FAC-WP

Question 2: Strategy Design, Backtesting, and Comparative Analysis

The design and assessment of a trading strategy based on several technical indicators are presented in this section. A number of different configurations were tested in addition to the final strategy. These examples demonstrate the drawbacks of particular indicator combinations and parameter selections and support the ultimate design choices..

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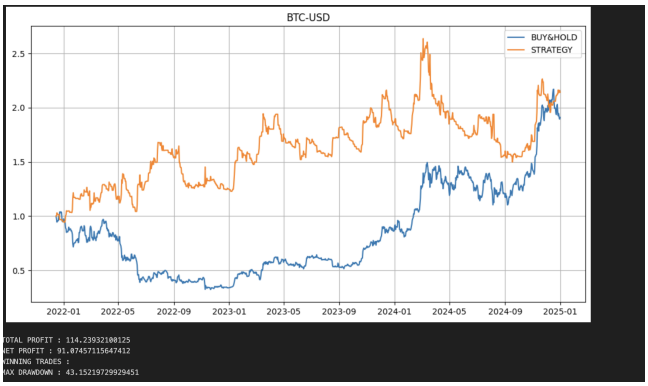
Case 1: Strategy Without Volatility Filter (VIX Removed)



Description: In this instance, momentum and volume indicators were kept, but the volatility filter based on the VIX index was eliminated.

Observation: The strategy was characterized by many entries during the phases of high uncertainty in the markets, causing large drawdowns and unsteadiness in equity curve growth. The strategy could not have been able to distinguish between stable and unstable markets in the absence of the volatility control. The strategy would have entered the markets during the phases of high risk.

Case 2: VIX Removed and Asset-Based Volatility Introduced

Description: In this configuration, the external volatility index (VIX) was removed and replaced with realized volatility computed directly from the asset's returns.

Observation: Compared to Case 1, the risk-adjusted performance shows a smoother growth of equity with lower drawdowns. The strategy performed poorly during extended ranging markets.

Interpretation: Volatility that is asset-specific better captures risk of the instrument being traded. Without a strong trend filter, volatility control is not sufficient.

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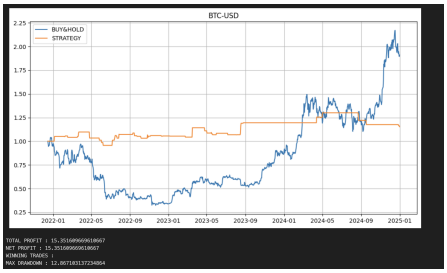
Case 3: Three Indicators Only with Parameter Variations



Description: This case evaluates strategies using only three indicators (momentum, volume, and volatility), with different parameter combinations to assess sensitivity.

Observation: Higher short-term profits were generated by certain parameter settings, but they also caused volatility to rise. Other arrangements had more stability but always lagged behind the market.

Conclusion: Even with parameter tuning, a lack of a long-term trend filter will not help. Failed or fragile combinations are not robust across all market regimes.

Risk Management Framework

The risk management was key in drafting the final strategy. Instead of trying to maximize raw returns, the strategy sought to control downside risk and return variation, thereby enhancing risk-adjusted performance measures, such as the Sharpe and Sortino ratios.

A Simple Moving Average (SMA) long-term trend filter and dynamic position sizing based on realized volatility were the two main risk management techniques used.

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Role of Simple Moving Average (SMA) as a Regime Filter

A long-term Simple Moving Average helped identify favorable market conditions. Trades were allowed only when the asset price stayed above the chosen SMA. This showed a bullish trend.

Rationale:

- Trading during bearish or sideways regimes significantly increases drawdowns.
- Momentum and volume indicators generate frequent false signals in non-trending markets.
- The SMA filter restricts participation to periods where trends are more persistent.

By excluding prolonged downtrends, the SMA-based regime filter reduced exposure during adverse market conditions. This directly lowered maximum drawdown and reduced the volatility of strategy returns, contributing to higher Sharpe and Sortino ratios.

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Volatility-Based Position Sizing

Besides the directional signals, realized volatility calculated from the asset's returns was used to dynamically adjust position sizing.

The daily returns were converted into a rolling standard deviation to determine realized volatility, and a volatility target was smoothed out by means of a longer rolling average. Position size was then scaled down depending on the current volatility:

$$PositionSize_t \propto \frac{VOL_{target}}{VOL_t}$$

Effect on Risk:

- In times of high volatility, traders decreased their positions, thereby containing losses during the sudden price movements.
- In periods of stability, traders increased their positions, thus being able to take part in the lasting trends better.

The implementation of this approach of volatility targeting not only decreased the total return volatility but also the downside volatility, thereby stabilizing the equity curve.

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Impact on Risk-Adjusted Performance

The application of SMA-based regime filtering along with volatility-based position sizing caused the following effects:

- Limited maximum drawdown as a result of decreased risk during bad regimes.
- Less aggressive return distribution with smaller extreme losses.
- Higher Sharpe ratio as a result of lower overall return volatility.
- Larger Sortino ratio as a consequence of major downside deviation reduction.

These advancements were notably reached without over-tuning the parameters, thus maintaining the system's robustness in varied market conditions.

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Summary

The ultimate methodology puts risk control first, while sailing into aggressive return maximization harbor. The application of trend-based regime filtering coupled with adaptable position sizing, the strategy illustrates that disciplined risk management is the key to achieving stable and strong performance even during market volatility.

Final Strategy Selection

Based on the comparative analysis, the final strategy incorporates:

- Momentum confirmation (ROC)
- Volume confirmation (A/D Line)
- Long-term trend filtering (SMA-based regime filter)
- Asset-specific volatility-based position sizing

This configuration demonstrated improved robustness, lower drawdowns, and superior risk-adjusted performance relative to the tested alternatives.

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Key Takeaway

The comparative analysis indicates that the performance will be unstable if the volatility control is completely removed or only parameter optimization is relied upon. Sound trading methods will demand filtering by market conditions, controlling risk, and applying validation across several indicator groups as a minimum.