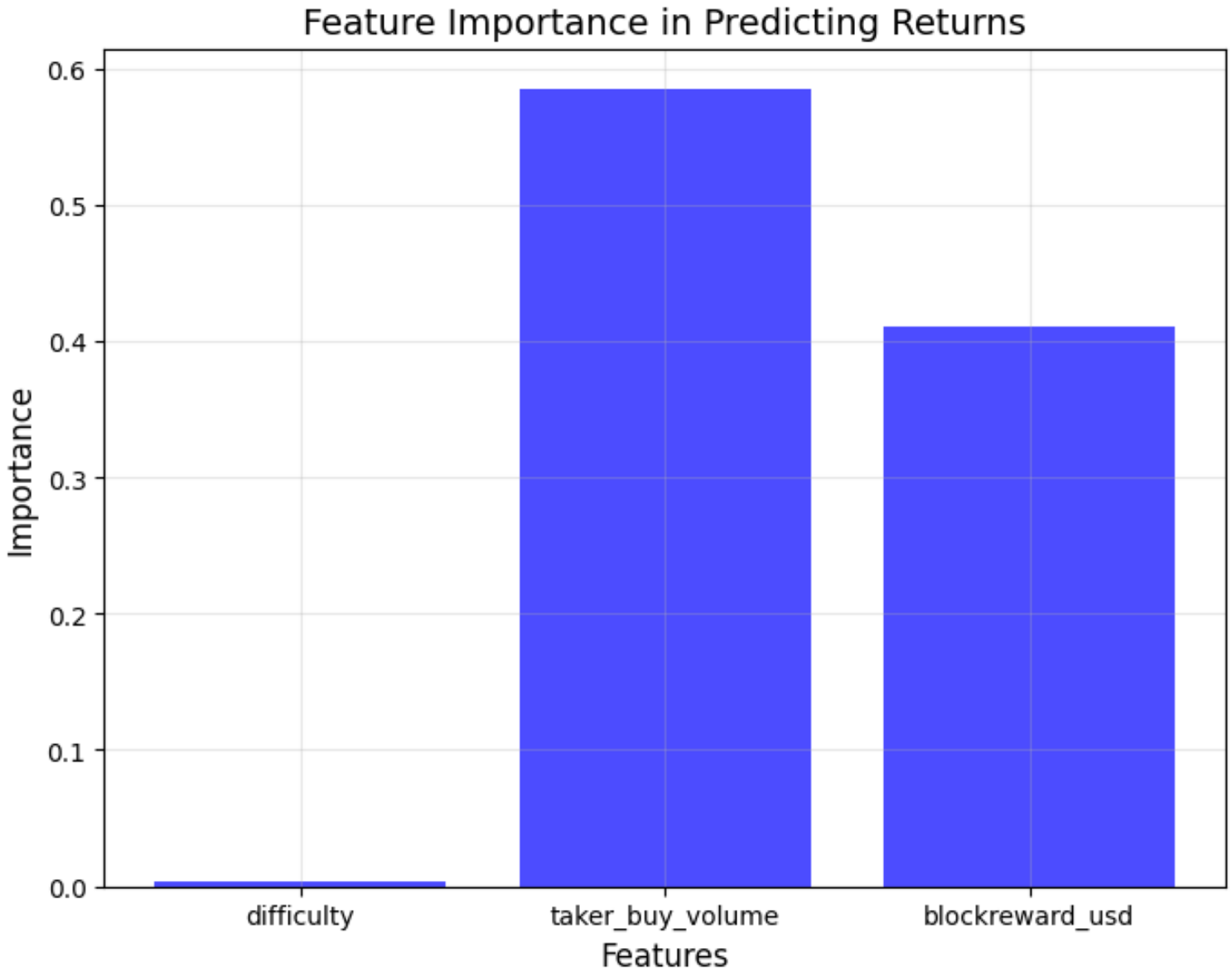
GROUP NAME:
OTAKGONE

Factors Influencing Cryptocurrency Prices

- **Trading Volume**: The demand and supply effects of buying and selling.
- **Mining Rewards**: Incentives for miners and their impact on supply.
- **Market Trends**: How network difficulty influences prices.

Key Factors Influencing Prices

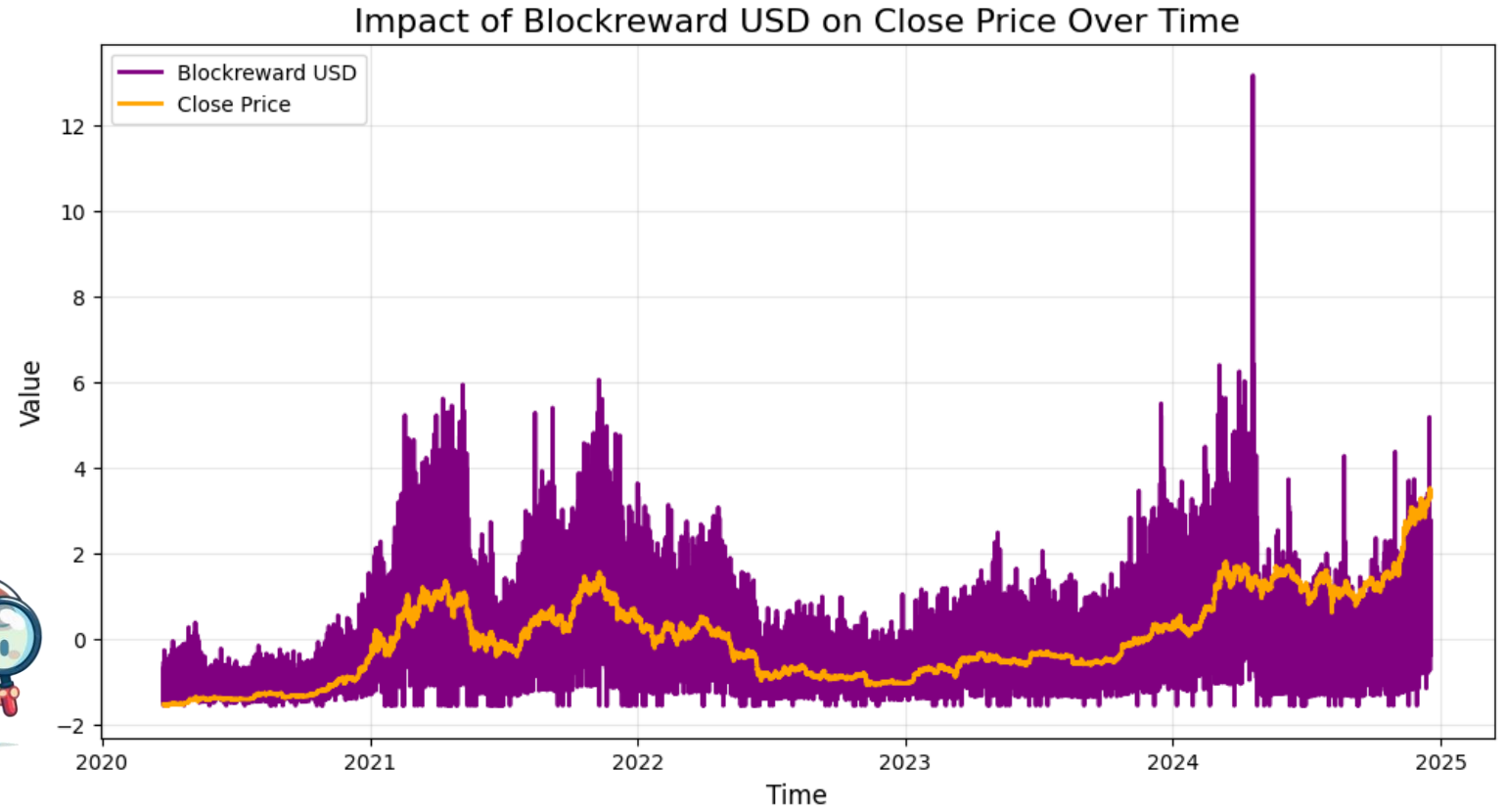
Feature Importance Chart: Highlight taker_buy_volume (59%) and blockreward_usd (41%) as key drivers of market behavior.



Impact of Trading Volume on Prices

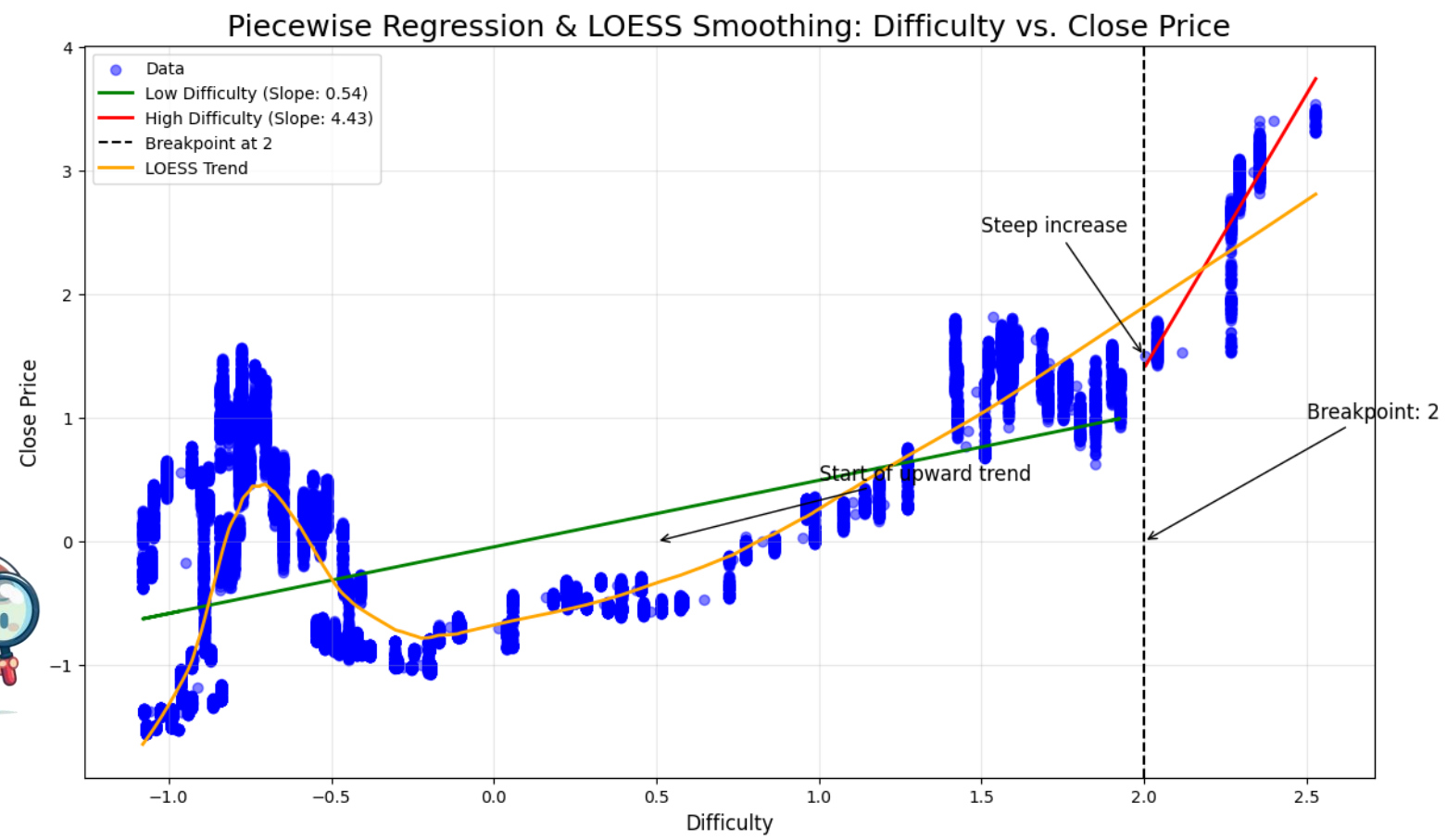
Key Observation:
Higher buy volumes lead to price increases, while higher sell volumes correlate with price drops.

How Mining Rewards Impact Prices



Key Observation:
Increased mining rewards attract more miners, affecting supply and potentially pushing prices higher.

The Role of Mining Difficulty in Price Trends



Observation:
Difficulty shows distinct trends at a breakpoint of :

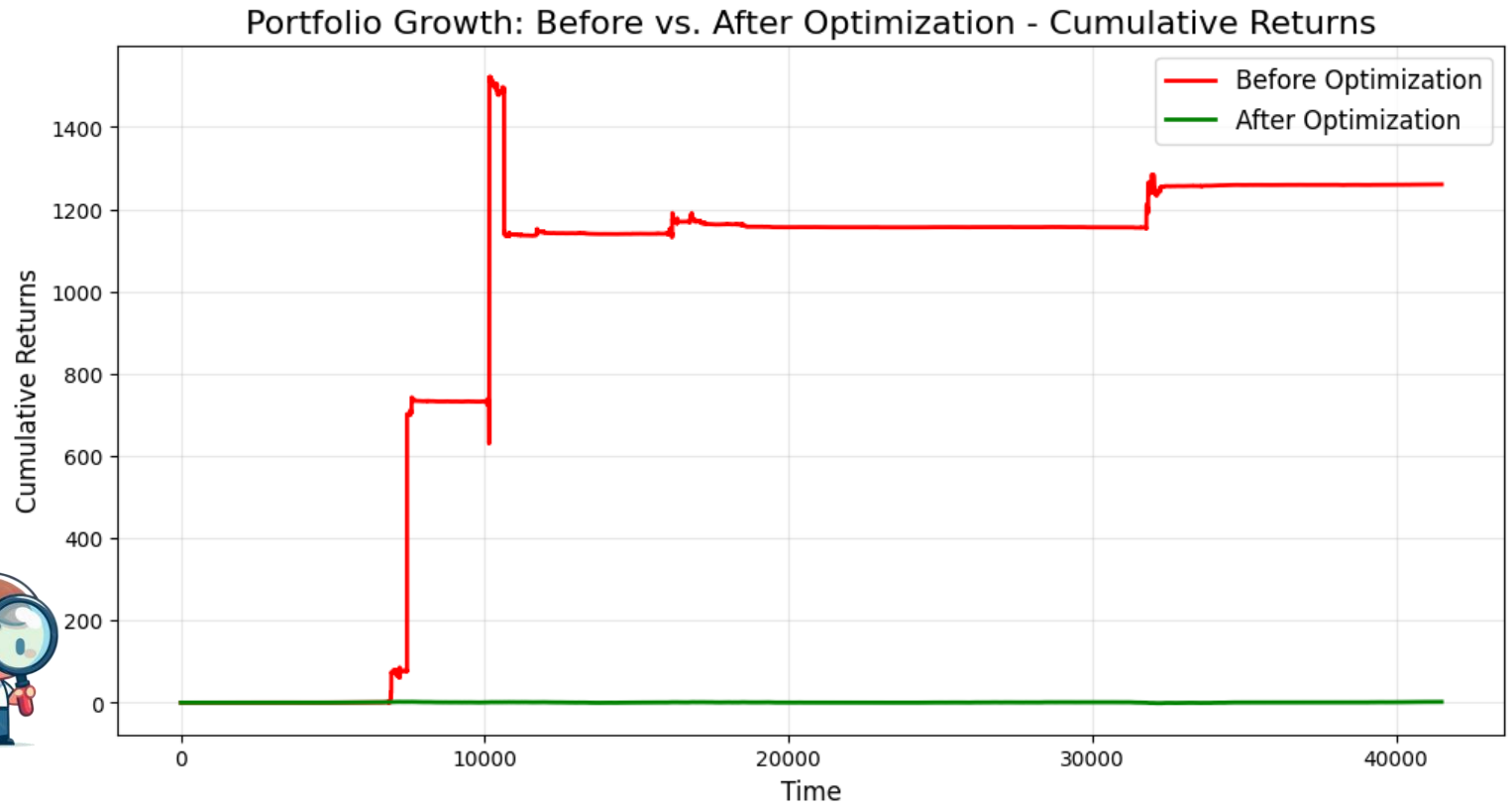
Piecewise Regression :

- Below the breakpoint, the price increases gradually.
- Above the breakpoint, the price rises steeply.

LOESS Smoothing :

- A gradual upward trend starts at lower difficulty levels.
- A steep increase is observed as difficulty rises above 2.

Optimizing Trading Strategies

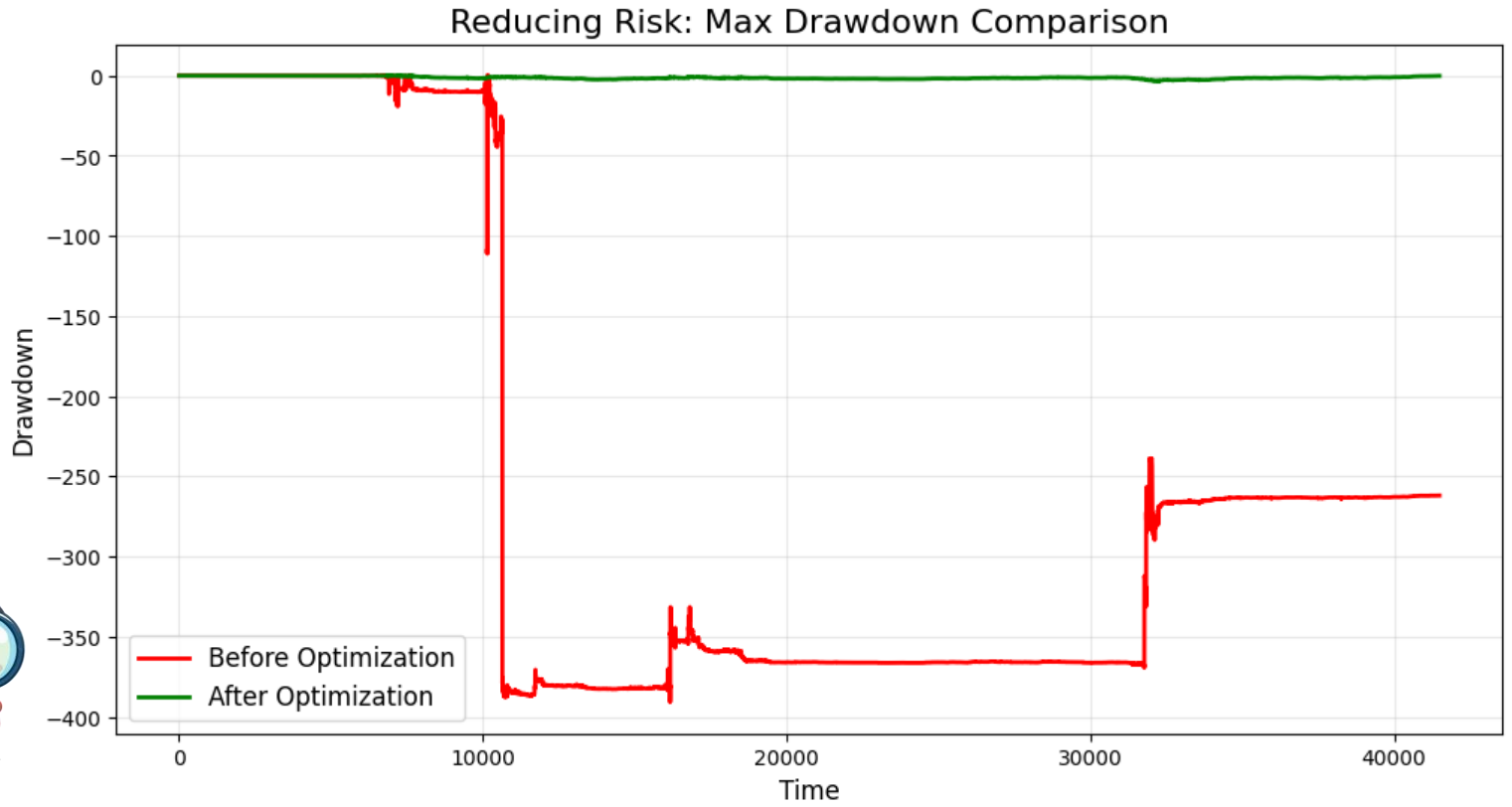


Key Observation:

- The unoptimized strategy had volatile growth with sharp ups and downs, making it unpredictable.
- After optimization, the strategy showed smoother, consistent returns over time.

- **Red Line:** Unoptimized strategy (volatile growth, sharp fluctuations).
- **Green Line:** Optimized strategy (smoother, consistent returns).

Risk Management Improvements

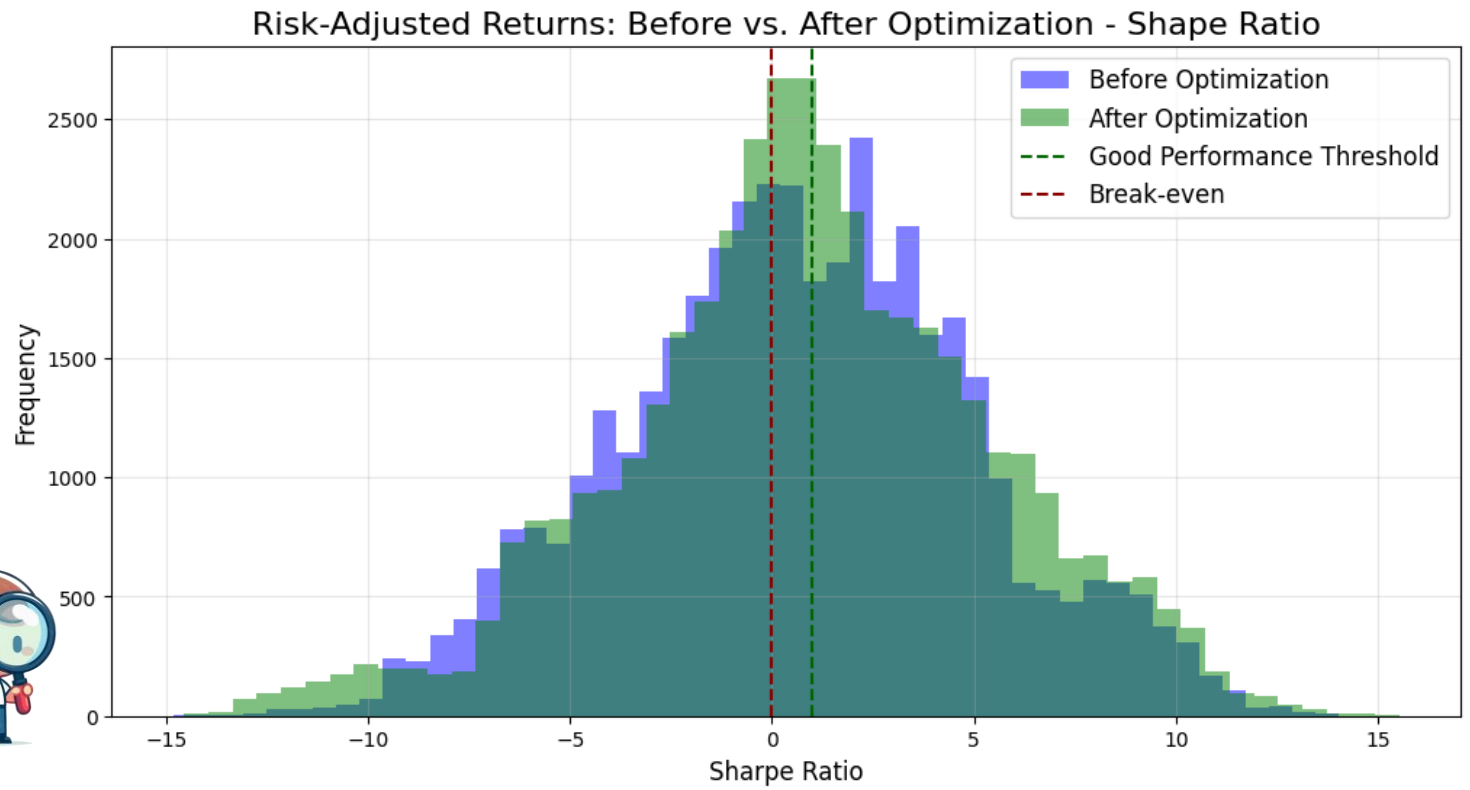


Key Observation:

- The unoptimized strategy suffered frequent and deep losses, exposing it to significant risks.
- The optimized strategy showed smaller and less frequent losses, demonstrating improved risk management.

- **Red Line:** Unoptimized strategy (frequent, deep losses).
- **Green Line:** Optimized strategy (smaller, less frequent losses).

Risk-Adjusted Returns

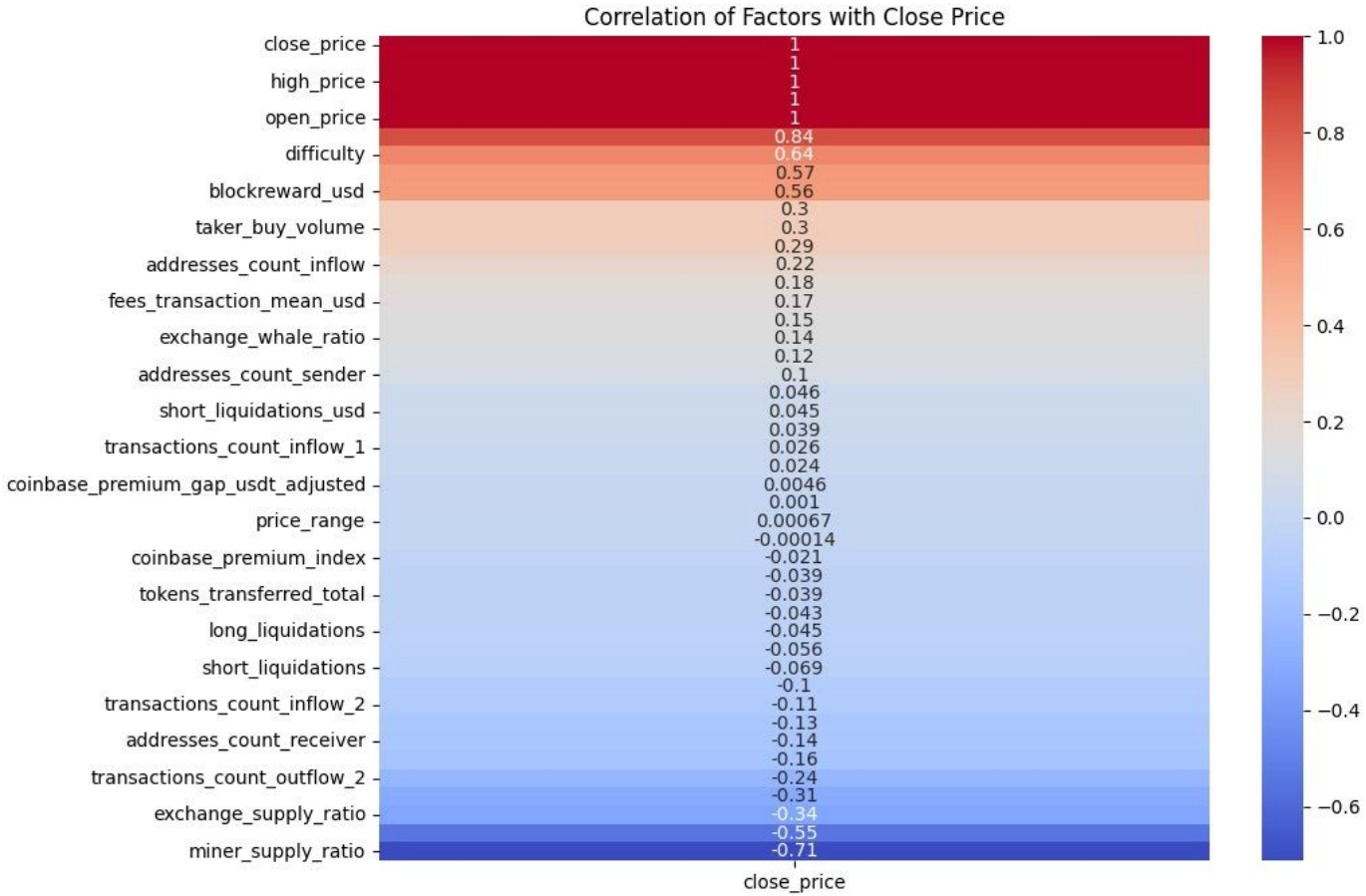


Key Observation:

- The unoptimized strategy had a wide range of negative Sharpe ratios, indicating poor risk-return balance.
- The optimized strategy shifted towards positive Sharpe ratios, with narrower distribution and improved consistency.

- **Blue Bars:** Wide and negative Sharpe ratios for the unoptimized strategy.
- **Green Bars:** Positive and narrower distribution for the optimized strategy.

Assumptions



1. **Mining Difficulty and Price Relationship**
- Strong positive correlation (0.64) suggests that as mining difficulty increases, Bitcoin price tends to increase.
- Higher mining difficulty indicates network security and miner confidence, potentially driving price appreciation

2. Block Reward and Price Dynamics
- Moderate positive correlation (0.56) with price indicates significant relationship
- Assumption: Block rewards in USD reflect both mining profitability and market conditions, influencing miner behavior and price

3. Taker Buy Volume Format
- Lower but positive correlation (0.30) with price suggests some price influence
- Assumption: Higher taker buy volume indicates aggressive buying pressure, potentially leading to price increases

Model

```python
models = {
    'XGBoost': xgb.XGBRegressor(
        n_estimators=300,
        learning_rate=0.01,  # Reduced from 0.05
        max_depth=4,         # Reduced from 6
        min_child_weight=3,  # Increased from 1
        subsample=0.7,
        colsample_bytree=0.7,
        reg_alpha=0.5,
        reg_lambda=1.5,
        random_state=42
    ),
    'LightGBM': LGBMRegressor(
        n_estimators=300,
        learning_rate=0.01,  # Reduced from 0.05
        max_depth=4,         # Reduced from 6
        num_leaves=15,       # Reduced from 31
        min_child_samples=30,# Increased from 20
        subsample=0.7,
        colsample_bytree=0.7,
        reg_alpha=0.5,
        reg_lambda=1.5,
        random_state=42
    )
}
```

Key Observation:

- Model shows predictive capability (low RMSE in some folds)
- Current trading performance needs improvement
- Strategy requires risk management implementation

Trading Performance Results

```
Training XGBoost...

Fold 1 Results:
RMSE: 0.52
Sharpe Ratio: -1.82
Max Drawdown: -821.74%
Strategy Type: Trend Following

Fold 2 Results:
RMSE: 0.18
Sharpe Ratio: -1.19
Max Drawdown: -13056.35%
Strategy Type: Mean Reversion

Fold 3 Results:
RMSE: 1.49
Sharpe Ratio: -2.82
Max Drawdown: -329.58%
Strategy Type: Trend Following
```

```
Fold 1 Results:
RMSE: 0.51
Sharpe Ratio: -1.82
Max Drawdown: -821.74%
Strategy Type: Trend Following
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of testing was 0.000753 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1872
[LightGBM] [Info] Number of data points in the train set: 21763, number of used features: 8
[LightGBM] [Info] Start training from score -0.203711

Fold 2 Results:
RMSE: 0.18
Sharpe Ratio: -1.19
Max Drawdown: -13056.35%
Strategy Type: Trend Following
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of testing was 0.000556 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1895
[LightGBM] [Info] Number of data points in the train set: 29021, number of used features: 8
[LightGBM] [Info] Start training from score -0.214501

Fold 3 Results:
RMSE: 1.50
Sharpe Ratio: -2.82
Max Drawdown: -329.58%
Strategy Type: Trend Following
```

Evaluation of Performance Results

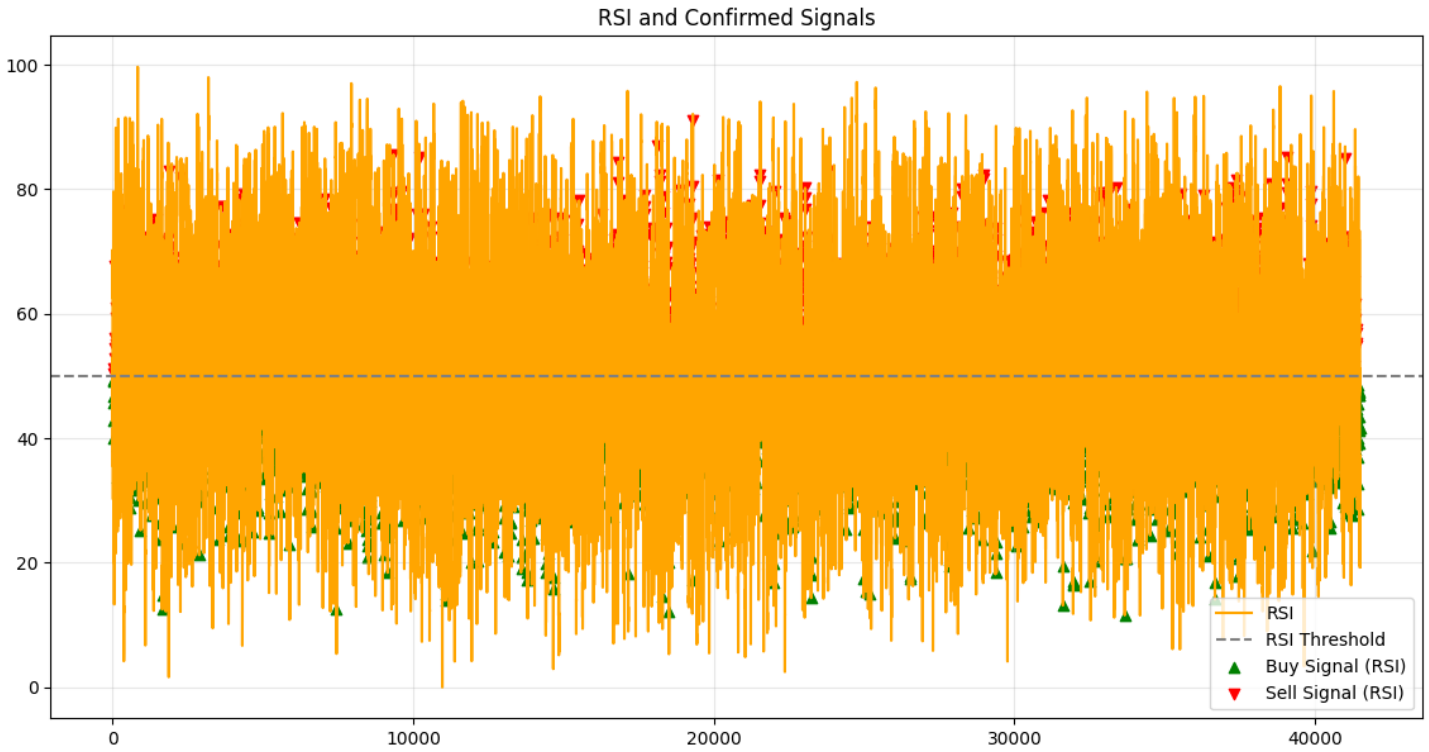
Model Consistency
- Both models show similar performance patterns
- Best RMSE consistently in Fold 2 (0.18)
- Worst performance in Fold 3 (RMSE > 1.4)

Trading Performance
- Consistently negative Sharpe Ratios (-1.19 to -2.82)
- Excessive drawdowns across all folds
- Predominantly trend-following behavior

Model Behavior
- Strategy type mostly consistent between models
- LightGBM shows more consistent trend-following behavior
- XGBoost switches between trend-following and mean reversion

Limitations and Concerns
- High variance in RMSE (0.18 to 1.50)
- Unsustainable drawdowns
- Negative risk-adjusted returns across all folds

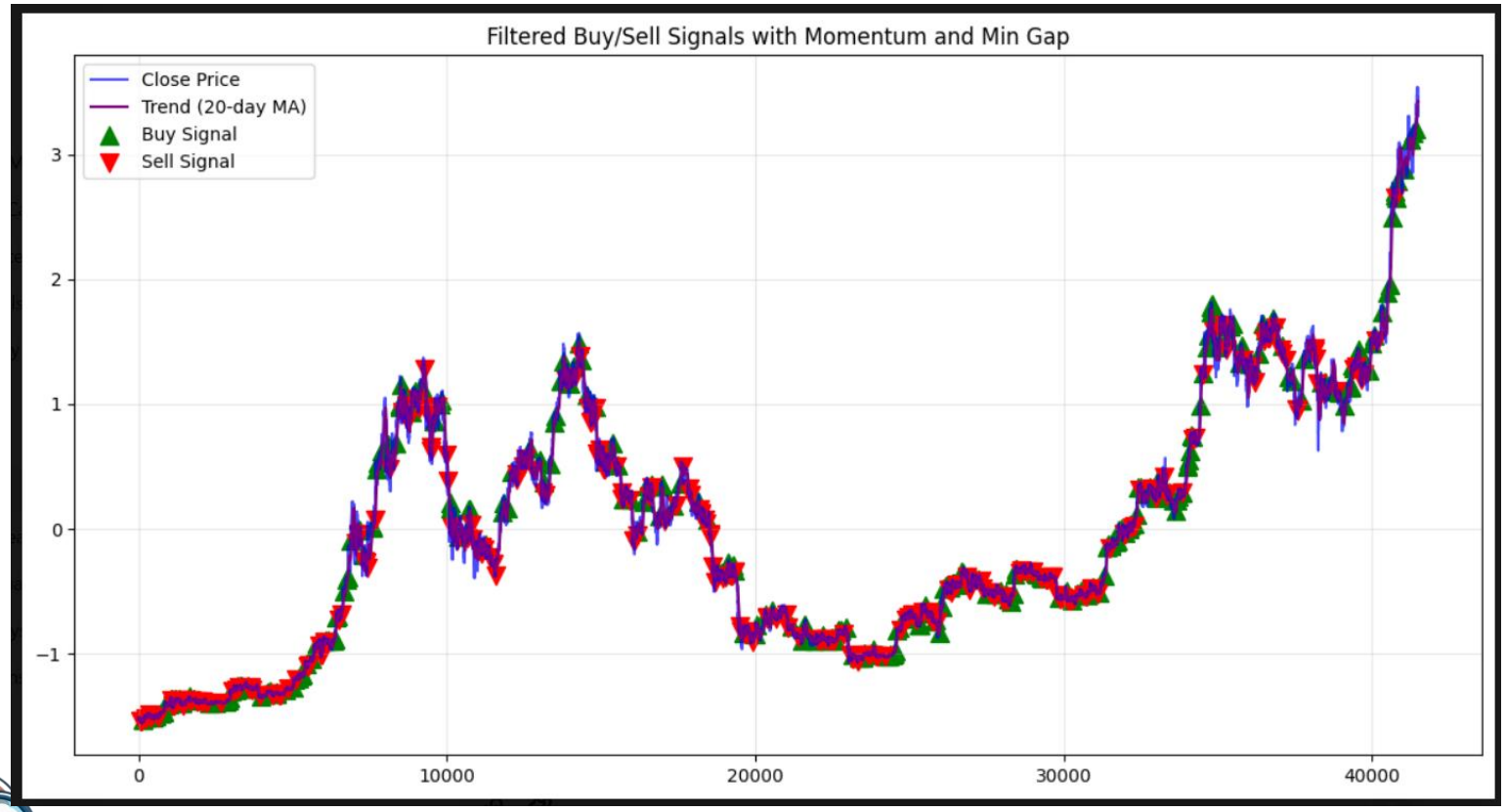
RSI trends and related buy/sell signals



- **Clear RSI Trends**: The graph effectively highlights periods of high and low momentum, helping to identify potential turning points in the market.

- **Signal-Driven Insights**: Buy and sell signals are consistent with RSI thresholds, supporting a momentum-based strategy.

Backtesting Momentum-Based Trading Signals with Trend Analysis



- The buy and sell signals are distributed around significant price changes, showing well working the filtering logic capturing momentum-based opportunities.

- The moving average provides a good visual aid for understanding the trend and aligning the buy/sell signals with it.

- Frequent signals may indicate the strategy is sensitive to noise, which could affect profitability depending on transaction costs.