The 3HTMOSDSDT.*rp1*: Three-hour Timeframe Market Order Strategy with Defined Stoploss and Dynamic Takeprofit

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https://github.com/algorembrant/QAT-QuantitativeAlgorithmicTrading

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Abstract

This study evaluates the 3HTMOSDSDT as a fully algorithmic trading model. The strategy was backtested on 2000 H3-timeframe USDJPY candles using Python, covering one year of data, with all trade decisions executed automatically without human intervention. Across 247 trades, the algorithm recorded a total return of 137% while maintaining a win rate of 32.39%. This outcome reflects an asymmetric payoff structure, where the average gain per winning trade (3.59%) exceeds the average loss per losing trade (-0.90%).

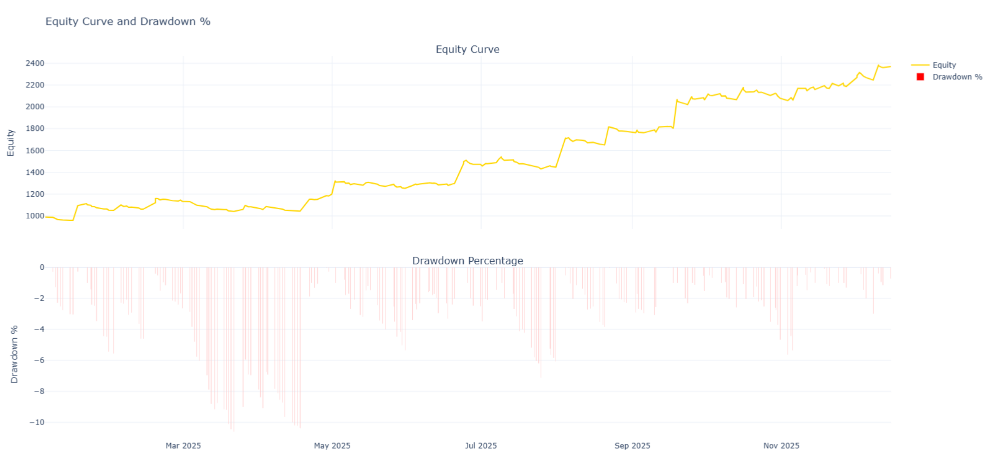

Figure 1: *Equity Curve and Drawdown Percentage of the 3HTMOSDSDT.rp1 Algorithmic Trading Model*

Risk-adjusted performance metrics were modest, with a Sharpe ratio of 0.15 and a Sortino ratio of 0.81, while the profit factor of 1.91 indicates nearly twice as much gross profit as gross loss. Algorithmic execution ensures strict adherence to the strategy without emotional bias. The study also emphasizes the importance of incorporating realistic market factors such as spread, slippage, commissions, and quotes aspect of the said currency pair for accurate live performance estimates.

1 Introduction

This is the 6th paper produced by the company. Specifically, this is the first study for the Three-Hour Timeframe Market Order Strategy with Defined Stoploss and Dynamic Take-profit (3HTMOSDSDT) Trading Model. Each version of the model is written in simple to complex (*rp1*, *rp2*, ..., *rp?*) format. Moving on, the initial plan is to build a diversification trading approach using multiple pairs at once, but before that, we need to clarify whether the trading model is working first. This study will serve as the foundation, not concrete, but it will serve as the idea of the model being profitable.

1.1 Aim of the Study

This study aims to design and develop a fully algorithmic trading strategy based on the three-hour timeframe that incorporates defined stop-loss and dynamic take-profit rules. The study seeks to establish the methodology, coding structure, and operational framework of the model, providing a structured approach for algorithmic execution on currency pair data. It focuses on implementing automated trade entries, exits, and risk management without relying on human discretion, while preparing the model for further evaluation and potential adaptation to other instruments.

1.1.1 It aims to find out the following main trade statistic performance:

winrate %, return %, drawdown %, risk-adjusted factors, average losses %, and average profit %.

2 Methodology

2.1 Dataset

The backtest is conducted using a fixed historical price chart composed of 2000 H3-timeframe OHLC data candles. Each H3 candle represents three consecutive hours of market activity, providing a consistent temporal structure for analysis.

Formally, the dataset is defined as

$$D = \{C_1, C_2, \ldots, C_{2000}\} \tag{1}$$

where each candle

$$C_i = (O_i, H_i, L_i, C_i, T_i) \tag{2}$$

contains the opening price, highest price, lowest price, closing price, and timestamp, respectively. The fixed dataset size ensures comparability and statistical stability across all evaluated trades.

2.2 Trading Setup

The trading setup is strictly session-based. Each setup spawns and begins exactly at 8:00 AM (UTC+8, Asia/Manila time zone) and ends at 11:00 AM, covering a single three-hour price range that aligns precisely with one H3 candle.

The session window is defined as

$$S = [08{:}00, 11{:}00]_{\text{UTC+8}} \tag{3}$$

The H3 candle formed during this session is the sole input used to determine trade direction, entry, and initial risk.

2.3 Trading Logic

Trade direction is determined by the directional bias of the session candle. If the candle closes above its open, it is classified as bullish. If the candle closes below its open, it is classified as bearish.

This rule is expressed as

$$\text{Direction} = \begin{cases} \text{Buy}, & C_s > O_s \\ \text{Sell}, & C_s < O_s \end{cases} \tag{4}$$

For a bullish setup, a buy order is executed at the close of the session candle, and the initial stop-loss is placed at the low of that candle. For a bearish setup, a sell order is executed at the close, and the initial stop-loss is placed at the high of the candle.

The entry and initial stop-loss are defined as

$$E = C_s \tag{5}$$

$$SL_0 = \begin{cases} L_s, & \text{bullish entry} \\ H_s, & \text{bearish entry} \end{cases} \tag{6}$$

No fixed take-profit level is defined at entry. Instead, the exit is governed entirely by the trailing stop-loss mechanism.

2.3.1 Trailing Mechanic

After trade entry, the stop-loss is dynamically adjusted based on the direction of subsequent processing candles.

For a bullish trade, the stop-loss is trailed only when a processing candle is bullish. In such cases, the stop-loss is moved to the low of that candle, provided it does not reduce the existing stop-loss level:

$$SL_t = \max(SL_{t-1}, L_t) \quad \text{when } C_t > O_t \tag{7}$$

For a bearish trade, the stop-loss is trailed only when a processing candle is bearish. The stop-loss is moved to the high of that candle, provided it does not increase the existing stop-loss level:

$$SL_t = \min(SL_{t-1}, H_t) \quad \text{when } C_t < O_t \tag{8}$$

This mechanism allows profits to expand while maintaining directional consistency with the original trade bias.

2.3.2 Parameters and Rules

Risk management is fixed and uniform across all trades. The account operates with an initial balance of 1000, and each trade risks exactly 1% of the current account equity.

The monetary risk per trade is defined as

$$R = E_q \times r \tag{9}$$

where the risk fraction r is set to 0.01. No slippage, spread, or commission costs are applied. Only one trade is allowed per setup, either buy or sell. There are no session-based exit restrictions, and trades are permitted to run indefinitely until the trailing stop-loss is triggered.

2.4 Code and Programming

The entire study is fully automated using Python. The system retrieves 2000 H3 OHLC price candles from MetaTrader 5, executes the trading logic, manages open positions, applies the trailing stop-loss rules, and records all trade outcomes and equity changes for backtesting analysis.

2.5 Important Calculations

The study evaluates the trading strategy using key performance metrics that quantify profitability, risk, and efficiency. All calculations are derived from the raw trade log and the equity curve generated during the automated backtest. Each formula below is accompanied by a description of its purpose and the meaning of its variables.

Win Rate: measures the proportion of profitable trades among all executed trades, indicating the success frequency of the strategy.

$$\text{Win Rate (\%)} = \frac{N_w}{N_t} \times 100 \tag{10}$$

- N_w number of winning trades
- N_t total number of executed trades

Total Return: calculates the percentage change in account equity from the beginning to the end of the backtest, representing overall profitability.

$$\text{Return (\%)} = \frac{E_f - E_i}{E_i} \times 100 \tag{11}$$

- E_i initial account equity
- E_f final account equity

Maximum Drawdown: identifies the largest decline in equity from a peak to a subsequent trough, reflecting the worst-case risk scenario.

$$DD_{\max}(\%) = \max_t \left(\frac{E_{\text{peak},t} - E_t}{E_{\text{peak},t}} \right) \times 100 \tag{12}$$

- E_t equity at time t
- $E_{\text{peak},t}$ maximum equity observed up to time t

Sharpe Ratio: evaluates risk-adjusted performance by comparing average returns to total volatility, helping to assess efficiency per unit of total risk.

$$\text{Sharpe} = \frac{\overline{R} - R_f}{\sigma_R} \tag{13}$$

- $\overline{R}$ mean trade return
- R_f risk-free rate, assumed to be zero
- σ_R standard deviation of trade returns

Sortino Ratio: similar to the Sharpe ratio but considers only downside risk, providing a measure of performance relative to negative returns.

$$\text{Sortino} = \frac{\overline{R} - R_f}{\sigma_D} \tag{14}$$

- σ_D standard deviation of negative trade returns (downside risk)

Profit Factor: expresses the ratio of total gains to total losses, indicating the strategy's ability to generate more profit than loss.

$$\text{Profit Factor} = \frac{\sum_{i=1}^{N_w} G_i}{\sum_{j=1}^{N_l} |L_j|} \tag{15}$$

- G_i profit from winning trade i
- L_j loss from losing trade j
- N_w total number of winning trades
- N_l total number of losing trades

Average Profit per Winning Trade: computes the mean profit of all winning trades, showing typical gain per successful trade.

$$\overline{G} = \frac{\sum_{i=1}^{N_w} G_i}{N_w} \tag{16}$$

Average Loss per Losing Trade: computes the mean loss of all losing trades, showing typical risk per failed trade.

$$\overline{L} = \frac{\sum_{j=1}^{N_l} L_j}{N_l} \tag{17}$$

These formulas provide a complete picture of the trading strategy's effectiveness, balancing both profitability and risk-adjusted efficiency for comprehensive performance evaluation.

2.6 Summary

The methodology establishes a fully deterministic and reproducible trading framework based on a fixed intraday session and a clearly defined price-action rule set. By anchoring trade decisions to a single H3 session candle and enforcing strict, rule-based risk management with a dynamic trailing stop-loss, the study isolates the performance characteristics of directional price behavior within a controlled time window. The use of a fixed dataset, constant risk exposure, and cost-free execution ensures that all observed results are attributable solely to the trading logic itself. Comprehensive performance metrics, including profitability, drawdown, and risk-adjusted measures, provide a robust basis for evaluating the effectiveness and stability of the proposed strategy.

3 Results

Figure 1: *The USDJPYc Chart with Trade Executions*

Figure 2: *The USDJPYc Chart with Trade Executions, Zoom-in version*

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RAW TRADE LOG WITH STRESS PARAMETERS, ENTRY TYPE, POSITION SIZE, AND EQUITY:

                    entry_time                  exit_time entry_type direction  \
0    2025-01-03 08:00:00+08:00 2025-01-03 11:00:00+08:00       sell     short
1    2025-01-06 08:00:00+08:00 2025-01-06 14:00:00+08:00        buy      long
2    2025-01-07 08:00:00+08:00 2025-01-07 14:00:00+08:00        buy      long
3    2025-01-08 08:00:00+08:00 2025-01-08 11:00:00+08:00       sell     short
4    2025-01-09 08:00:00+08:00 2025-01-09 14:00:00+08:00       sell     short
..                         ...                       ...        ...       ...
242  2025-12-09 08:00:00+08:00 2025-12-10 20:00:00+08:00        buy      long
243  2025-12-10 08:00:00+08:00 2025-12-10 17:00:00+08:00       sell     short
244  2025-12-11 08:00:00+08:00 2025-12-11 20:00:00+08:00        buy      long
245  2025-12-12 08:00:00+08:00 2025-12-12 14:00:00+08:00        buy      long
246  2025-12-15 08:00:00+08:00 2025-12-15 20:00:00+08:00       sell     short

     entry_price_raw  entry_price_stressed  exit_price_stressed  initial_stop  \
0            157.310               157.310              157.402       157.402
1            157.717               157.717              157.652       157.485
2            158.275               158.275              157.732       157.732
3            158.097               158.097              158.231       158.231
4            158.086               158.086              158.143       158.322
..               ...                   ...                  ...           ...
242          155.866               155.866              156.672       155.738
243          156.653               156.653              156.761       156.934
244          155.770               155.770              155.614       155.485
245          155.671               155.671              155.628       155.454
246          155.427               155.427              155.199       155.983

     final_stop  position_size  entry_slippage  exit_slippage  spread_entry  \
0       157.402     108.695652             0.0            0.0           0.0
1       157.652      42.672414             0.0            0.0           0.0
2       157.732      18.180963             0.0            0.0           0.0
3       158.231      72.936868             0.0            0.0           0.0
4       158.143      40.999173             0.0            0.0           0.0
..          ...            ...             ...            ...           ...
242     156.672     175.467982             0.0            0.0           0.0
243     156.761      84.961472             0.0            0.0           0.0
244     155.614      83.447071             0.0            0.0           0.0
245     155.628     108.996488             0.0            0.0           0.0
246     155.199      42.455700             0.0            0.0           0.0
```

Figure 3: *The Raw Trade Log, Part 1*

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     spread_exit  commission_entry  commission_exit  pnl_before_costs  \
0            0.0               0.0              0.0        -10.000000
1            0.0               0.0              0.0         -2.773707
2            0.0               0.0              0.0         -9.872263
3            0.0               0.0              0.0         -9.773540
4            0.0               0.0              0.0         -2.336953
..           ...               ...              ...               ...
242          0.0               0.0              0.0        141.427194
243          0.0               0.0              0.0         -9.175839
244          0.0               0.0              0.0        -13.017743
245          0.0               0.0              0.0         -4.686849
246          0.0               0.0              0.0          9.679900

     pnl_after_costs       equity
0         -10.000000   990.000000
1          -2.773707   987.226293
2          -9.872263   977.354030
3          -9.773540   967.580490
4          -2.336953   965.243537
..               ...          ...
242       141.427194  2387.417364
243        -9.175839  2378.241525
244       -13.017743  2365.223782
245        -4.686849  2360.536933
246         9.679900  2370.216833

[247 rows x 19 columns]
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Figure 4: *The Raw Trade Log, Part 2*

TRADE PERFORMANCE STATISTICS

	Value
Number of trades	247.000000
Number of buys	114.000000
Number of sells	133.000000
Number of trading days	247.000000
Winrate percentage	32.388664
Average profit percentage	3.586750
Average loss percentage	-0.903122
Return percentage	137.021683
Max drawdown percentage	-10.599466
Max drawdown time duration (hours)	1674.000000
Average drawdown time duration (hours)	339.913043
Sharpe ratio	0.146710
Sortino ratio	0.805005
Profit factor	1.913976
Minimum stop-loss distance	0.027000
Maximum stop-loss distance	1.439000
Average stop-loss distance	0.359445
Minimum take-profit distance	0.000000
Maximum take-profit distance	2.892000
Average take-profit distance	0.300903

Figure 5: *Performance Statistics*

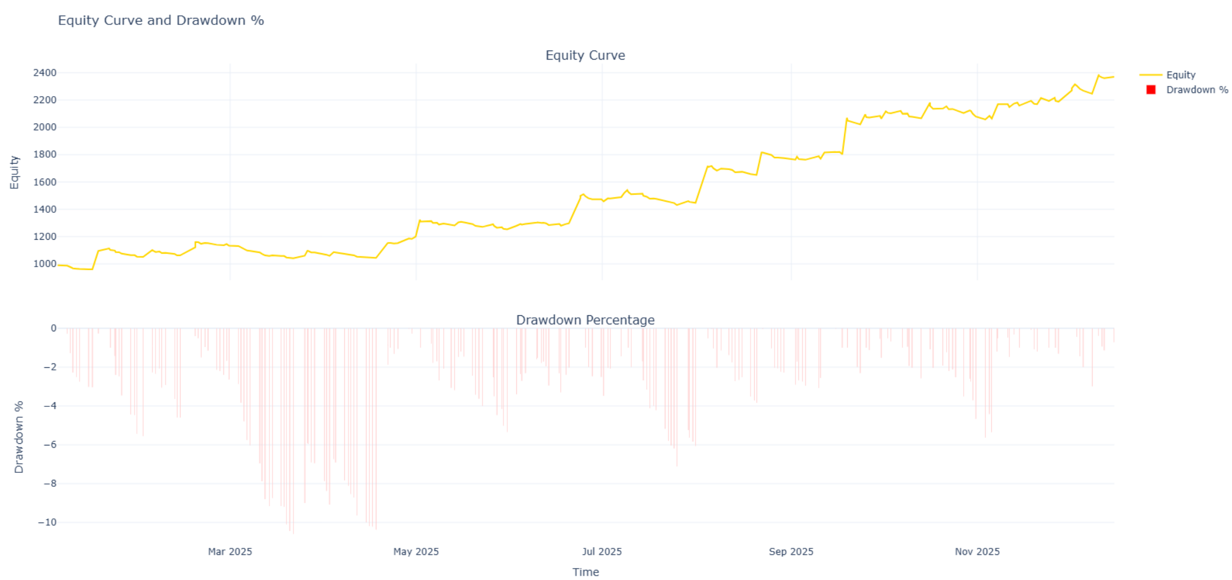

Figure 6: *The Equity Curve and Drawdown Percentage*

Discussion

The performance of the Three-Hour Timeframe Market Order Strategy with Defined Stoploss and Dynamic Takeprofit (3HTMOSDSDT) provides several insights into its behavior and effectiveness. Over 247 trades conducted across 247 trading days, the model executed 114 buy trades and 133 sell trades, indicating slightly more short-side activity. Despite a relatively low win rate of 32.39%, the strategy achieved a total return of 137.02%, highlighting that the average profit per winning trade (3.59%) is significantly larger than the average loss per losing trade (-0.90%). This demonstrates that the model relies on a high reward-to-risk structure rather than frequent winning trades.

Risk management appears effective, with a maximum drawdown of 10.60%, although drawdown durations can be long, with the maximum lasting 1674 hours and the average drawdown duration at 340 hours. These prolonged periods of negative equity suggest that traders using this model need to maintain discipline and sufficient capital to endure temporary losses.

The risk-adjusted performance metrics show a modest Sharpe ratio of 0.15, reflecting limited returns relative to overall volatility. However, the Sortino ratio of 0.81 indicates better performance when only downside risk is considered, and a profit factor of 1.91 confirms that gross profits nearly double gross losses. The stop-loss distances range from 0.027 to 1.439, averaging 0.36, while the take-profit distances vary from 0.00 to 2.892, averaging 0.30, demonstrating the dynamic take-profit mechanism's adaptability to market conditions.

Overall, the discussion suggests that the 3HTMOSDSDT model is capable of generating consistent long-term returns through careful management of risk and reward. The system's reliance on larger gains from fewer winning trades means it is particularly suitable for traders with patience and a disciplined approach, as short-term losses may occur frequently but are contained by defined stop-losses.

Conclusion

The Three-Hour Timeframe Market Order Strategy with Defined Stoploss and Dynamic Takeprofit (3HTMOSDSDT) shows that a trading system can make good profits even with a low win rate. Over 247 trades, the strategy achieved a total return of 137%, despite winning only about 32% of trades. This is possible because the average profit from winning trades (3.59%) is much higher than the average loss from losing trades (-0.90%).

The strategy keeps risks under control, with a maximum drawdown of 10.60%, although some drawdowns lasted for long periods. Risk-adjusted performance is modest, with a Sharpe ratio of 0.15, but the Sortino ratio of 0.81 and profit factor of 1.91 indicate the system earns nearly twice as much from winning trades as it loses from losing trades.

Stop-loss levels are clearly defined, averaging 0.36, and take-profit targets are dynamic, averaging 0.30. This allows the strategy to capture larger profits while limiting losses. Overall, the 3HTMOSDSDT model demonstrates that a low-win-rate, high-reward approach can be effective if trades are executed consistently and risks are managed carefully.

Recommendation

For practical implementation, it is recommended to include realistic market factors such as spread, slippage, and commissions when backtesting the model. Incorporating these stress parameters can affect both potential gains and drawdowns, providing a more accurate estimate of real-world performance. Traders should also monitor drawdown durations and maintain proper capital management to ensure the strategy remains sustainable under varying market conditions.

Additionally, before developing a new version of the model, it is important to study the quotes of USDJPY (or the intended currency pair) carefully. The original model was designed by traders with experience in Gold commodity Forex, which may behave differently from pure currency pairs. Understanding the characteristics, volatility, and market structure of the new instrument will help in adapting the strategy effectively and avoiding assumptions that may not hold outside of the original trading context.