Regime-Adaptive 500-Stock Strategy: Can Systematic Trading Beat S&P 500 Buy & Hold?

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Purpose

Exploring Systematic Trading vs. Buy-and-Hold

- **Objective of the Experiment:** This study aims to critically assess whether a regime-adaptive systematic trading strategy can surpass the performance metrics of a passive buy-and-hold strategy, signaling a shift in investment paradigms.

- **Significance of Market Benchmarking:** The S&P 500 serves as a foundational benchmark, embodying a diverse array of large-cap U.S. equities. It is widely acknowledged as a litmus test for evaluating investment performance across various strategies, including systematic trading.

- **Focus on Market Regime Dynamics:** Understanding market regimes—periods characterized by specific patterns and behavior—is crucial in optimizing strategy performance. The presentation emphasizes the importance of employing technical signals for effective regime detection.

Strategy & Methodology

Enhancing Performance Through Adaptive Techniques

Innovative Strategy Framework:

Universe: S&P 500 stocks with ≥10 years history; SPY as market proxy.
Regime detection: 3-state Gaussian HMM on SPY returns & vol; SMA200 override to “upgrade/degrade” regimes.
Macro safety valve:
- Bullish trend ➜ lighten/disable shorts, raise net/beta floors.
- Bearish trend ➜ more shorts, deeper negative tilt.

Rebalance: Weekly targets with smoothing; gross exposure: 1.2 (bull), 1.0 (neutral), 0.8 (bear).

Signal and Selection:

Momentum: blended 12–1 & 6m returns.
Mean reversion: oversold score = (100 − RSI14)/100 + (−BBZ20).
Cross-sectional ranking: Percentile ranks ∈ [0,1].
Regime-specific rules:
- **Bull:** long winners only.
- **Neutral:** blend momentum + mean reversion; moderate shorts.
- **Bear:** contrarian longs, heavy shorts (losers).

Short gate: shorts only if stock < 200-day SMA.

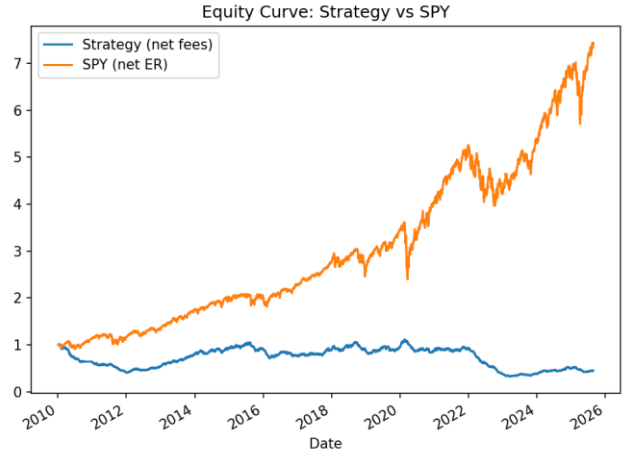
Portfolio Construction and Risk:

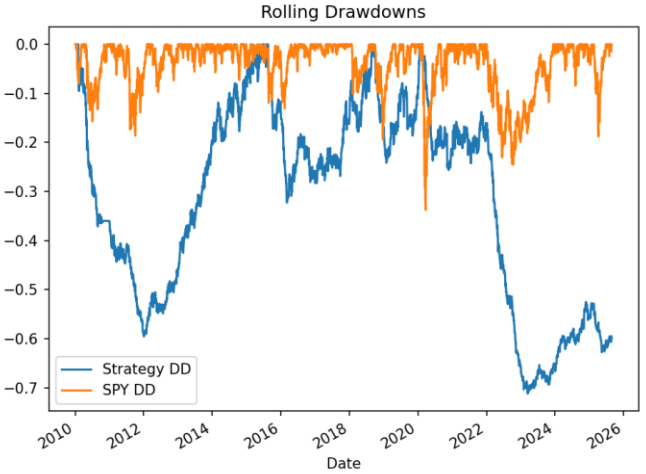
Equal-weight within sleeves ➜ L1 normalized.
Beta targeting: Ridge neutralizer aligns portfolio beta with regime target.
Net tilt: Reallocates long/short balance to meet exposure goals.
Volatility targeting: EWMA scaling to 15% annualized vol (cap/clamps).
Friction modeling: trading costs (bps turnover), borrow costs on shorts, management fees.
Outputs: trade logs, equity curves, rolling betas, SPY comparisons.

Equity Performance & Risk

Evaluating Growth and Stability of the Trading Strategy

- **Equity Curve (Left):**
  - SPY (orange) shows consistent long-term growth.
  - Strategy (blue) lags benchmark over full period.
  - **Costs and regime shifts eroded cumulative returns.**
- **Rolling Drawdowns (Right):**
  - Strategy faced deeper, more prolonged drawdowns (>60%).
  - SPY rarely exceeded ~20% drawdowns.
  - Higher downside risk despite adaptive rules.
- **Key Takeaway:**
  - Strategy failed to outperform buy-and-hold.
  - More volatile and less resilient than SPY.

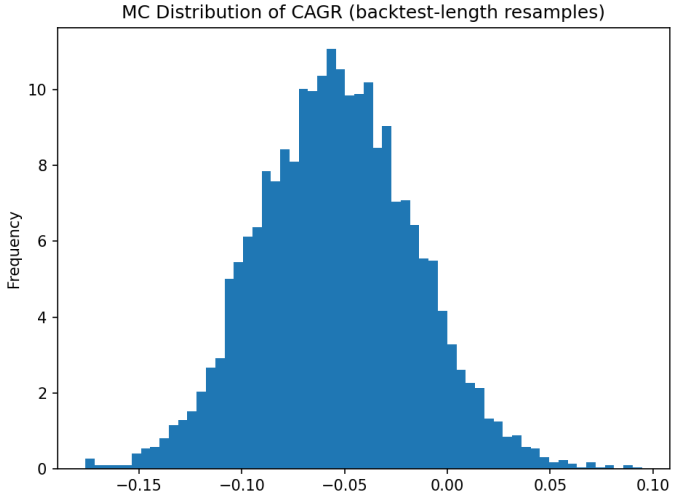


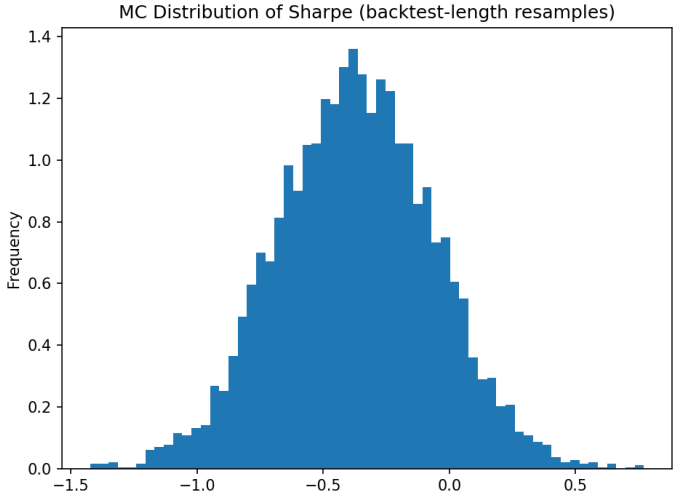


Monte Carlo Risk Metrics

Understanding Growth Potential and Return Ratios

- **CAGR Distribution:** Monte Carlo resampling shows most paths deliver negative compound annual growth rates, with the distribution centered around –5% to –7% annually, highlighting consistent underperformance risk relative to buy-and-hold.
- **Sharpe Ratio Distribution:** The Sharpe histogram is also skewed negative, with most outcomes between –0.5 and –1.0, suggesting the strategy generates poor risk-adjusted returns across resampled histories.
- **Key Takeaway:** Both distributions indicate that even when accounting for randomness in market paths, the strategy struggles to generate sustainable growth or attractive risk-adjusted performance.





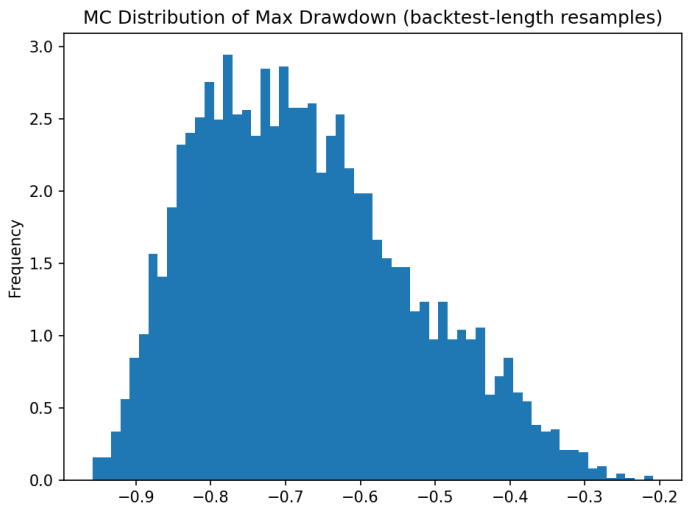
Monte Carlo Drawdowns

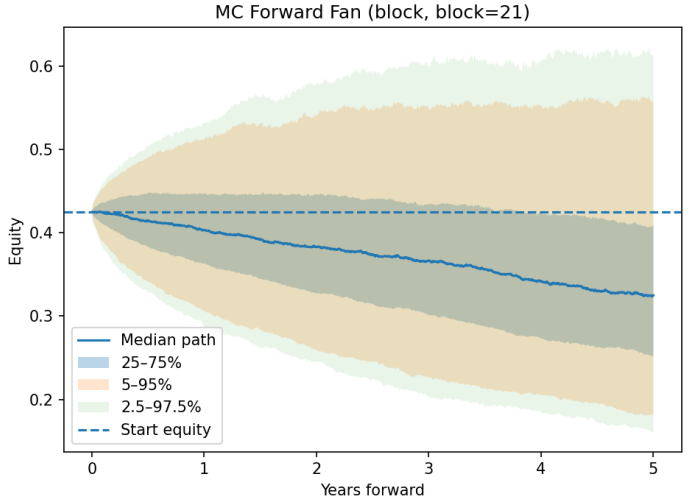
Assessing Vulnerabilities in Down Market Conditions

- **Max Drawdown Frequency Analysis:** The findings reveal considerable incidences of significant drawdowns, often exceeding -40% and reaching -70%. Such occurrences signal a severe vulnerability to adverse market conditions, which must be addressed.

- **Strategic Implications on Risk Management:** Repeated encounters with large drawdowns illustrate the necessity for a robust risk management framework, emphasizing the need to safeguard investor capital during volatile phases effectively.

- **Historical Contextualization:** When viewed through the lens of historical performance, current data corroborates the frequent nature of substantial drawdowns, thereby reinforcing the urgent need for rigorous strategies to manage downside risks effectively.





Modeling Challenges

- **Short sleeve drag:** Borrow costs + anti-momentum shorts → persistent headwind in bull markets.
- **Under-participation in rallies:** Beta/net tilt floors & vol targeting throttled upside capture.
- **Ranking noise:** 50-name universe → unstable cross-sectional ranks, higher turnover.
- **Late regime switches:** HMM + SMA override caused whipsaws at turning points.
- **Net result:** Higher drawdowns & lower CAGR vs. SPY buy-and-hold.

Management Recommendation & Takeaways

Evaluating Systematic Trading's Practical Viability

- **Summary of Key Conclusions:** The analysis concludes that while the systematic framework presents interesting academic insights, its practical implementation underperformed against conventional buy-and-hold strategies, prompting reconsideration of investor approaches.

- **Future Research Opportunities:** Prospective investigations may include examining factor tilts, alternative data sources, and adjustments to beta exposure strategies, all aimed at enhancing systematic trading performance outcomes.

- **Considerations for Management Action:** Given the current findings, launching a fund based on this strategy may not be justified. Introducing a research-centered approach might yield further exploratory insights and refined methodologies.