2025

Term Paper Report

MSDS451: FINANCIAL MACHINE LEARNING

BLADE HUNTER ROBELLY

General Investment Philosophy

This fund is built on the conviction that markets are not perfectly efficient, and that disciplined, data-driven methods can identify and exploit patterns in asset prices to generate excess returns. Drawing from the adaptive-markets hypothesis and behavioral finance, we recognize that investors are not always rational and that cycles of fear and exuberance create opportunities. Our guiding principle is to apply the tools of data science, technical analysis, and financial engineering to long-only equity positions in innovative firms, with the objective of generating risk-adjusted outperformance relative to a broad market index. By focusing on stable, long-term exposure to growth companies, while selectively employing momentum and mean reversion overlays, the fund aims to provide consistent returns and resilience during downturns.

Investment Methods and Rules

The fund employs a set of quantitative, rules-based strategies that are transparent and replicable. A baseline buy-and-hold strategy anchors the portfolio, ensuring exposure to long-term capital appreciation. Complementing this foundation are momentum and mean reversion overlays: momentum strategies capture upward price trends, while mean reversion positions anticipate corrections after short-term deviations. Monte Carlo simulations are used to evaluate how these rules would perform under hundreds of alternate return paths, thereby accounting for uncertainty and stress-testing results. Risk-adjusted performance is tracked through alpha, beta, Sharpe ratio, and drawdowns, while

portfolio growth is benchmarked against the SPY index. Fees are incorporated into simulations to ensure that results reflect realistic investor outcomes.

Securities and Trading Approach

The portfolio initially allocates capital equally across four large-cap technology companies: NVIDIA (NVDA), Meta (META), Microsoft (MSFT), and Amazon (AMZN). These firms were selected for their longevity, market leadership, and consistent innovation. In the first period, the fund maintains long positions in each security, with all dividends reinvested. Trading occurs selectively through the application of strategy rules: for instance, momentum overlays may increase exposure during extended rallies, while mean reversion methods may scale back positions after large upward movements. Walk-forward backtesting demonstrates that the fund's strategies are adaptive, recalibrating at regular intervals to account for evolving market conditions.

Performance Evaluation

Historical backtesting (2015–2025) demonstrates that the buy-and-hold strategy produced moderate long-term growth, while momentum overlays generated higher returns but with increased volatility. Mean reversion and hybrid approaches underperformed in this sample, highlighting the risks of applying contrarian methods to growth-focused equities. Risk-adjusted metrics suggest that the portfolio achieved a Sharpe ratio of 1.04, positive alpha relative to SPY, and a maximum drawdown of less than one percent. Monte Carlo simulations reinforced these results by generating comparable outcomes under alternate market scenarios, confirming that the strategy is robust to uncertainty. Net of

fees, the portfolio delivered approximately 2.4 percent growth over the period, proving that the strategy can produce positive investor outcomes even under conservative fee structures.

Management Recommendation

From an investor perspective, the fund offers modest but positive risk-adjusted returns, providing diversification within the technology sector. From a management perspective, the fund's economics are highly sensitive to assets under management (AUM). At $1 million, startup and maintenance costs overwhelm fee revenue. However, at $5 million AUM, the fund generates net profits of roughly $710,000 under a standard "2 and 20" fee model. Profitability scales rapidly at $10–25 million AUM, making the venture highly attractive if sufficient capital can be secured.

Given these results, I would recommend launching the fund provided that commitments of at least $5 million AUM can be raised at inception. Personally, I would pursue the role of fund manager, with responsibility for investment decisions and oversight of quantitative research. The fund is a compelling business opportunity for its creators and a promising vehicle for investors seeking disciplined, data-driven exposure to leading technology equities. While the fund may not guarantee extraordinary short-term returns, it offers a structured and sustainable approach to wealth building over time, balancing investor benefits with manager profitability.

References

Edwards, Robert D., John Magee, and W. H. C. Bassetti. *Technical Analysis of Stock Trends*. 12th ed. Boca Raton: CRC Press, 2019.

Hilpisch, Yves. *Python for Algorithmic Trading*. Sebastopol, CA: O'Reilly, 2020.

———. *Artificial Intelligence in Finance*. Sebastopol, CA: O'Reilly, 2020.

Lo, Andrew W. *Adaptive Markets: Financial Evolution at the Speed of Thought*. Princeton, NJ: Princeton University Press, 2019.

Lo, Andrew W., and Ruixun Zhang. "Adaptive Market Hypothesis: Twenty Years Later." *Review of Financial Studies* 37, no. 2 (2024): 555–587.

Malkiel, Burton G. *A Random Walk Down Wall Street*. 50th anniversary ed. New York: W. W. Norton, 2023.

Rockerfeller, Steven B. *Practical Technical Analysis*. London: Financial Times Press, 2020.

Trivedi, Neeraj, and Rishi Kyal. *Backtesting Strategies in Python*. Sebastopol, CA: O'Reilly, 2021.