

The Laboratory Letters

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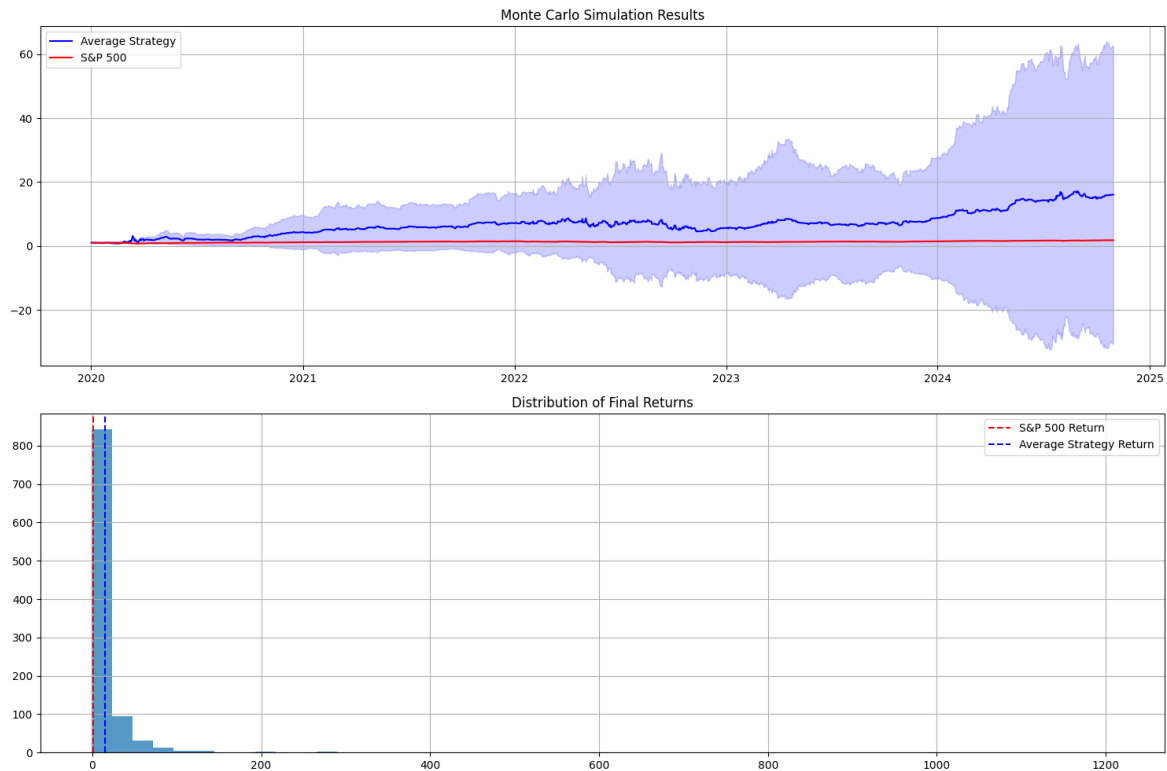
Abstract

In this edition of The Letters, I use AI to summarize some code that I have thrown together. This code trades SnP 500 ETFs each day starting at the open and holding until the next day. Unfortunately, I redacted the actual parameters but if you would like to follow along with the code feel free! After work, I have been dedicating most of my time to this code which is why there was little time to write about it for the newsletter.

Thank you and enjoy!

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This isn't a dream, this is a simulated return of going day by day and making a prediction using margin and a 3x leverage SnP500 ETF. Then buying or shorting the following day. I will track this algorithm for a year using a spreadsheet and then try to put actual money into it.

1 The System

This code represents a sophisticated algorithmic trading system that integrates technical analysis, machine learning, and risk management into a comprehensive trading strategy. At its core, the system utilizes a combination of Bollinger Bands and other technical indicators to generate trading signals, which are then refined through a machine learning approach using XGBoost classification.

The foundation of the system's technical analysis lies in its implementation of Bollinger Bands, calculated using a [REDACTED]-day moving average window and a non-standard [REDACTED] standard deviation multiplier. This more conservative approach than the typical 2.0 standard deviations suggests a focus on reducing false signals. The system enriches the basic Bollinger Bands with derived metrics including the percentage position within the bands, the bandwidth as a volatility indicator, and crossing signals when the price moves beyond the upper or lower bands. These indicators are complemented by traditional technical analysis tools including a [REDACTED]-day Relative Strength Index, Moving Average Convergence Divergence calculated using [REDACTED] and [REDACTED]-day exponential moving averages, and volume-based metrics including a [REDACTED]-day moving average of volume and the current volume ratio.

The machine learning component of the system employs XGBoost, a gradient-boosting framework known for its performance in financial applications. The model is trained on a feature set that combines the previously calculated technical indicators, creating a robust prediction framework. The XGBoost classifier is configured with carefully tuned hyperparameters, including a maximum depth of [REDACTED], learning rate of [REDACTED], and [REDACTED] estimators, suggesting significant optimization work has been done to balance model complexity with performance. The training process implements a train-validation split to ensure the model's generalizability.

Risk management and position sizing are handled through a sophisticated simulation framework that accounts for margin trading. The system allows for leveraged positions up to 50% while incorporating realistic trading costs including a 7% annual margin interest rate. The position sizing algorithm dynamically adjusts based on the current portfolio value and implements a maintenance margin requirement of 25%, automatically handling margin calls if the portfolio value drops below critical levels. This conservative approach to risk management suggests the system is designed for real-world trading conditions where capital preservation is as important as generating returns.

The system's robustness is validated through an extensive Monte Carlo simulation framework that runs [REDACTED] iterations with different random seeds. This approach generates distributions of key performance metrics including final returns, Sharpe ratios, and maximum drawdowns, providing a comprehensive view of the strategy's potential performance across different market conditions. The simulation results are carefully tracked and analyzed, with the system maintaining detailed records of portfolio values, returns, leverage ratios, and margin usage throughout each simulation run.

A particularly noteworthy feature is the ensemble prediction mechanism that aggregates predictions from multiple models to generate more stable trading signals. This approach runs [REDACTED] different instances of the model with varying random seeds, combining their predictions through both mean and median probabilities. This ensemble approach helps mitigate the risk of any single model's potential instability or overfitting.

2 Brian Wesbury

This quote is a take on our purpose as a society.

The "human condition" is always to push forward for the better and economics is the study of that process.

The point of society is to be progressive and always work to create a better system. We need economics to better optimize that system and understand the underlying movers of our society. What we have to do is come to terms that it is not perfect, and never will be perfect, but we can try to reach the limit.

3 Disclaimer

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