

NVDA Regimes, Signals & Volatility Plan

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QUESTION

How do NVDA's market regimes differ, which technical indicators are most profitable in each regime, and what is the forecast for the next 30 days of volatility?

Analysis Preparation — Features Engineered

NVDA is now in a reusable, modeling-ready format with return-based fields, multi-horizon realized volatility, and the full core technical indicator set needed for regime detection, backtesting, and volatility forecasting.

Observations

A complete feature pipeline is in place. The prepared base history `df_nvda_base` contains 1,256 daily observations with parsed dates plus close-to-close and intraday log returns. The broader feature table `df_nvda_feat` adds 10-, 20-, and 60-day realized volatility, and the indicator-enriched version `df_nvda_feat_indicators` adds SMA(10/20/50/200), RSI(14), MACD, Bollinger Bands, ADX with directional movement, and OBV.

NVDA's realized volatility is structurally high. The 10-day realized volatility averaged 0.0298 daily, the 20-day averaged 0.0305, and the 60-day averaged 0.0315; annualized, that is roughly 47.4%, 48.5%, and 50.0%. In portfolio terms, this means even the "normal" state of the stock has been high-risk enough that regime-specific strategy selection will likely matter materially.

Volatility Metric	Count	Mean	Std Dev	Min	Max	Missing
10-day realized vol	1246	0.0298	0.0128	0.0080	0.0767	10
20-day realized vol	1236	0.0305	0.0109	0.0141	0.0572	20
60-day realized vol	1196	0.0315	0.0085	0.0156	0.0506	60
10-day annualized vol	1246	0.4737	0.2034	0.1264	1.2171	10
20-day annualized vol	1236	0.4849	0.1724	0.2236	0.9076	20
60-day annualized vol	1196	0.5003	0.1350	0.2469	0.8027	60

The price trend context is visually clear. The candlestick view **Figure 1**

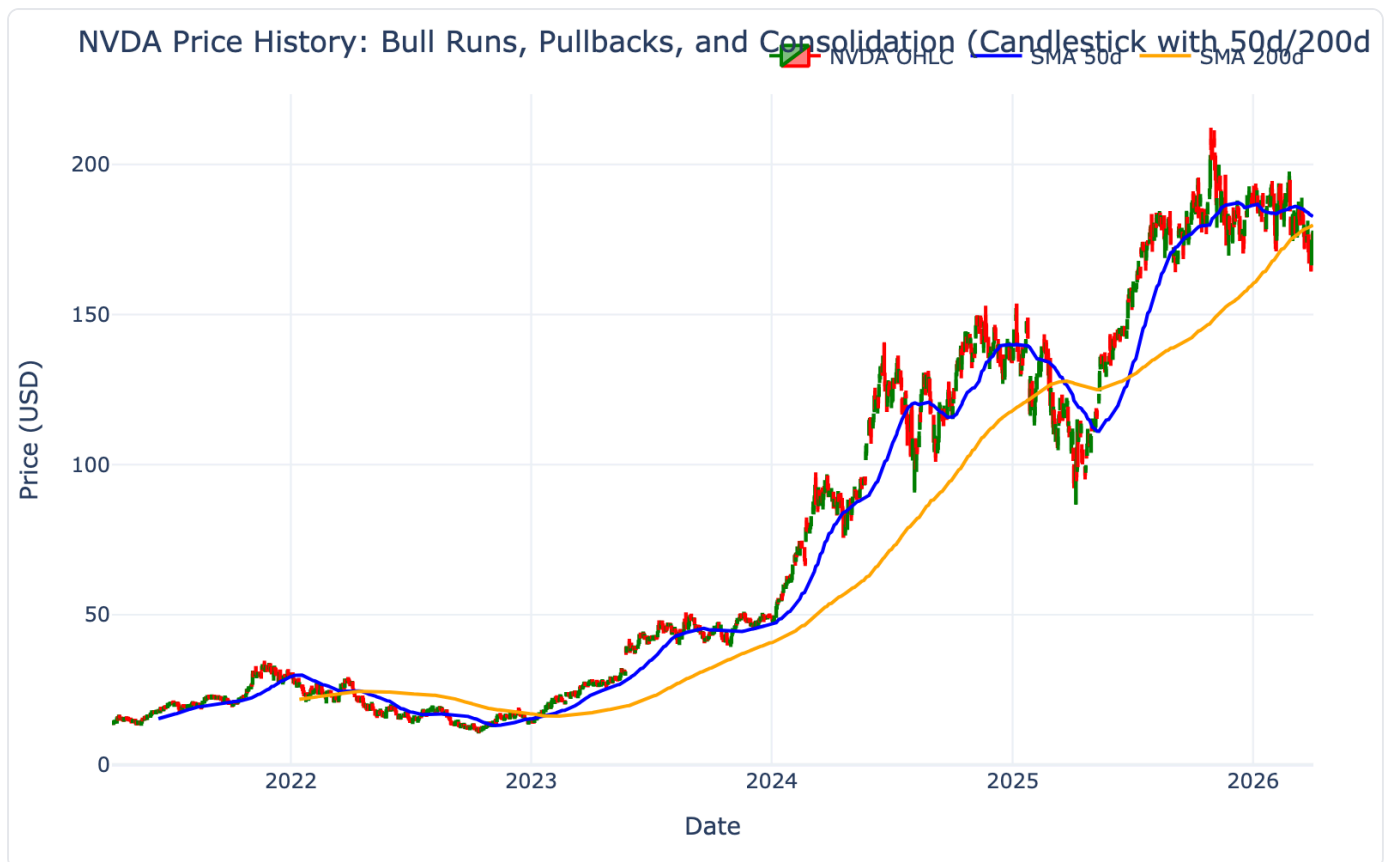


Figure 1

shows long stretches where the 50-day average stays above the 200-day average, interrupted by pullbacks and choppy consolidation zones that should map naturally into later regime clusters.

One data-quality surprise needs to be carried forward. The active session's NVDA history runs through `2026-04-02`, not the `2024-08-07` endpoint described in the original profile. That is not a blocker, but it means all later regime and forecast interpretations should be treated as based on the currently loaded data rather than the earlier profile.

Next Steps

The next task will use these engineered features to cluster daily observations into a small set of interpretable market regimes, summarize how those regimes differ in volatility and trend strength, and map when each regime occurred so strategy performance can be tested in the right market context.

NVDA Market Regimes

Overview

NVDA's history separates cleanly into three actionable regimes: a high-volatility downtrend, a low-volatility sideways/quiet regime, and a strong uptrend regime. This matters because the next task can now test technical strategies in the environments where they are most likely to help or fail, rather than averaging performance across fundamentally different market states.

Key Patterns & Observations

The 3-regime solution was the best balance of separation and interpretability. Comparing candidate cluster counts on the regime feature set `df_nvda_regime_features` showed the strongest silhouette at $k=3$ (0.3265), versus 0.3199 for $k=4$ and 0.3078 for $k=5$. In practice, that means adding more clusters split the data more finely but did not improve separation enough to justify a more complex regime map.

The most important regime is the strong uptrend state, because it combines positive drift with the highest trend strength. In the merged regime history `df_nvda_with_regime`, Regime 2 had a 20-day mean return feature of 0.0087, average ADX of 37.9, and average price position 49.2% above the 200-day moving average. That is the classic "trend is strong and persistent" environment where trend-following indicators like moving averages and MACD would normally be expected to work best.

Regime 0 captures the riskier drawdown environment. It combined negative local trend (-0.0033), the highest 20-day realized volatility (0.0413 daily), and an average position 5.4% below the 200-day moving average. In trading terms, this is the regime where long-only trend signals often suffer whipsaws or deep drawdowns unless paired with stronger filters or risk control.

Regime 1 is quieter but not necessarily bearish. It showed the lowest 20-day realized volatility (0.0227), the weakest ADX (17.9), and still sat 26.6% above the 200-day moving average on average. That suggests a consolidation or low-energy drift regime rather than a true bear phase, which is exactly the kind of environment where mean-reversion or selective momentum rules may outperform pure trend chasing.

The regimes were fairly balanced in prevalence but not in persistence. Eligible days split into 373 days for Regime 0, 355 for Regime 1, and 329 for Regime 2. Regime 0 had the longest average run length at 28.7 days and a max stretch of 86 days, while Regime 1 had the single longest uninterrupted streak at 157 days. The regime timeline **Figure 2**

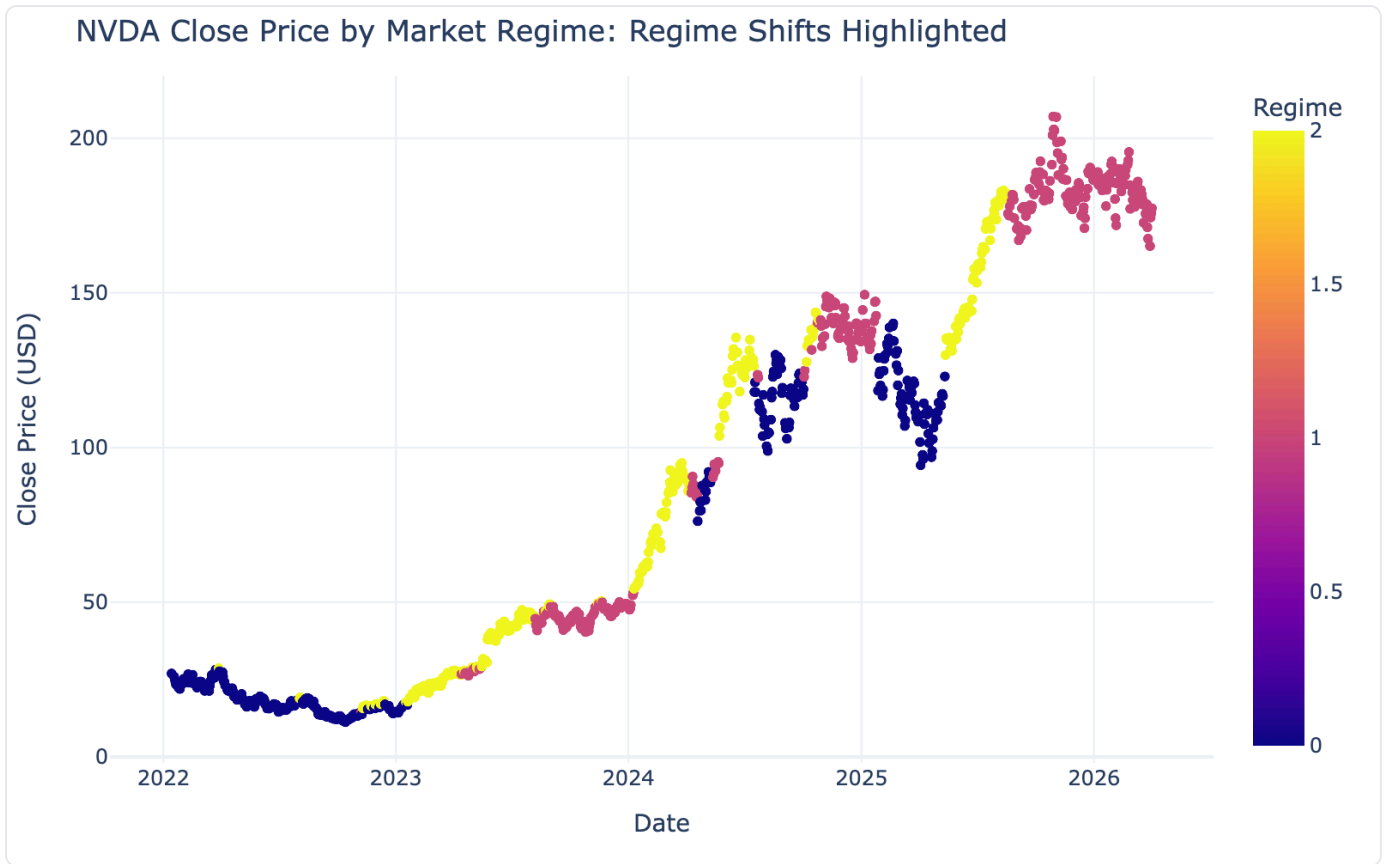


Figure 2

shows these states arriving in multi-week to multi-month blocks rather than random daily flips, which is important because regime-aware strategies need persistence to be tradable.

Regime	Interpretation	Days	Share of Eligible Days	Avg ADX	Avg 20d Vol	Avg Distance vs SMA200
0	Downtrend, high volatility, below long-term trend	373	35.3%	22.9	0.0413	-0.0538
1	Quiet / sideways, low volatility, still above long-term trend	355	33.6%	17.9	0.0227	0.2656
2	Strong uptrend, moderate volatility, strongest trend strength	329	31.1%	37.9	0.0294	0.4921

Regime	Mean Run Length (days)	Median Run Length	Max Run Length	Number of Runs
0	28.7	16.0	86	13
1	19.7	3.5	157	18
2	15.0	3.5	67	22

Interpretation & Implications

The strategic takeaway is that NVDA has not lived in one stable market environment. It has alternated between a dangerous high-volatility drawdown state, a quieter consolidation state, and a powerful trend state. That means any indicator judged only on full-sample performance will blur together very different conditions and may hide where it truly has edge.

The next step is therefore the economically meaningful one: test SMA, RSI, MACD, Bollinger, ADX-filtered, and volume-confirmation rules inside these regimes and around their transitions. If the expected pattern holds, trend-following rules should dominate in Regime 2, while quieter or more mean-reverting logic should look relatively better in Regime 1, and risk-adjusted performance should deteriorate most sharply in Regime 0.

Technical Indicator Performance by Regime

Overview

NVDA's best technical strategy depends heavily on regime. In the strong uptrend regime, classic trend-following signals dominated; in the quiet low-volatility regime, selective mean-reversion signals looked best; and in the high-volatility downtrend, most always-on momentum rules deteriorated while more selective contrarian or filtered signals held up better.

The backtest results table `df_strategy_metrics_v2` and the strategy signal history `df_nvda_signals_v2` now give a regime-aware performance map rather than one blended full-sample average. The regime Sharpe comparison **Figure 3**

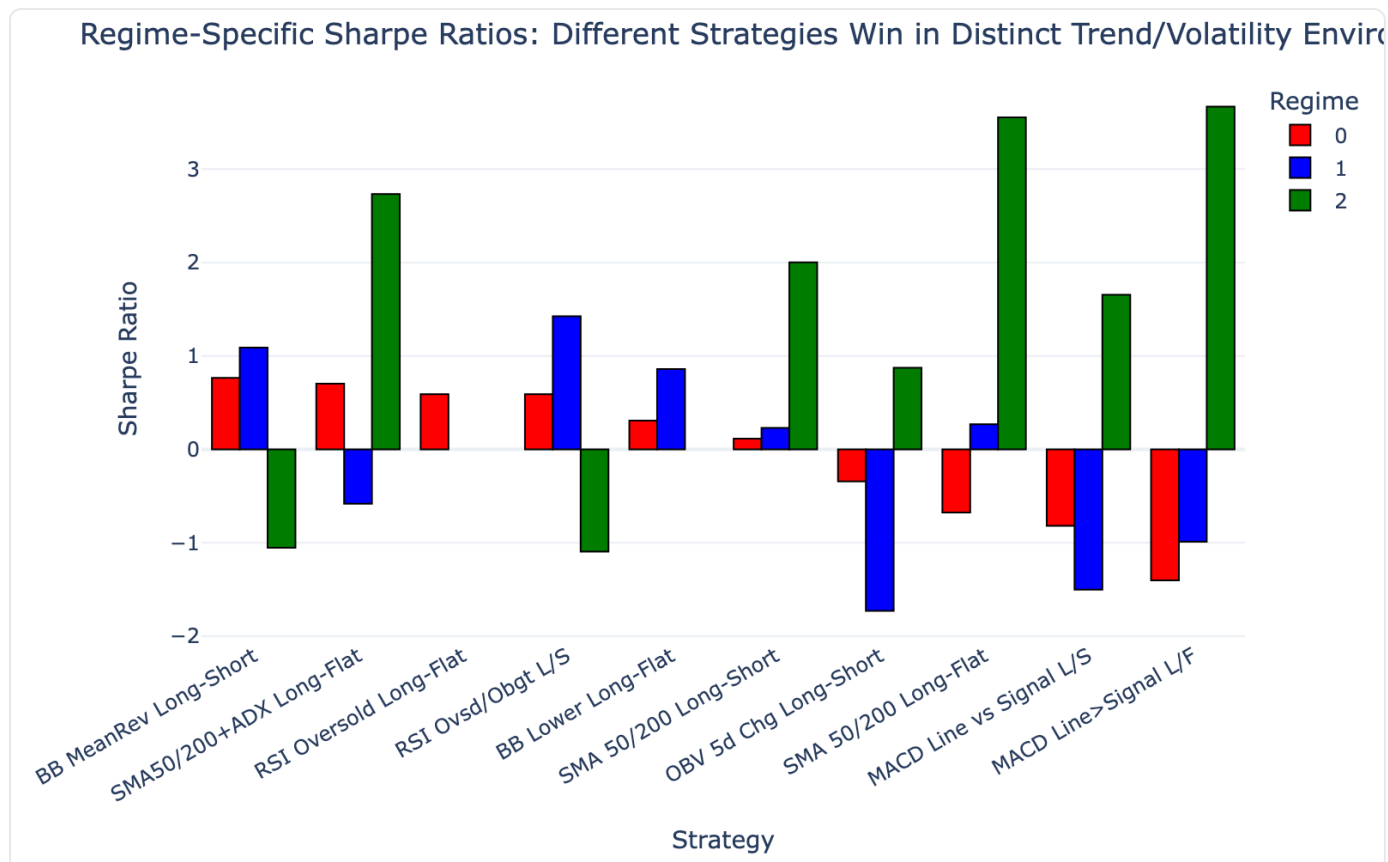


Figure 3

makes that dispersion visually obvious.

Key Patterns & Observations

Trend-following clearly won in Regime 2, the strong uptrend state. The best Sharpe came from MACD long-flat at 3.67, followed by SMA 50/200 long-flat at 3.56. In practical terms, when NVDA was in a strong, persistent uptrend with high ADX, staying aligned with trend delivered the best risk-adjusted payoff.

Mean-reversion was relatively strongest in Regime 1, the quiet low-volatility state. RSI overbought/oversold long-short posted a Sharpe of 1.43, and Bollinger mean-reversion long-short posted 1.09. But this comes with an important caution: the RSI long-short signal was active only about 1.1% of regime days, so its strong Sharpe is statistically fragile. The Bollinger rule is more credible here because it was active on about 7.3% of regime days and still held a strong positive Sharpe.

Regime 0, the high-volatility downtrend, punished many always-on trend and momentum rules. The best Sharpe in that regime came from Bollinger mean-reversion long-short at 0.76, with ADX-filtered SMA long-flat next at 0.70. By contrast, MACD long-flat was deeply negative with Sharpe -1.40, and MACD long-short was also negative at -0.82. That pattern fits a falling, volatile tape where unfiltered momentum signals get whipsawed or stay exposed on the wrong side.

Regime	Top Strategy	Sharpe	Second Strategy	Sharpe	Main Takeaway
0: High-vol downtrend	Bollinger mean-reversion L/S	0.76	SMA + ADX long-flat	0.70	Selective contrarian or filtered trend signals held up best
1: Low-vol quiet regime	RSI overbought/oversold L/S	1.43	Bollinger mean-reversion L/S	1.09	Mean-reversion worked best, but the RSI result is sparse
2: Strong uptrend	MACD long-flat	3.67	SMA 50/200 long-flat	3.56	Trend-following strongly dominated

Statistical Insights

The backtests used shifted signals so that strategy return on day t was based on information known by the prior close:

$$r_t^{(s)} = \text{extsignal}_{t-1}^{(s)} \cdot r_t$$

where r_t is NVDA's close-to-close log return and $\text{signal}_{t-1}^{(s)}$ is the prior-day position from strategy s .

Performance was then summarized with cumulative geometric return, annualized return, annualized volatility, Sharpe, Sortino, max drawdown, and daily 95% VaR. In advisor terms, Sharpe tells us which strategies earned the most return per unit of total risk, Sortino focuses only on downside volatility, max drawdown shows the worst peak-to-trough loss an investor would have lived through, and VaR estimates a typical bad day threshold.

A few activity patterns are as important as the Sharpe ratios themselves:

Strategy	Full-Sample Active Day Share	Interpretation
SMA 50/200 Long-Flat	63.5%	Often in the market; a practical trend benchmark
MACD Line Above Signal Long-Flat	50.1%	Balanced exposure; responsive trend-following
SMA 50/200 + ADX Long-Flat	26.9%	More selective; activates only in stronger trends
Bollinger Lower Long-Flat	4.2%	Sparse contrarian trigger
RSI Oversold Long-Flat	0.9%	Extremely sparse; interpret metrics cautiously
OBV 5d Change Long-Short	99.6%	Almost always exposed; more like a continuous directional overlay

Interpretation & Implications

The most reliable takeaway is that strong trends reward staying with the trend. Regime 2 had average ADX near 37.9 and average price nearly 49% above the 200-day average, and that is exactly where MACD and SMA systems excelled. This is the cleanest regime-strategy match in the study.

The second takeaway is that low-volatility calm periods behave differently from strong uptrends. In Regime 1, with ADX around 17.9, the best-performing rules were mean-reversion oriented rather than pure trend-following. That suggests when NVDA is drifting quietly rather than accelerating, buying dips and fading short-term overextension can work better than chasing directional continuation.

The danger regime is the high-volatility downtrend. Regime 0 combined average 20-day realized volatility of 0.0413, ADX around 22.9, and price below the 200-day average. In that environment, many continuous exposure systems were weak, while selective mean-reversion or filtered trend participation did better. For a trader or risk manager, that means reducing confidence in standard momentum rules when NVDA slips into a volatile falling regime.

One nuance matters: some of the strongest regime-specific Sharpe ratios came from sparse signals. That is especially true for RSI in Regime 1 and for strategies with zero activation in parts of Regime 2. Those should be treated as tactical supplements, not primary engines, unless future validation confirms their edge on broader data.

The bottom line is that NVDA is a regime-dependent technical trading asset: use MACD/SMA trend systems in strong uptrends, lean toward Bollinger-style mean reversion in quieter or stressed regimes, and be skeptical of always-on momentum exposure when volatility is high and the stock is below long-term trend.

NVDA Regimes, Indicator Edge, and 30-Day Volatility Outlook

Overview

NVDA behaves like a three-regime stock, and the best indicator depends on which regime it is in. The strongest historical edge came from trend-following signals during the strong uptrend regime, while quieter or stressed regimes favored more selective mean-reversion or filtered approaches. The volatility model now points to moderate-to-elevated risk persisting over the next 30 trading days, not a sharp drop into a calm regime.

Key Patterns & Observations

The regime map is economically coherent. The regime-enriched NVDA history shows three distinct states in the prepared market-regime dataset `df_nvda_with_regime`: a high-volatility downtrend regime, a low-volatility quiet regime, and a strong uptrend regime. Those states were not brief noise; they arrived in multi-week or multi-month stretches, which makes regime-aware strategy selection practical rather than theoretical.

Regime	Character	Avg 20d Vol	Avg ADX	Avg Distance vs SMA200	Typical Implication
0	High-volatility downtrend	0.0413 daily	22.9	-5.4%	Trend longs struggle; selective contrarian or filtered rules matter more
1	Low-volatility quiet / sideways	0.0227 daily	17.9	26.6%	Mean-reversion works better than aggressive trend chasing
2	Strong uptrend	0.0294 daily	37.9	49.2%	Trend-following signals dominate

Trend-following dominated where trend strength was real. The backtest summary `df_strategy_metrics_v2` showed that in Regime 2, MACD long-flat had the highest Sharpe at 3.67, followed closely by SMA 50/200 long-flat at 3.56. That is exactly what a portfolio manager would want to see: when NVDA is strongly above its long-term trend and ADX is high, staying with momentum was historically the best risk-adjusted choice.

Mean-reversion was better in quieter and stressed tapes, but with different levels of confidence. In Regime 1, RSI overbought/oversold long-short posted a Sharpe of 1.43, but it was active on only about 1.1% of days, so that result is fragile. Bollinger mean-reversion long-short was more credible

there with Sharpe **1.09** and broader activity. In Regime 0, Bollinger mean-reversion long-short led with Sharpe **0.76**, and SMA plus ADX filtering followed at **0.70**, while always-on MACD signals were negative.

Regime	Most Credible Winners	Sharpe	Caution
0	Bollinger mean-reversion L/S; SMA+ADX long-flat	0.76; 0.70	High-volatility downtrends still remain difficult and unstable
1	Bollinger mean-reversion L/S	1.09	RSI L/S scored higher at 1.43 but was too sparse to trust strongly
2	MACD long-flat; SMA 50/200 long-flat	3.67; 3.56	Strongest and most reliable regime-strategy fit in the study

The return series passes the basic volatility-model sanity checks. Augmented Dickey-Fuller tests rejected a unit root for close-to-close log returns (**-21.62**, **$p \approx 0$**), squared returns (**-15.69**, **$p \approx 1.44e-28$**), and absolute returns (**-3.88**, **$p \approx 0.0022$**). In plain English, that means the return series is stationary enough for standard conditional-volatility modeling, and the volatility proxies behave in a way consistent with clustered but mean-reverting risk.

Statistical Insights

The volatility forecast table **df_vol_forecast** comes from a fitted GARCH-family model applied to daily NVDA log returns. The conditional standard deviation path is the key object:

$$\sigma_{t+h} = \sqrt{\widehat{\text{Var}}(r_{t+h} | \mathcal{F}_t)}$$

where r_{t+h} is the future daily log return and \mathcal{F}_t is the information set available at the latest date.

The model's 30-day forecast starts near **42.7%** annualized volatility and drifts up toward about **46.7%** annualized by the end of the horizon. The practical forecast band ends around **42.0%** to **51.4%** annualized.

Forecast Metric	Value
Day-1 annualized volatility forecast	42.7%
Day-30 annualized volatility forecast	46.7%
Approx. average 30-day annualized forecast	44.8%
Day-30 lower bound	42.0%
Day-30 upper bound	51.4%

The realized-vs-forecast volatility view **Figure 4**

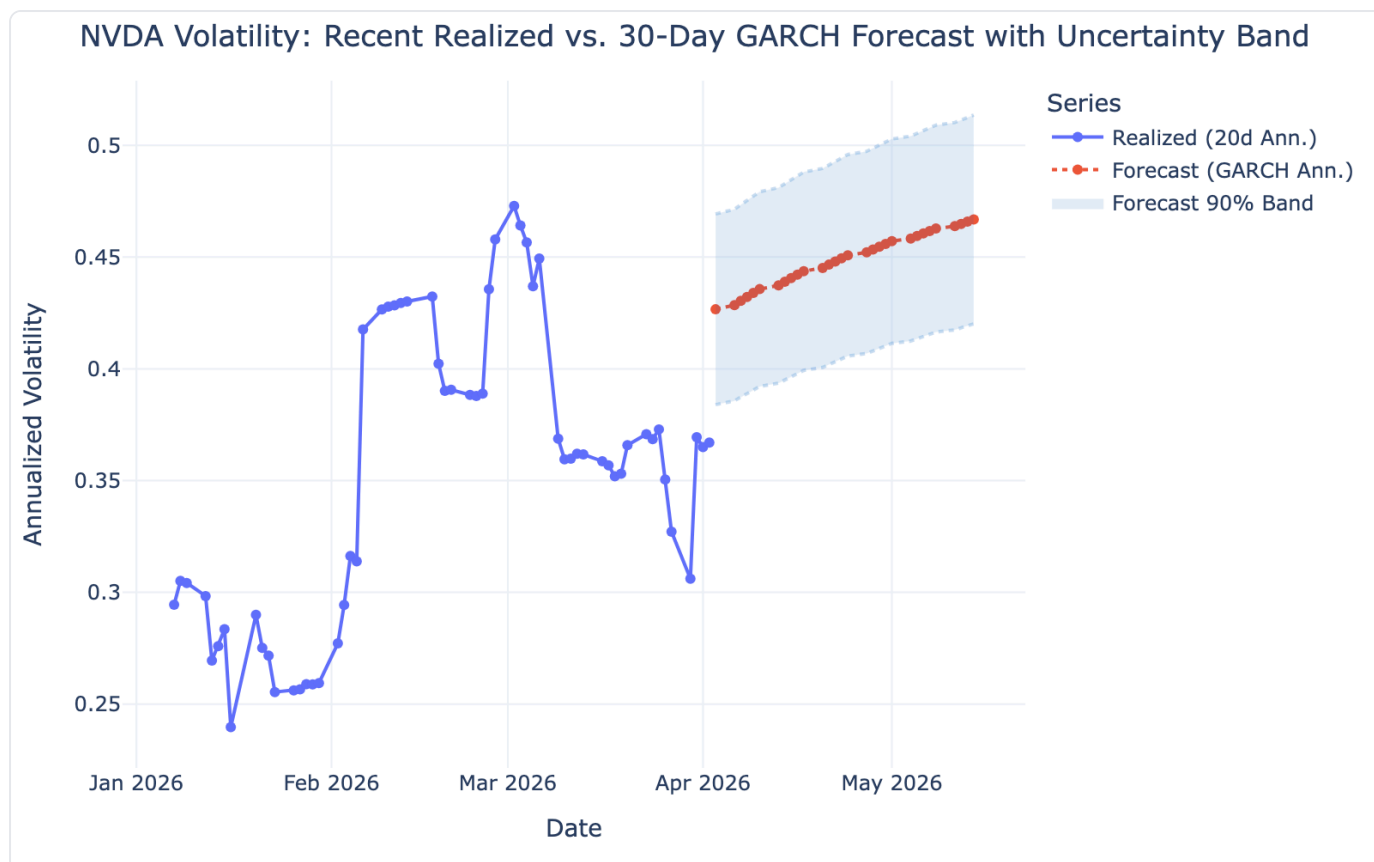


Figure 4

shows that the forecast sits in the same general neighborhood as recent realized volatility rather than collapsing sharply lower. That is the important portfolio implication: **the model expects continued meaningful day-to-day risk, not an immediate normalization.**

Interpretation & Implications

The current setup argues against treating NVDA as a quiet consolidation trade. The forward volatility path is still elevated enough that aggressive mean-reversion should be used selectively, not as the default. If the stock remains in or near the strong uptrend regime, MACD and SMA-trend systems remain the historically preferred playbook. If price action slips toward the high-volatility downtrend regime, the evidence says to scale back trust in always-on momentum and lean more toward filtered or contrarian setups.

Regime transitions matter because strategies break differently at the edges. Trend systems worked very well once the uptrend regime was established, but they degraded sharply in the high-volatility downtrend regime. That means the biggest tactical mistake would be assuming a strategy that worked in Regime 2 should be held with equal conviction when volatility rises and the stock loses long-term trend support.

From a risk-management standpoint, position sizing should stay conservative over the next month. A roughly 45% annualized forward volatility environment is still high enough that leverage, stop placement, and options positioning need to assume larger-than-normal daily swings. For discretionary trading, the evidence supports staying trend-aligned only when regime evidence remains

favorable and reducing exposure quickly if the stock begins rotating toward the high-volatility downtrend cluster.

Limitations

This analysis is reliable for the NVDA daily history currently loaded in the session, but it does **not** prove that these indicator edges will persist out of sample. The forecast also comes from a simple GARCH-family specification with practical uncertainty bounds rather than full simulation-based intervals, so it should be treated as a disciplined baseline rather than a precise volatility promise. Finally, the strongest regime-specific Sharpe ratios from sparse strategies, especially RSI in the quiet regime, are best viewed as tentative tactical signals rather than robust primary systems.

The bottom line: NVDA's historical behavior is best understood as a rotation among three regimes; trend-following indicators were the clear winners in the strong uptrend regime, mean-reversion helped more in quieter or stressed conditions, and the next 30 trading days look likely to remain in a moderate-to-high volatility environment that favors disciplined regime-aware trading over one-size-fits-all signals.

Data Sources

- df_nvda_base
- df_nvda_feat
- df_nvda_feat_indicators
- df_nvda_regime_features
- df_nvda_with_regime
- df_strategy_metrics_v2
- df_nvda_signals_v2
- df_vol_forecast