

Report of my Advanced Version of Backtesting Simulation Framework

This advanced version of the backtesting framework integrates adaptive trading strategies, synthetic data generation, and multi-asset market simulation. It models realistic market behavior using correlated returns and evaluates portfolio performance with metrics like Total Return, Sharpe Ratio, and Max Drawdown. By combining real and GAN-generated synthetic data, the framework aims to stress-test strategies under diverse market conditions.

At its core is an **AdaptiveStrategy**, which employs a Random Forest model to predict returns based on technical indicators (e.g., SMA, volatility, momentum). The strategy dynamically adjusts portfolio positions (long, short, neutral) during the simulation, leveraging machine learning to adapt to evolving market trends and conditions.

The current project output shows strong performance on real data, with metrics such as Total Return (56.54%), Annualized Return (49.21%), and Sharpe Ratio (1.66).

However, the synthetic data results (all metrics at 0.00) highlight challenges in generating realistic data or effectively integrating it into the simulation, limiting the ability to test strategies beyond historical scenarios.

This issue may stem from synthetic data not being properly initialized or passed into the simulation. Further debugging and improvements are needed to enhance the realism of GAN-generated data and ensure seamless integration into the framework, unlocking its full potential for the future diverse scenario testing.