RSI-Based Trading Strategy for Bitcoin (BTC-USD)

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1 Thesis

This report investigates the performance of a momentum-based trading strategy applied to Bitcoin (BTC-USD) from January 2022 to January 2023. The strategy utilizes the Relative Strength Index (RSI) as a key indicator to identify overbought and oversold conditions, generating buy and sell signals. The objective is to determine whether this RSI-based strategy delivers superior risk-adjusted returns compared to a simple buy-and-hold approach. Although momentum strategies like this one can exploit market trends, they may also face challenges such as delayed reactions in fast-changing markets and vulnerability to significant volatility, which is especially common in cryptocurrency markets like Bitcoin.

2 Risk Concerns

Despite the potential benefits of momentum strategies, this approach carries several risks, particularly in highly volatile assets such as Bitcoin:

- **Lagging Indicator**: The RSI, as a momentum indicator, reacts to past price data. This delay can result in suboptimal trade entries or exits, particularly during periods of rapid market reversals.
- **High Volatility and Drawdowns**: Bitcoin is known for its extreme volatility. The RSI strategy, like buy-and-hold, may suffer from significant drawdowns during market crashes or sudden price movements, as reflected in the maximum drawdown results.
- **Transaction Costs**: This analysis assumes zero transaction costs. In practice, frequent buying and selling due to RSI signals can significantly reduce profitability, as high transaction fees and slippage often affect performance.
- **Choppy Markets**: In sideways or highly volatile markets, false signals generated by RSI can result in frequent trades, reducing overall performance compared to a buy-and-hold strategy.

3 Technical Indicators and Strategy

The strategy employs a key technical indicator—the Relative Strength Index (RSI)—to generate buy/sell signals based on momentum extremes:

- **RSI (Relative Strength Index)**: A 14-day RSI is calculated to identify overbought and oversold conditions. The strategy generates buy signals when the RSI falls below 30 (indicating oversold conditions), and sell signals when the RSI exceeds 70 (indicating overbought conditions).

The strategy buys Bitcoin when the buy signal is triggered (RSI <30) and sells when the sell signal occurs (RSI >70). This approach is compared against a simple buy-and-hold strategy.

4 Results

The backtest was conducted using an initial capital of $10,000, running from January 2022 to January 2023, and compared to a buy-and-hold strategy over the same period.

4.1 Sharpe Ratio

The Sharpe Ratio measures the strategy's risk-adjusted return. A higher Sharpe Ratio indicates better returns relative to the risk taken.

- **RSI Strategy Sharpe Ratio**: -0.30
- **Buy-and-Hold Sharpe Ratio**: Not applicable due to insufficient meaningful returns or volatility.

A negative Sharpe Ratio for the RSI strategy suggests that its risk-adjusted returns were poor.

4.2 Maximum Drawdown

The Maximum Drawdown captures the largest portfolio decline from a peak to a trough. Both the RSI strategy and the Buy-and-Hold approach experienced significant drawdowns.

- **RSI Strategy Maximum Drawdown**: -55.34%
- **Buy-and-Hold Maximum Drawdown**: -66.74%

The RSI strategy limited losses better than the Buy-and-Hold approach, but both approaches experienced substantial drawdowns due to Bitcoin's high volatility.

4.3 Price with Buy/Sell Signals

Figure 1 shows the Bitcoin price chart with the RSI buy/sell signals overlaid. Green triangles indicate buy signals (RSI <30), while red triangles indicate sell signals (RSI >70). The signals capture momentum extremes, with buys occurring in oversold conditions and sells triggered during overbought conditions. This plot highlights how the strategy attempts to exploit price reversals.

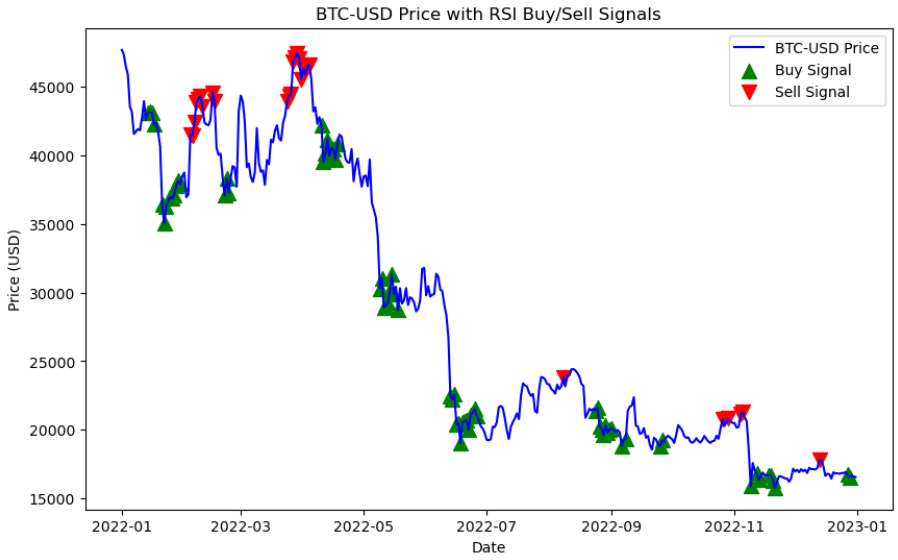

Figure 1: Bitcoin Price with RSI Buy/Sell Signals

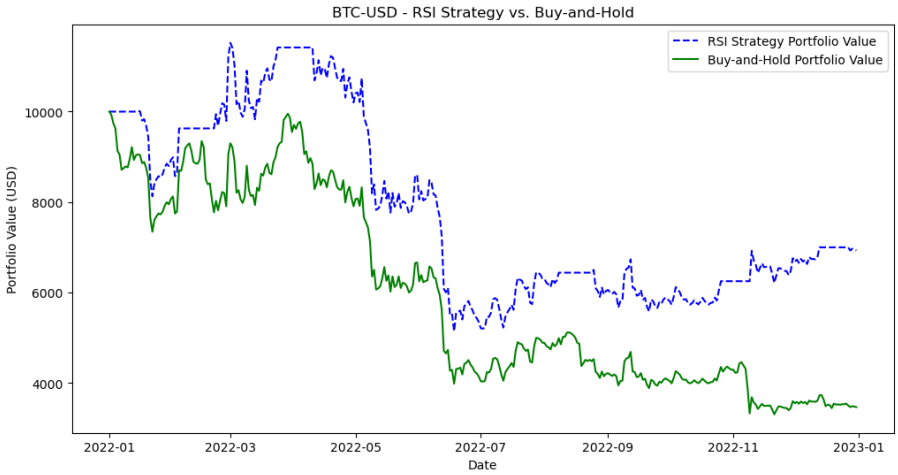

Figure 2: Strategy vs. Buy-and-Hold Portfolio Value

4.4 Strategy vs. Buy-and-Hold Portfolio Value

Figure 2 compares the portfolio values of the RSI-based strategy with a simple Buy-and-Hold approach. Both portfolios start with $10,000 of initial capital. The RSI strategy attempts to time the market by entering and exiting positions based on RSI signals, whereas the Buy-and-Hold approach continuously holds Bitcoin throughout the period. Despite the RSI strategy's poor risk-adjusted return, it preserves more capital than the Buy-and-Hold strategy.

4.5 RSI with Buy/Sell Signals

Figure 3 displays the RSI values over time, with key buy and sell signals marked. Buy signals occur when the RSI falls below 30, indicating potentially oversold conditions. Sell signals occur when the RSI rises above 70, indicating overbought conditions. The RSI helps the strategy avoid buying at overpriced levels and selling during panic sell-offs.

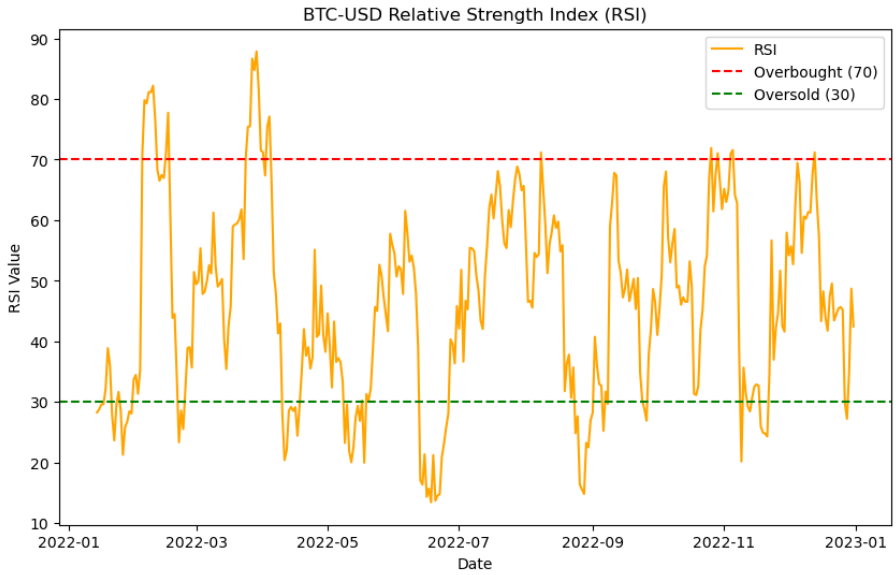

Figure 3: RSI with Buy/Sell Signals

5 Explanation of the Results

5.1 Sharpe Ratio Analysis

The RSI strategy's negative Sharpe Ratio of -0.30 indicates that the strategy underperformed on a risk-adjusted basis. Despite preserving more capital than Buy-and-Hold, the strategy's high volatility and negative returns relative to risk impacted its performance.

5.2 Maximum Drawdown Discussion

The maximum drawdowns for both strategies were significant, with the RSI strategy experiencing a -55.34% drawdown compared to Buy-and-Hold's -66.74%. While the RSI strategy outperformed Buy-and-Hold in limiting losses, it was still highly vulnerable to Bitcoin's steep declines.

6 Extensions

To enhance the performance of this RSI-based strategy, several extensions could be considered:

- **Stop-Loss Mechanisms**: Implementing a stop-loss to limit losses during market crashes could reduce drawdown risks.
- **Adaptive RSI Parameters**: Adjusting the length of the RSI or its overbought/oversold thresholds based on volatility could improve performance.
- **Diversification**: Adding other cryptocurrencies or assets to the portfolio could reduce risk and improve returns.
- **Transaction Costs**: Factoring in transaction fees would give a more realistic view of the strategy's profitability.