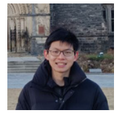
Problem Statement:

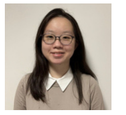
How do we make the Mean-Variance Optimisation (MVO) Model more dynamic?


Akshay


Dean


Justin


Socka


Vera

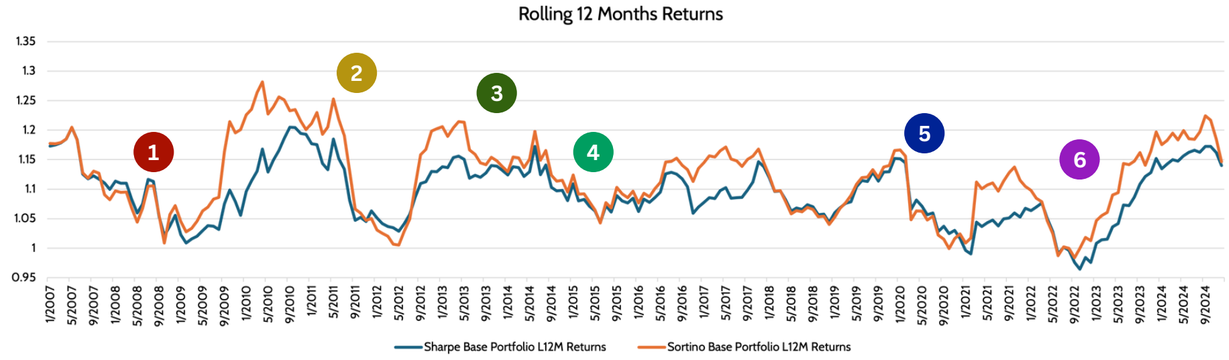
What is MVO?

MVO uses historical data to balance risk and return, aiding portfolio allocation by maximising returns for a given risk level or minimising risk for a desired return.

Main Issues with MVO

MVO relies on historical data, cannot time the market, and penalises both positive and negative deviations, making it less effective in changing market conditions.

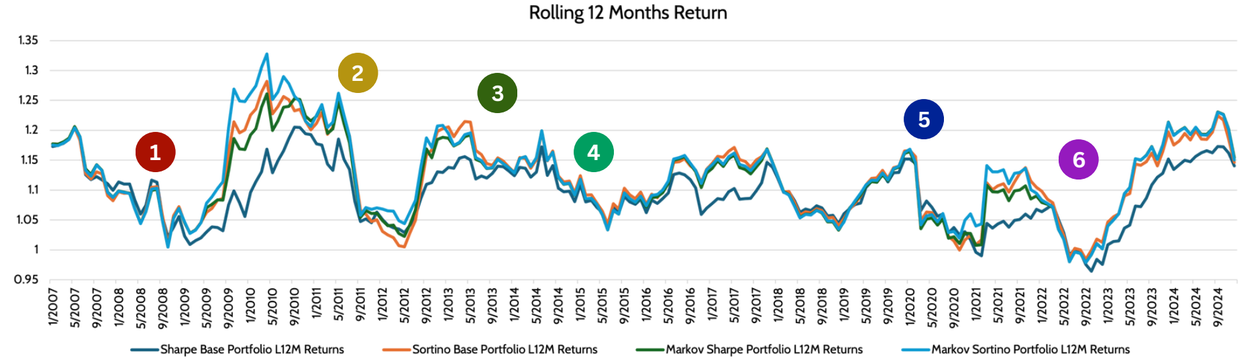
Sortino Ratio



Sortino ratio focuses solely on downside risk, unlike the Sharpe ratio which penalises all volatility including positive returns. Since the goal in portfolio optimisation is to minimise losses the Sortino ratio offer a more intuitive risk adjusted return measure.

By reacting to only negative deviations, the Sortino based MVO responds more quickly to sharp market declines, making the model more adaptive and protective during volatile periods by adjusting allocation to reduce exposure to falling assets.

Hidden Markov Model: Bull and Bear



HMM models the market as switching between bull and bear states, using past returns to assign probabilities and adjust strategies accordingly.

HMM Sharpe vs. Traditional Sharpe: The HMM-adjusted Sharpe ratio dynamically adapts to market regimes by reducing exposure in bear markets and increasing it in bull markets. This approach minimises unnecessary risk-taking and enhances the Sharpe ratio.

HMM Sortino vs. Traditional Sortino: While HMM reduces exposure during bear markets, the added benefit is less pronounced since the Sortino ratio filters out upside volatility and focuses solely on downside risk. As a result, the regime-switching mechanism of HMM overlaps with what Sortino does.

Key Events

Key Events are highlighted in the graphs above to show which method performed better in terms of Rolling 12 Month Returns.

1. **2007-2009** Global Financial Crisis
2. European Debt crisis **2010**
3. **2013** Taper Tantrum
4. China Slowdown **2015**
5. **2020** COVID-19 Crisis
6. DM Tightening **2022**

Recommendations

The model that generates the highest market returns depends on the market state.

Stable Market: Sharpe Base
Sharp Market Decline: Sortino Base
Market Recovery: HMM Sortino