX Futures (1-month), ProShares VIX Short-Term Futures ETF (VIXY) and ProShares Short VIX Short-Term Futures ETF (SVXY). Price data for SPY, VIX, VIXY, and SVXY was sourced from Yahoo Finance, while VIX futures data was obtained from the CBOE. The sample period spans from October 11, 2011, to December 31, 2024. The start date was chosen to ensure data consistency – beginning one week after the more recent of SVXY's launch (October 3, 2011) and VIXY's 1-for-4 reverse split (January 11, 2011).

II. Strategy Overview

We evaluate three trading strategies derived from the VIX term structure and benchmark them against the baseline approach of a systematic "dip-buying" strategy that purchases SPY following a 5% decline and holds the position for 30 days.

Since the VIX cannot be traded by itself, we aim to obtain long and short VIX exposures through trading VIX ETFs – namely, VIXY and SVXY. VIXY provides long exposure to VIX futures by continuously rolling expiring contracts into longer-dated ones, thereby incurring negative roll yield

in contango regimes. SVXY, on the other hand, offers short exposure to the VIX by maintaining a short position in a rolling basket of VIX futures, benefiting from positive roll yield in contango.

We construct a trading signal by evaluating whether the VIX term structure is in contango or backwardation. We will call this signal "the basis" (B) and calculate it as:

$$B = \frac{VIX\ Futures}{VIX\ Spot} - 1$$

Here VIX Futures is the open price of VIX futures on the day of the trade, and VIX Spot is the spot opening price of the VIX. When B > 0, the term structure is in contango, and when B < 0, the VIX term structure is in backwardation. Contango implies negative roll yield from long VIX futures positions and positive yield from short positions, while backwardation suggests the opposite.

The first "pure VIX" trading strategy we present is called "Long Short VIX" (LSV). Each trading day, we calculate the basis at the open prices and, if the basis signals backwardation, we enter a long VIXY and short SVXY position at the close price. If the basis signals contango, we enter a short VIXY and long SVXY position.

The second proposed strategy is called "Hedged Long Short VIX" (HLSV), which builds on the LSV strategy by adding long and short exposures to SPY. Similar to the LSV, each trading day, we calculate the basis at the open prices and, if the basis signals backwardation, we enter a long VIXY, short SVXY and long SPY positions at the close price. If the basis signals contango, we enter a short VIXY, long SVXY and short SPY positions.

The last strategy is called "Long SPY Long VIX" (LSLV). Its purpose is to hedge against sudden drops in the S&P 500 by varying the SPY holdings based on the basis. If the VIX term structure is in contango, we allocate 100% of the capital to a long SPY position. If the term structure is in backwardation, we reduce the holding of the SPY to 75% and allocate 25% of the capital to a long VIXY position.

For all strategies, we simulate trading with an initial capital of $100,000 and apply a transaction fee of 0.15% per trade. Positions are re-evaluated daily, and trades are executed at the close based on signals generated at the open.

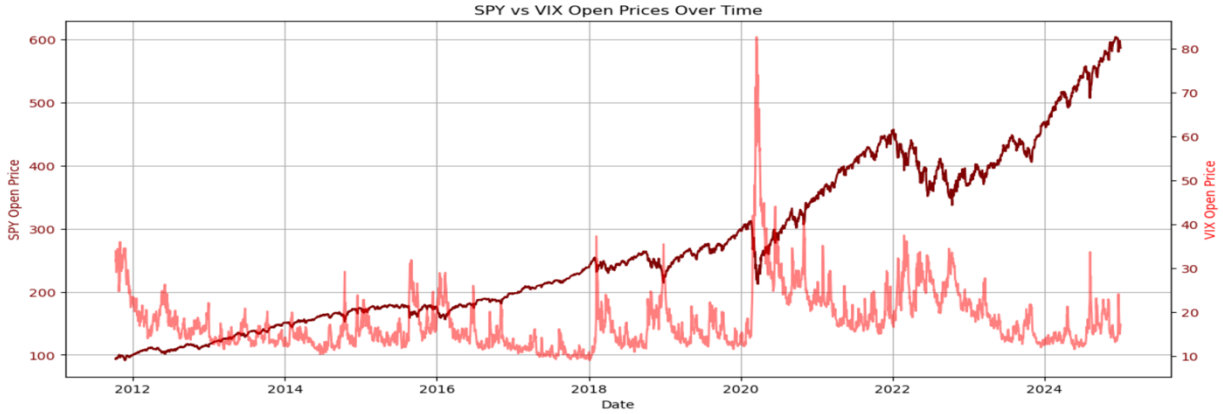

Figure 1: SPY and VIX performance 2011-2024.

III. Strategy Performance

Table I reports the annualized returns, volatilities, maximum drawdowns, and Sharpe ratios for the three proposed strategies alongside the baseline. All three strategies underperform the baseline in terms of risk-adjusted returns, as measured by the Sharpe ratio. However, the LSLV strategy stands out with a relatively close Sharpe ratio of 0.44 compared to the baseline's 0.51. This suggests that LSLV offers a more balanced approach, capturing some of the volatility premium while preserving meaningful equity exposure.

Table I: Strategy Performance

Strategy	Total Cumulative Return	Annual Return	Annualized Vol	Max Drawdown	Sharpe Ratio
LSV	272.62%	10.48%	49.91%	(83.10%)	0.18
HLSV	(51.30%)	(5.31%)	44.16%	(93.54%)	(0.15)
LSLV	147.53%	7.11%	13.35%	(41.07%)	0.44
SPY_Dip_5%_Hold_30d	131.38%	2.47%	9.69%	(28.32%)	0.51

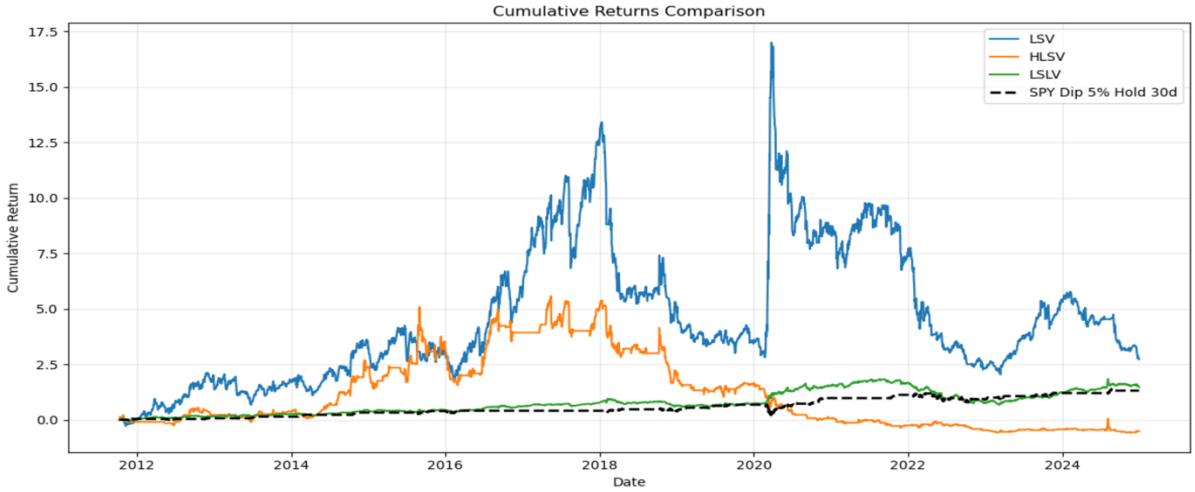

Figure 2: Cumulative return of three strategies vs. the baseline.

LSV Strategy

Although the LSV strategy generates positive annual returns, it exhibits a low Sharpe ratio of 0.18, reflecting its extremely high volatility. The use of VIXY and SVXY introduces significant performance drag due to roll decay and leverage erosion, respectively. The basis signal, while conceptually sound, is not strong or stable enough to overcome these structural headwinds in practice.

Between 2016 and 2018, the LSV strategy delivered exceptional performance, benefiting from a prolonged period of low market volatility and the heightened reliability of the basis signal. This environment contributed to growing popularity and eventual overcrowding of short volatility trades, particularly through products such as SVXY. Issuers of inverse volatility products are required to hedge tail risk by purchasing long volatility instruments like VIXY, which can create a destabilizing feedback loop: rising volatility prompts increased demand for VIX-linked products, further inflating VIX prices and accelerating losses for short VIX positions.

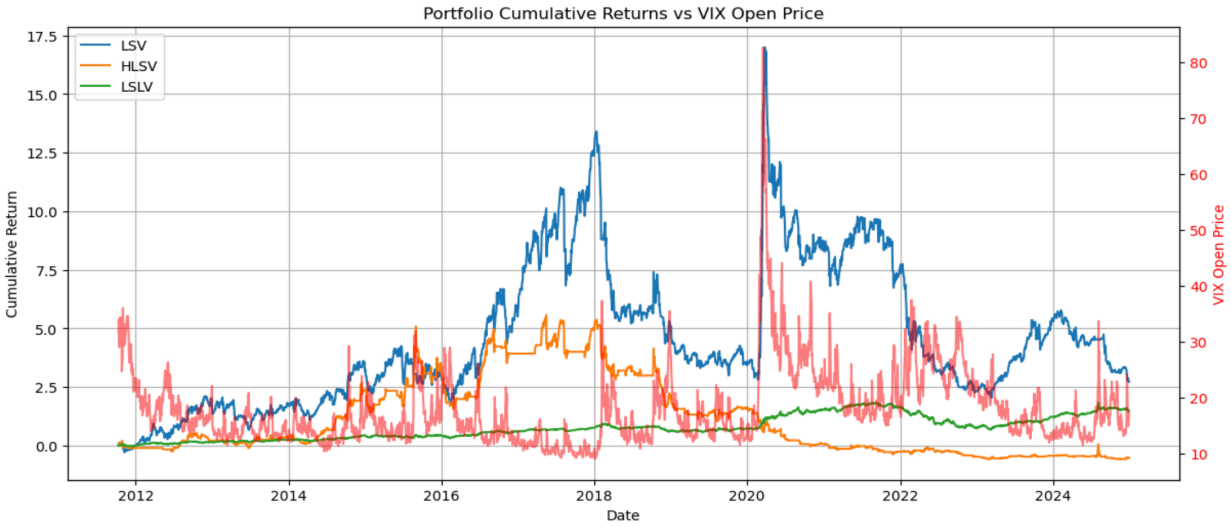

Figure 3: Cumulative return of three strategies vs. VIX open price.

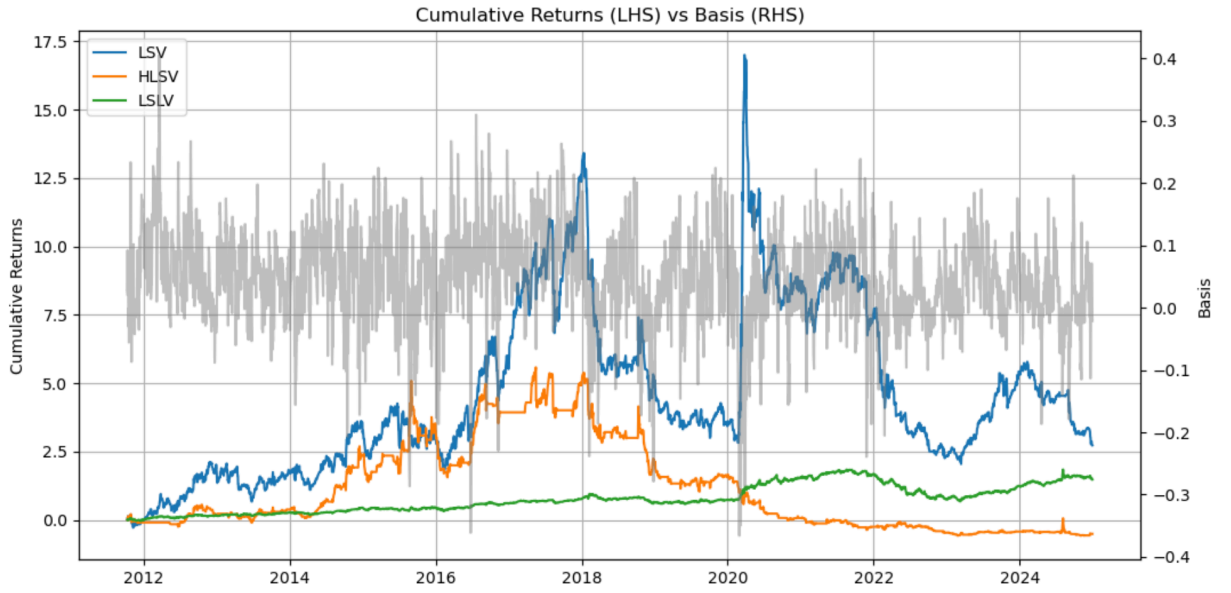

Figure 4: Cumulative return of three strategies vs. the basis.

Such dynamics culminated in the event known as “Volmageddon” on February 5, 2018, when the VIX more than doubled intraday, spiking from 18 at the open to over 37 by market close. This triggered a wave of forced liquidations and rebalancing in volatility-linked products, causing SVXY to lose over 90% of its value in a single day, effectively wiping out years of accumulated gains for inverse volatility strategies like LSV (see Figure 2). In the aftermath, SVXY reduced its target exposure from -1x to -0.5x the S&P 500 VIX Short-Term Futures Index, limiting its future return potential.

In early 2020, during the onset of the COVID-19 pandemic, the VIX futures curve again inverted into backwardation, a rare but highly favorable environment for long VIX strategies. The LSV strategy temporarily benefited from this dislocation. However, as markets normalized post-2022,

the curve reverted to contango, a regime that imposes structural drag on long VIX positions due to negative roll yield. In this environment, LSV's typical position – short VIXY and long SVXY – became far less effective, especially given SVXY's reduced leverage and a muted volatility landscape.

Overall, the performance of LSV is highly dependent on the slope of the VIX term structure. It performs well during backwardation and high-volatility regimes, but struggles significantly during contango. The strategy's reliance on the basis signal alone appears overly simplistic and insufficient for consistent performance. It also suffers from frequent rebalancing costs, diminished signal effectiveness, and greater market awareness of tail risk, all of which contribute to its declining profitability in more recent years.

HLSV Strategy

The HLSV strategy delivers the weakest performance among the three proposed approaches (Sharpe ratio of -0.15), primarily due to over-hedging and signal dilution. By combining VIX-based positions with directional SPY trades, the strategy frequently offsets its own gains—particularly when SPY moves counter to profitable VIX exposures. The reliance on the basis signal, which can be noisy or slow to reflect market conditions, further contributes to mistimed entries. Moreover, frequent rebalancing across three assets increases transaction costs, and structural headwinds such as roll decay in VIX ETFs diminish returns. Despite its added complexity, HLSV fails to generate superior risk-adjusted performance.

LSLV Strategy

The LSLV strategy delivered the most promising results among the three proposed approaches, with a Sharpe ratio of 0.44 and a significantly lower annualized volatility of 13.35%, compared to the elevated 44–50% volatilities observed in the LSV and HLSV strategies. Although it underperforms the baseline in terms of Sharpe ratio, it exceeds it in cumulative return (147.53% vs. 131.38%). Notably, LSLV did not experience a sharp decline during the Covid-19 market crash in March 2020, unlike the baseline strategy (see Figure 5). These results highlight LSLV as a balanced, volatility-aware approach that helps investors manage market exposure while offering diversification beyond pure equity beta.

IV. Factor Analysis

To evaluate the performance of the three proposed strategies, we conducted a multi-factor regression analysis using the Capital Asset Pricing Model (CAPM) and the Fama-French Three-Factor (FF3) model over the period from October 2011 to December 2024 (159 monthly observations) (see Table II and Table III on the next page).

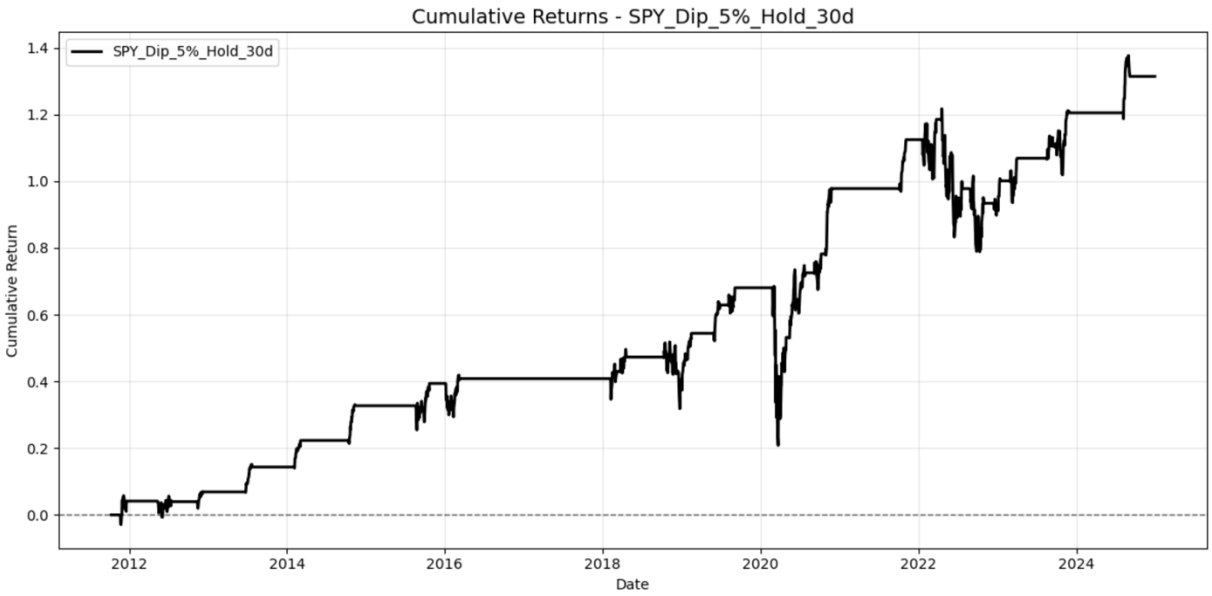

Figure 5: Cumulative return of the baseline strategy.

LSV Strategy

The LSV strategy exhibited a high CAPM alpha of 28.91% annualized, although the estimate was not statistically significant ($p = 0.1988$). Under the FF3 model, the alpha remains strong at 25.19%, with a similarly insignificant p-value (0.2474), suggesting the returns are not fully explained by traditional risk factors. The LSV strategy shows almost no market exposure and no meaningful size tilt, but a significant negative loading on the value factor ($\beta_{HML} = -1.961$, $p < 0.01$), indicating a strong bias toward growth stocks. The FF3 model explains 8.9% of the variation in returns.

HLSV Strategy

The HLSV strategy produces the weakest performance among the three, with a negative alpha in both CAPM (–4.38%) and FF3 (–5.33%) frameworks. Neither alpha is statistically significant. However, the market beta becomes significant in the FF3 model ($\beta_{Market} = 0.457$, $p = 0.0486$), indicating positive exposure to overall market risk. The R^2 values remain low across both models (CAPM $R^2 = 2.2\%$, FF3 $R^2 = 2.5\%$), highlighting the poor explanatory power of traditional factors. The strategy's lack of a strong signal or factor alignment contributes to its underperformance.

LSLV Strategy

The LSLV strategy delivers a more stable and market-sensitive return profile. Its CAPM alpha is negligible at 0.35% annualized, and not statistically significant. In the FF3 model, the alpha turns slightly negative (–0.70%), also insignificant. However, the market beta is highly significant and positive ($\beta_{Market} = 0.477$, $p < 0.01$), confirming strong exposure to market risk. LSLV has modest negative exposure to size ($\beta_{SMB} = -0.166$) and significant negative loading on value ($\beta_{HML} = -0.308$, $p < 0.01$). Importantly, the FF3 model explains 30.6% of return variation, the highest among all three strategies, reinforcing LSLV's consistency and relative robustness among the three strategies.

Table II: Strategy Exposure to CAPM

CAPM	LSV	HLSV	LSLV
Alpha (monthly)	0.0241 (28.91% annualized)	-0.0037 (-4.38% annualized)	0.0003
t-statistic:	1.29	-0.38	0.10
p-value:	0.20	0.71	0.92
Beta (Market):	-0.10	0.41	0.44
t-statistic:	-0.23	1.87	6.68
p-value:	-0.82	0.06*	0.00***
R-squared:	0.00%	2.20%	22.10%

Table III: Strategy Exposure to Fama-French 3-Factor Model

FAMA-FRENCH 3-FACTOR	LSV	HLSV	LSLV
Alpha (monthly)	0.021 (25.19% annualized)	-0.0044 (-5.33% annualized)	-0.0006 (-0.7% annualized)
t-statistic:	1.16	-0.46	-0.21
p-value:	0.25	0.65	0.83
Beta (Market):	0.02	0.46	0.48
t-statistic:	0.04	1.99	7.32
p-value:	0.97	0.0486**	0.0000***
Beta (SMB)	-0.27	-0.28	-0.17
t-statistic:	-0.38	-0.73	-1.55
p-value:	0.70	0.46	0.12
Beta (HML)	-1.96	0.07	-0.31
t-statistic:	-3.81	0.26	-3.92
p-value:	0.0002***	0.80	0.0001***
R-squared:	8.88%	2.50%	30.60%

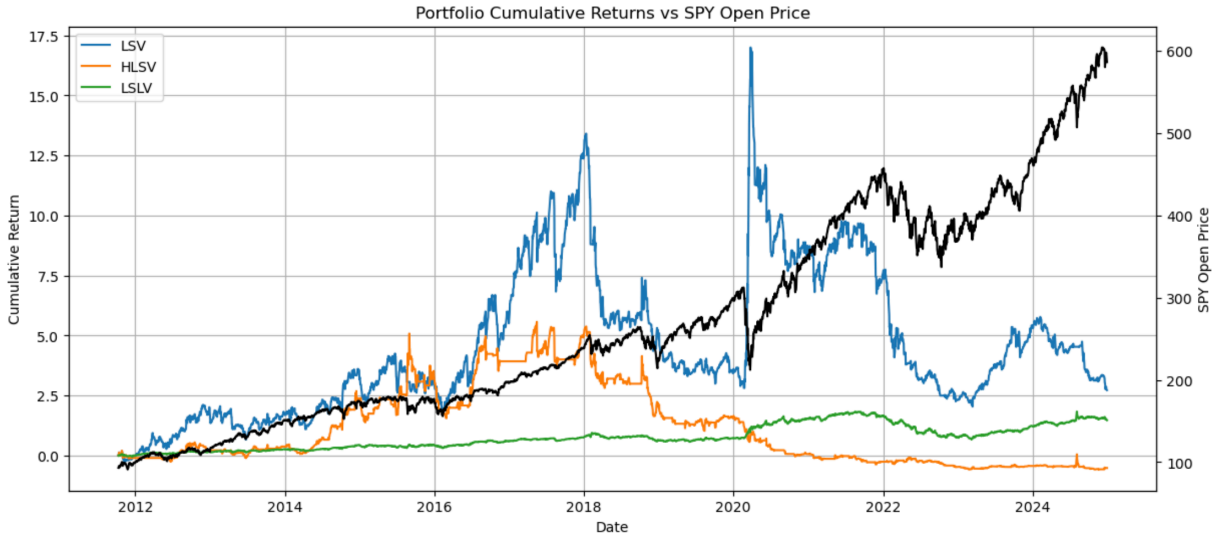

Figure 6: Cumulative return of the three strategies vs. buying and holding SPY.

V. Conclusion

All three strategies analyzed exhibit statistically insignificant alphas under both the CAPM and Fama-French 3-Factor models, supporting the conclusion that they lack a persistent edge over conventional passive investments. Their returns are largely attributable to exposures to known risk factors, particularly the market and value factors, rather than any systematic mispricing. The absence of significant alpha also indicates that the trading signal—namely, the VIX term structure "basis" – is likely too weak, noisy, or unstable to deliver consistent outperformance across different market regimes. While the signal may have been effective during certain historical periods (e.g., 2016–2018), it lacks robustness over time. Given this, the additional complexity, volatility, tail risk, and transaction costs associated with implementing these strategies are difficult to justify, especially in comparison to simpler, more reliable alternatives such as passive investment in SPY (see Figure 6) or systematic dip-buying strategies.

References

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