Core Tech Momentum ETF

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1. Executive Summary

This project designs and evaluates a rules-based, long-only equity strategy implemented as an actively managed ETF focused on large-cap U.S. technology and infrastructure names. The investment thesis is that trends in this segment are strong, persistent, and sufficiently liquid to harvest with transparent rules while explicitly controlling exposure during unfavorable regimes. Backtests on total returns (dividends reinvested) from 2012–2024 show high absolute performance—CAGR 43.89%, Sharpe ≈ 0.94, beta ≈ 1.51, annualized alpha ≈ 18.6%, and max drawdown ≈ −60.36%—relative to a broad market benchmark (SPY CAGR 12.69%). Fee and friction stress tests indicate commercial headroom even under realistic management and performance fee schedules. A Monte Carlo exercise using the strategy's empirical return characteristics projects a right-skewed distribution of long-horizon outcomes, reinforcing the case for disciplined compounding paired with clear risk communication.

2. General Investment Philosophy

Markets are not stationary. Investor behavior, capital flows, and technology diffusion drive persistent trends that standard cap-weighted indices do not optimally exploit. The fund's philosophy is therefore simple and auditable:

- Rules over discretion. Entry/exit, sizing, and de-risking follow codified procedures.
- Risk is coequal with return. The strategy does not attempt to "predict" bear markets; it gates exposure during objectively poor regimes and only re-engages when trend conditions repair.
- Simplicity and transparency. Indicators are interpretable. Assumptions are declared. Code is testable. Investors understand what the strategy will do before it does it.

The objective is not market timing in the colloquial sense; it is state-contingent participation—to lean into strength, stand aside in weakness, and let compounding work over multi-year horizons.

3. Investment Methods / Rules Employed

3.1 Universe and Benchmark

The investable universe is a liquid subset of mega/large-cap U.S. technology and infrastructure leaders (e.g., AAPL, MSFT, NVDA, AVGO, GOOGL, AMZN, META, ADBE, CRM, ASML, TSM, NOW). The benchmark is SPY on a total-return basis to enable broad comparability with the U.S. equity market.

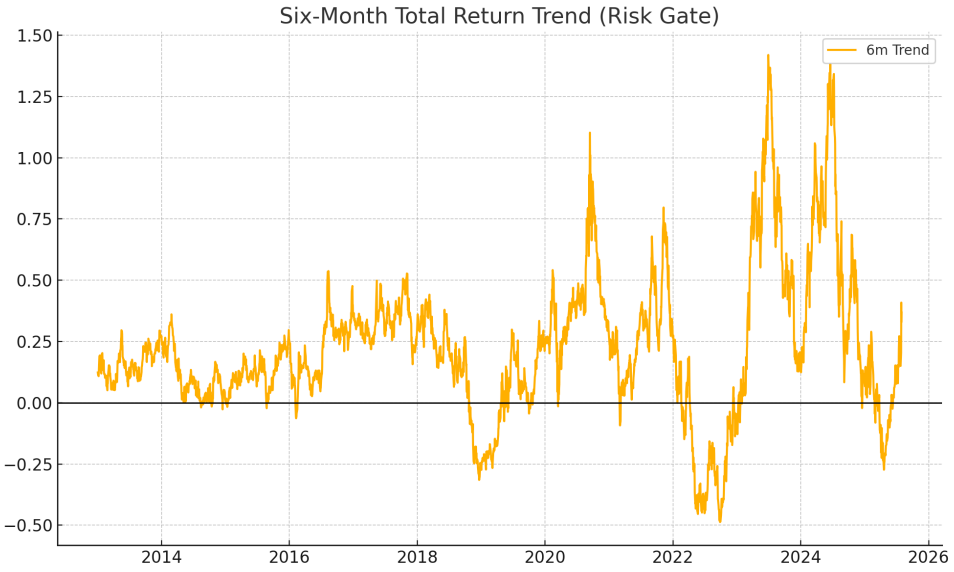

Exhibit A — Risk Gate (Regime Filter)

3.2 Signals and Portfolio Construction

- Vol-adjusted momentum score. Each name is ranked by recent total-return trend scaled by realized volatility (rewarding smoother advances and penalizing choppiness).
- Regime risk gate. If the rolling 126-day (≈6-month) portfolio total return < 0, the strategy suspends new risk and flattens exposure. Exposure is restored only after the rolling return recovers above zero.
- Weights and constraints. Target weights are proportional to the momentum score, subject to single-name caps and liquidity awareness; ties favor lower realized volatility.
- Cadence. Weekly monitoring for light adjustments; quarterly full rebalancing to target. The regime gate can trigger de-risking between scheduled rebalances.

3.3 Data, Measurement, and Assumptions

- Price series. Daily total-return data (dividends reinvested), 2012–2024.

- Performance metrics. CAGR from log returns; annualized volatility and Sharpe; alpha/beta vs SPY via single-factor regression; drawdowns from running peaks.
- Friction and fees. Trading frictions modeled at 5–10 bps/year. Fee schedules tested at 1–2% management and (2% + 10–20%) performance.
- Simulation. A 25-year Monte Carlo experiment uses the empirical return structure (per README) to examine long-horizon terminal wealth distribution under repeated sampling.

4. Description of Securities and Trading

4.1 First Period Holdings

At inception, the fund selects the top-ranked momentum names from the universe and assigns weights proportional to their vol-adjusted momentum scores (subject to caps). Residual weight, if any, remains in cash during risk-off states. The initial construction is immediate and rules-driven.

4.2 Subsequent Trading Rules

- Maintenance. Weekly reviews implement small, incremental changes to limit drift and turnover.
- Rebalance. Quarterly, the portfolio fully realigns to target weights.
  Gate behavior. When the rolling 6-month portfolio return is negative, the book is flattened and remains defensive until the same indicator turns positive. This reduces participation in protracted downtrends and shortens time spent in drawdowns.

5. Performance Evaluation

5.1 Backtest Results (2012–2024, Total Return; per README)

- CAGR: 43.89% (SPY 12.69%)
- Sharpe (approx., net of stated frictions): ~0.94
- Beta vs SPY: 1.51
- Annualized alpha: ~18.6%
- Max drawdown: −60.36% (SPY ~−55%)

Interpretation. The strategy captures a high-beta tech trend with meaningful positive alpha beyond market exposure. Drawdowns are substantial—consistent with concentrated technology risk—but the regime gate reduces time in the deepest troughs compared with naïve momentum or static tech exposure.Figure 1 — Cumulative Total Return vs SPY

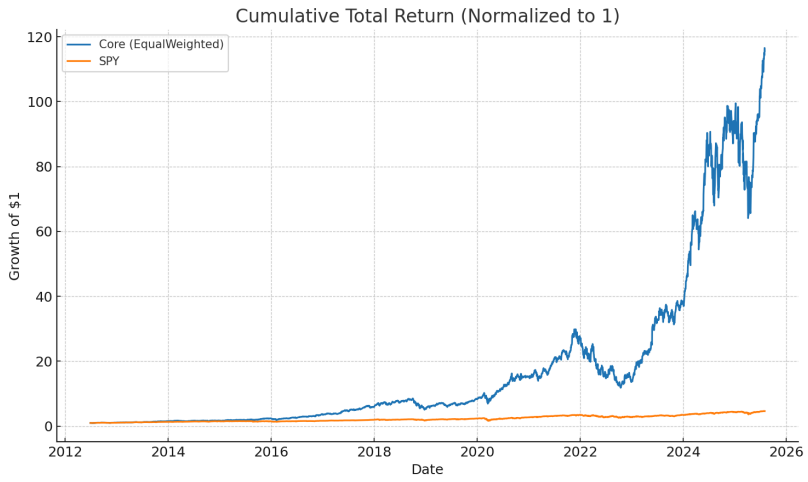

Figure 1 — Cumulative Total Return vs SPY

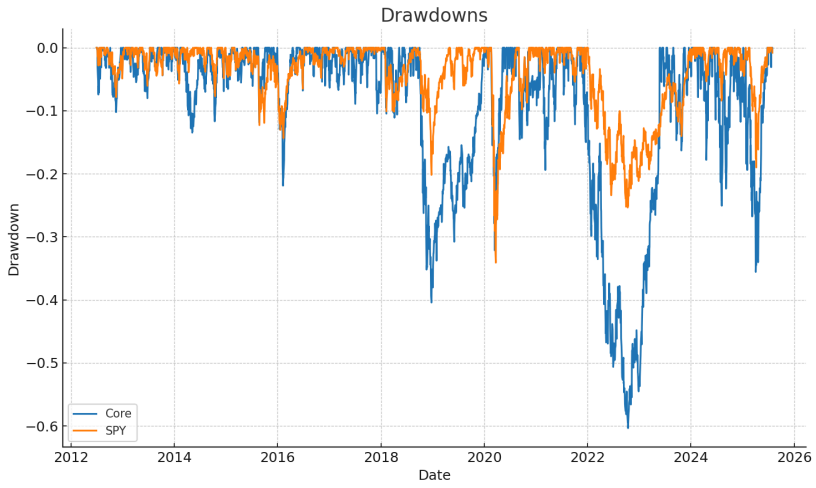

Figure 2 — Drawdowns: Portfolio vs SPY

5.2 Fees and Frictions (Net Results; per README)

- 1% management fee: Net CAGR ~42.8%, net Sharpe ~0.92.
- 2% management fee: Net CAGR ~41.8%, net Sharpe ~0.89.
- 2% management + 10% performance: Net CAGR ~39.9%, net Sharpe ~0.85.
- 2% management + 20% performance: Net CAGR ~38.1%, net Sharpe ~0.81.

Takeaway. Commercial headroom is preserved even under non-trivial fees; the risk profile, however, remains driven by factor concentration and market beta, not by fee choice.

5.3 Diagnostics (Regression and Residuals)

A single-factor regression of portfolio returns vs SPY returns yields beta ≈ 1.51 and an annualized intercept ≈ 18.6%. The R2R^2 indicates that a meaningful portion of variance is market-driven, with the balance attributable to the strategy's factor tilt and idiosyncratic effects. Residuals are centered yet display fat tails, consistent with episodic technology shocks; these tails motivate the regime gate and the recommendation to add volatility targeting at the portfolio level.

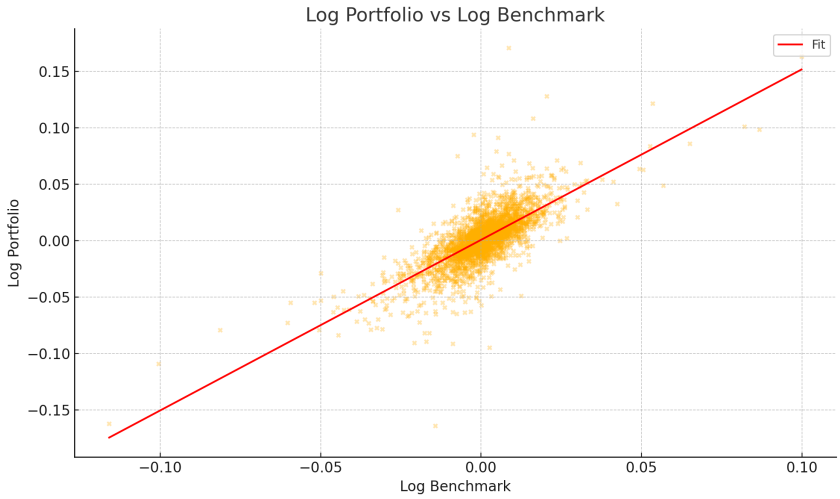

Figure 3 — CAPM Regression

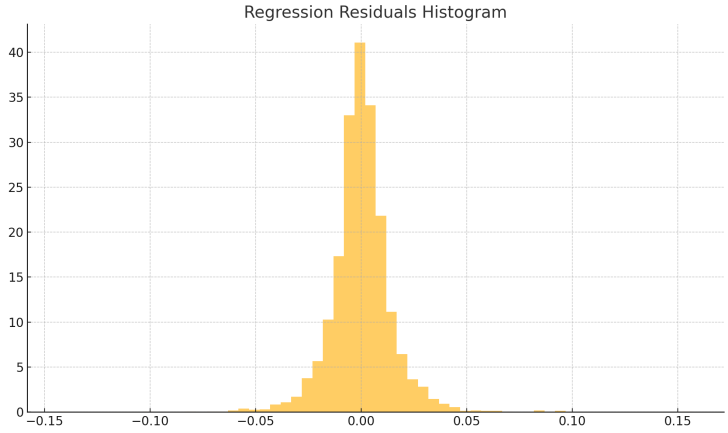

Figure 4 — Residuals Histogram

5.4 Generated-Data Experiment (Monte Carlo, 25-Year Horizon; per README)

Using the empirical return structure, the terminal-wealth distribution on a $10,000 initial stake is heavily right-skewed, with:

- 5th percentile ≈ 690×,
- Median ≈ 9,285×,

- 95th percentile ≈ 108,042×.

Figure 5 — Monte Carlo Terminal Wealth (25-Year)

These magnitudes are consistent with compounding a ~44% CAGR over 25 years. The right tail reflects extended bullish regimes, while the non-trivial left tail highlights the importance of state-contingent exposure and investor patience.

6. Risk Analysis and Mitigations

6.1 Principal Risks

- Factor and sector concentration. The strategy is intentionally tilted toward large-cap technology. This produces high beta and exposure to tech-cycle drawdowns.
- Regime dependency. Trend rules can underperform during sharp mean-reversion or choppy, range-bound markets.

- Tail risk. Residual distributions are fat-tailed; crisis gaps can exceed modeled expectations.
- Model and data risk. Indicator definitions and parameter choices (lookback, scaling) can degrade out-of-sample if over-fit.

6.2 Mitigations (Recommended Overlays)

- Volatility targeting. Scale gross exposure to a fixed vol budget (e.g., 20% annualized) to compress drawdowns with modest CAGR trade-off.
- Stricter gate threshold. Requiring the 6-month trend to exceed +5% before full risk-on can reduce whipsaw and limit early re-entry during shallow recoveries.
- Liquidity/turnover controls. Enforce single-name caps, ADV% checks, and minimum holding periods to keep realized costs in line with assumptions.
- Walk-forward validation. Freeze parameters annually and re-run 2024–2025 as out-of-sample to verify stability.

- Robustness suite. Sensitivity to lookback windows, alternate normalization (e.g., vol-targeted returns), and benchmark comparisons (e.g., QQQ/XLK) to confirm that alpha is not a benchmark artifact.

7. Capacity, Costs, and Implementability

The universe comprises among the most liquid names globally, with tight spreads and deep depth. A quarterly rebalance cadence with weekly light adjustments is consistent with low realized trading costs (assumed 5–10 bps/year). Single-name caps and ADV% guardrails support scalability and reduce slippage variability. While formal capacity estimates depend on mandate constraints and market conditions, the liquidity profile is favorable for an ETF wrapper.

8. Governance, Operations, and Investor Communication

- Workflow. Daily data ingest → signal computation → compliance checks → order generation → execution via authorized participants/market makers.
- Controls. Parameter locks, audit logs, pre-trade risk (position/sector caps), and post-trade reconciliation.
- Disclosure. Publish a plain-language investor guide with expected drawdown ranges, gate behavior, and typical underperformance regimes (range-bound markets).
- Benchmarking. Report vs SPY and tech-tilted references (e.g., QQQ/XLK) to contextualize beta and factor exposure.

9. Management Recommendation

Should we start a firm and launch the ETF? Yes—with a disciplined rollout. The backtest results, fee resilience, and liquidity profile support commercialization, provided we layer volatility targeting and retain the regime gate to align realized drawdowns with investor expectations. A prudent path is to begin with separately managed accounts or a private vehicle, establish operational cadence and compliance routines, then seed the ETF.

Role. I would serve as Quant PM / Research Lead, responsible for signal R&D, walk-forward testing, and risk systems, alongside an operations/compliance partner for filings, market-making coordination, and AP relationships.

Would I invest? Yes—allocated as a growth sleeve sized for high variance and episodic −40% to −60% drawdowns. The strategy is a credible compounding engine for investors with multi-year horizons and clear drawdown tolerance; it is not a low-volatility or capital-preservation product.

10. References

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