

Research Report: From Zero to Quantitative & AI-AVT Fusion Strategy

Course: GR5398 FinRL by Bruce Yang

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1. Learning Reflections & Gratitude

As a newcomer to the world of quantitative finance, this assignment has been an eye-opening journey. I would like to express my sincere gratitude to the professor for providing such a comprehensive course, which allowed me to bridge the gap between academic theory and real-world financial technology.

First Encounter with Data: Before this course, my understanding of stocks was limited to price fluctuations. For the first time, I learned how to decode the hidden signals in financial statements using logic and Python.

Awe of Risk Management: Building this strategy taught me that "Returns are just the result, while risk management is the soul." Relying solely on AI predictions is not enough; learning how to survive during a market crash is the most profound lesson I've learned.

Practical Knowledge: Transitioning from a novice to being able to implement a full backtest process has been incredibly rewarding. I truly appreciate the opportunity to learn such practical, industry-standard skills.

2. Strategy Comparison

In this report, I compared the Original Baseline Strategy (provided in the course) with my improved AI-AVT (Alpha-Volatility-Timing) Fusion Strategy.

2.1 The Original Baseline Strategy (Teacher's Version)

Logic: Selects the Top 25% of stocks based on AI scores and assigns Equal Weights (1/N) to all selected assets.

Observation: This is a solid foundational framework. However, without a market-timing mechanism, the strategy remains 100% invested even during bear markets, leading to significant drawdowns.

2.2 The AI-AVT Fusion Strategy (Optimized Version)

To enhance performance and stability, I use:

Concentrated to Top 15 and 95%: Instead of a broad selection, I narrowed the focus to the top 15 stocks and top 5% to capture the strongest predictive signals.

Inverse Volatility Weighting: Instead of equal weighting, I allocated more capital to stocks with steadier growth

SMA-200: I used a "Safety Brake" using the SPY 200-day Moving Average. When the market trend turns bearish, the system automatically reduces exposure to 10% to protect the principal.

Strategy Comparison Table

Dimension	Baseline Strategy (Teacher's)	AI-AVT Fusion Strategy (Ours)	Improvement Significance
Weighting	Equal Weight (1/N)	Inverse Volatility	Reduces impact of high-risk stocks
Concentration	Broad (Top 25%)	Elite (Top 15)	Maximizes Alpha per unit of capital
Defense	None (100% Invested)	SMA-200 Timing	Protects principal in bear markets
Risk Control	Basic	Dynamic Risk-Adaptive	Higher Sharpe Ratio and lower Drawdown

3. Conclusion & Future Outlook

The fusion strategy represents a significant leap from a simple selection model to a mature portfolio management system:

Thanks to the timing switch, the strategy demonstrated much better resilience during volatile periods like 2020.

Quality of Returns approach smoothed the equity curve, resulting in a higher Sharpe Ratio.

Acknowledgment: I am deeply grateful for the guidance from the Bruce Yang and the TA team. This course has not only taught me code and algorithms but also a scientific way of thinking—finding certainty in an uncertain market.