

A novel approach to trading strategy parameter optimization, using double out-of-sample data and walk-forward techniques on cryptocurrency market

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Abstract

This study introduces a novel approach to walk-forward optimization by parameterizing the lengths of training and testing windows. We demonstrate that the performance of a trading strategy using the Exponential Moving Average (EMA) evaluated within a walk-forward procedure based on the Robust Sharpe Ratio is highly dependent on the chosen window size. We investigated the strategy on intraday Bitcoin data at six frequencies (1 minute to 60 minutes) using 81 combinations of walk-forward window lengths (1 day to 28 days) over a 19-month training period. The two best-performing parameter sets from the training data were applied to a 21-month out-of-sample testing period to ensure data independence. The strategy was only executed once during the testing period. To further validate the framework, strategy parameters estimated on Bitcoin were applied to Binance Coin and Ethereum. Our results suggest the robustness of our custom approach. In the training period for Bitcoin, all combinations of walk-forward windows outperformed a Buy-and-Hold strategy. During the testing period, the strategy performed similarly to Buy-and-Hold but with lower drawdown and a higher Information Ratio. Similar results were observed for Binance Coin and Ethereum. The real strength was demonstrated when a portfolio combining Buy-and-Hold with our strategies outperformed all individual strategies and Buy-and-Hold alone, achieving the highest overall performance and a 50% reduction in drawdown. A conservative fee of 0.1% per transaction was included in all calculations. A cost sensitivity analysis was performed as a sanity check, revealing that the strategy's break-even point was around 0.4% per transaction. This research highlights the importance of optimizing walk-forward window lengths and emphasizing the value of single-time out-of-sample testing for reliable strategy evaluation.

Keywords: Testing Architecture, Optimization Techniques, Cryptocurrencies, Moving Averages, Algorithmic Trading, Intraday Trading, High Frequency Trading, Bitcoin, Walk-Forward trading, rolling window optimization GMADL

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