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Methodology

[TradingEdge.Pro's](#) methodology describes a multi-step process for building and validating trading strategies, structured into two parts: strategy development and testing, and practical use. In the testing phase, a strategy is defined as a set of objective rules, validated through initial tests, optimised, and assessed for stability (robustness), and then evaluated using Walk-Forward Analysis. The detailed testing assumptions (including the instrument universe, in-sample/out-of-sample periods, data sources, transaction costs, and execution rules) are described in the "[Testing Specification](#)" document. The full methodology and metric definitions are available on the TradingEdge.Pro "[Methodology](#)" page.



Momentum Pinball v.2

Investment Strategy Testing Summary

The **Momentum Pinball (MP) v.2** strategy is a modification of version **v.1**, consistent with **Linda Bradford Raschke's approach**, expanded with a **directional filter based on a moving average** and **new exit logic**. The entry signal still generates **the LBR/RSI** (short RSI calculated on the short-term price change - ROC), but a **position is opened after the signal only if the direction is in line with the trend**. Entry is executed **with a stop order** set for **the breakout of the signal candle's extreme**, and **exit occurs at the opening of the next session after the LBR/RSI crosses to the opposite extreme – we do not use a stop loss order**. In practice, v.2 is **more selective** (trend filter), and **the exit signal** is unambiguous, based on **an oscillator reversal**.

It's worth noting that while the strategy's results on in-sample data are decent, it **failed stability testing across a wide range of optimized parameters**. This means the strategy loses its profitability and generates significantly larger drawdowns when tested with suboptimal parameters. Therefore, **it is not recommended for use in real-world trading**.

Our goal is to have a strategy that remains **profitable and effective across a wide range of parameters**, because the market is a volatile organism, and optimal parameters can change over time. **I can't emphasize enough that for a strategy to work in real-world conditions, it must also perform under suboptimal parameters and conditions**. In short, **it must be stable** to changing market conditions.

I don't know who said these words, but they perfectly capture the problem of many optimizations:

"I've never seen a strategy that didn't work in backtests."

We don't know the future, we don't know future market conditions, but if we know that our strategy **has historically generated acceptable results** in various market conditions and across various parameter ranges, then we are **one step ahead of other** market participants.



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Step 1: Formulate an investment strategy

Momentum Pinball (MP) v.2 retains the classic "**LBR/RSI extreme day & price confirmation entry**" sequence, adding a **trend filter** and **oscillator exit**. The strategy is **single-directional—long only**—and designed for markets that **naturally tend to rebound quickly**: major stock indices, Treasury futures, gold, and the US dollar index.

A signal day occurs when **the LBR/RSI falls below a pre-defined oversold threshold**; additionally, **the close of the day falls above the moving average**, confirming compliance with an **uptrend**. **For the following session, a buy stop** tick order is placed **above the signal candle's high, without a stop loss order**. This allows the market **to confirm** the direction before opening a position.

Once activated, the position is held **until the LBR/RSI enters the overbought zone**, at which point it **closes at the opening of the next session**. The absence of a stop loss, time-exit, and short version simplifies the decision-making process and focuses the strategy on **short, dynamic bounces** within the prevailing trend.

The strategy uses:

- **Extremes Oscillator (LBR/RSI)** – identifies a day of momentum overshoot;
- **Simple price trigger – T+1** entry on breakout of today's extreme;
- **Trend filter (MA)** – plays only with the market direction;
- **Exit on oscillator reversal** – closing at the session opening after LBR/RSI enters the overbought zone.
- **Short horizon** – the **LBR/RSI indicator** is very price sensitive, so it reaches extremes in periods of several days.

Characteristics of the strategy and its strengths and weaknesses:

- **Mechanical and transparent** – easy to code and test;
- **Selective** – the MA filter allows you to always play with the trend;
- **Snap-back oriented** – tailored to asset classes known for their quick rebounds;
- **Sensitive to gaps/slips** (stop entries) – realistic costs required;
- **No short side** – less diversification, but greater alignment with target market profile;
- **No stop loss orders** – requires appropriate scaling of position sizes and diversification within the strategies used.

Momentum Pinball (MP) v.2, despite its simplicity, provides a **solid foundation for building algorithmic portfolios**. However, it requires **discipline and strict adherence to risk management methods**.



Step 2: Determine investment principles

Below is the pseudocode for the **Momentum Pinball (MP) v.2 strategy** on daily data:

1. **Calculating Indicators:**
 - a. **LBR/RSI(X/Y)** – X-period RSI calculated on **the Y-period price change (ROC)**.
 - b. **MA(MABars)** – moving average used as a **direction filter** (uptrend when the price closes above the average).
2. **Generating Entry Signals – Long Position:**
 - a. **Extreme Condition:** A signal day occurs when the LBR/RSI(X/Y) reading falls **below the established** oversold threshold (**RSIThreshold**).
 - b. **Trend filter:** Same day close is **above the MA(MABars)**.
 - c. **Setting an entry order (after the signal):** for the next session, set a **buy stop order** placed **one tick above the high** of the candle on the signal day.
 - d. **Starting Stop:** lack.
3. **Generating Output Signals:**
 - a. **Oscillator exit:** when **LBR/RSI(X/Y)** enters the **overbought zone** during the position, **close the position at the opening of the next session**.
4. **Daily Monitoring:**
 - a. **The LBR/RSI(X/Y)** reading and identify a potential **day of extremes**.
 - b. The system verifies entry/exit conditions and sets appropriate buy stop orders for the next day.
 - c. For active positions, monitor **LBR/RSI(X/Y)** and execute **an oscillator exit** at the next day's open.
5. **Additional Notes:**
 - a. **No Short Positions:** The strategy focuses solely on long positions in an uptrend.
 - b. **Financial Instruments:** for the purposes of this test, **long positions on stock indices, bonds, gold and the dollar index were used**.
 - c. **Stop Loss Management:**
 - i. The strategy does not use Stop Loss orders, which means that potential losses are not limited by automatic position closure.
 - ii. This is an important consideration for risk management and requires discipline from the trader and the possible introduction of their own capital protection mechanisms.

The above rules are described in a way that allows them to be directly converted into a script in the chosen testing platform, which ensures the accuracy of the historical simulation and the reliability of the test results.

The tests are carried out assuming that the risk of one position is **2.0% of the total capital**, with a **hypothetical stop loss order located 2 x ATR (40 days)** away from the position opening point.



Step 3: Pre-test your investment strategy

Below are some purchase and sale transactions that allow you to verify the following aspects:

- **Correctness of generated signals;**
- **Direction of opening a position;**
- **Moment of opening the position;**
- **The opening price of the position;**
- **Moment of closing the position;**
- **Closing price of the position;**
- **Compliance of the transaction with the theoretical assumptions of the investment strategy.**

At this stage, **it doesn't matter** whether the trades are **profitable**, what **instrument was used**, or whether they occurred **recently** or **in the distant past**. The key is **to verify that the trades are generated correctly** and in line with the assumptions described in the previous step.

The first transaction was executed on a gold futures contract. In mid-September 2024, a long MP position signal appeared (first candle in the left-hand rectangle): the 3-day RSI calculated on a 1-period price change (ROC) fell below 30 points, and the closing price of this candle fell above the 150-day moving average. This indicates the formation of a signal candle. According to the strategy's rules, **a buy stop order was set for the next session, one tick above the high of the signal candle.** **The position was opened the next day** (second candle in the left-hand rectangle). **The system worked correctly.**

The strategy assumes **closing the position when the 3-day RSI, calculated on a 1-period price change (ROC), rises above 70 points (symmetrically relative to the opening level of 30 points).** This occurred on the third day after the position was opened (the first candle in the right-hand rectangle). Therefore, we close the position the following day at the opening (the second candle in the right-hand rectangle). **The system worked correctly.**





The second transaction was executed on a German bond futures contract. In mid-October 2024, a long MP position signal appeared (first candle in the left-hand rectangle): the 3-day RSI calculated on a 1-period price change (ROC) fell below 30 points, and the closing price of this candle fell above the 150-day moving average. This indicates the formation of a signal candle. In accordance with the strategy's rules, **a buy stop order was set for the next session, one tick above the high of the signal candle.** The position was opened the next day (second candle in the left-hand rectangle). **The system worked correctly.**

The strategy assumes **closing the position when the 3-day RSI, calculated on a 1-period price change (ROC), rises above 70 points (symmetrically relative to the opening level of 30 points).** This occurred on the fifth day after the position was opened (the first candle in the right-hand rectangle). Therefore, we close the position the following day at the opening (the second candle in the right-hand rectangle). **The system worked correctly.**



Once we are sure that the transactions are generated correctly, we can proceed to the first test of the strategy on the full **in-sample data set**. These tests are conducted on **baseline parameters** that, in my opinion, should align with the strategy's stated goals.

First, **we reject strategies that linearly lose capital.** If a strategy exhibits this pattern, it's a clear signal that any parameter optimization is pointless.

Our basic expectation is that the strategy generates **positive results**, even if they are at a low level.

Tested base parameters:

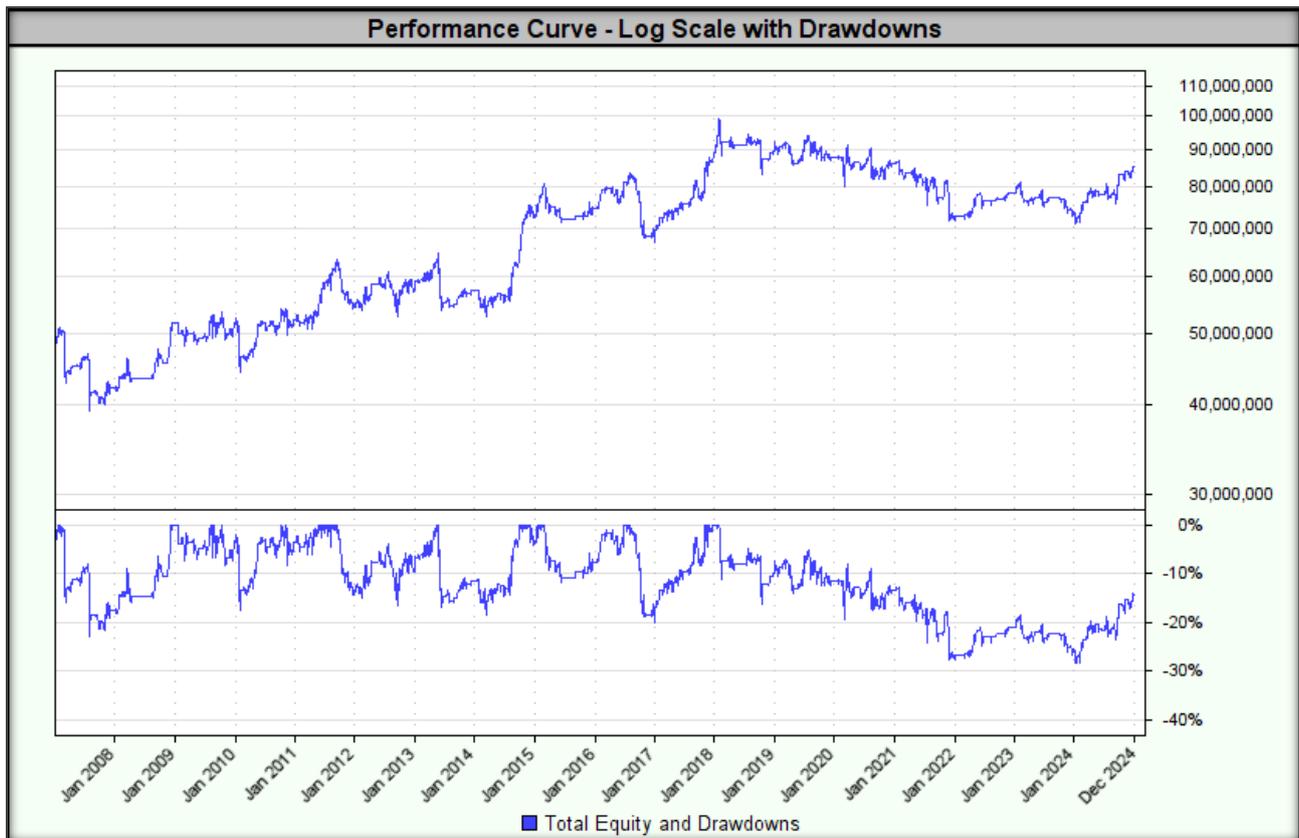
- **LBR/RSI(3/1):** 3-period RSI calculated on a 1-period price change (ROC);
- **LBR/RSI Threshold (open/close):** 30/70;
- **MA(150):** 150-period moving average;
- **Method of opening a position (long/short):** buy stop one tick above the high of the signal candle;
- **Order validity:** the order remains active only in the next session;
- **Stop loss:** none;



- **Closing the position:** LBR/RSI at 70 points;
- **Position direction:** long positions;
- **Financial Instruments:** for the purposes of this test, **long positions on stock indices, bonds, gold and the dollar index were used.**
- **Position sizes:** corresponding to a risk of **2.0% of total capital**, with a **hypothetical stop loss order located 2 x ATR (40 days)** away from the position opening point.

The test result is shown below.

Historical or simulated results do not guarantee that similar outcomes will be achieved in the future.



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Indicators/Measures	Concluding a transaction at the opening price
CAGR%	2.99%
MAR Ratio	0.11
RAR%	4.03%
R-Cubed	0.07
Robust Sharpe Ratio	0.32
Max Drawdown	28.4%
Wins	60.0%
Losses	40.0%
Average Win%	1.24%



Average Loss%	1.57%
Win/Loss Ratio	0.79
Average Trade Duration (days)	13
Percent Profit Factor	1.19
SQN	-
Number of transactions	563

In summary, the system works properly and generates signals as expected. Furthermore, tests on the baseline parameters yielded acceptable results, although the drawdown length may be concerning. Nevertheless, we can move on to the most interesting stage of creating an investment strategy – **optimization.**



Step 4: Optimizing and assessing the stability of the investment strategy

This stage of strategy development and testing is crucial because it determines how effective the strategy will be in real-world conditions. I cannot emphasize enough that for a strategy to work in real-world conditions, it must also perform under suboptimal parameters and conditions. In short, it must be stable to changing market conditions.

I don't know who said these words, but they perfectly capture the problem of many optimizations:

"I've never seen a strategy that didn't work in backtests."

My goal is not to find optimal parameter values – my goal is to find a wide range of parameters for which the strategy will generate acceptable results. We don't know the future, we don't know future market conditions, but if we know that our strategy has historically generated acceptable results in various market conditions and across various parameter ranges, then we are one step ahead of other market participants.

What parameters to choose for the next period is the topic of consideration in Step 5, "Walk-Forward Analysis", but before we get to that, we need to know whether our strategy is even stable.

1. Stability across a wide range of optimized parameters

This version of the Momentum Pinball (MP) v.2 strategy utilizes the Grid Search method to optimize parameters. This approach fully optimizes all specified parameters by creating a wide range of possible combinations. Our goal is to find parameter ranges that will keep the strategy stable (robust), allowing us to assess its suitability in real-world market conditions.

The key criterion for assessing stability is that all test results must demonstrate a positive MAR, and the maximum drawdown must not exceed 250% of the drawdown for the result with the highest MAR. If any test produces a negative MAR, or if the drawdown exceeds 250% of the drawdown for the result with the highest MAR, the strategy is rejected entirely.

In the first step, we test the stability of parameters on in-sample data. To do this, we define ranges of parameter values so that the ratio of the highest to lowest value in the range is at least 150%.

In the tested strategy, the ranges defined in this way are:

- LBR/RSI:
 - ROC: range 2-3 (step: 1);
 - RSI: range 3-4 (step: 1);
- LBR/RSI Threshold: range 20-30 (step: 1);
- MA: range 100-170 (step: 5).

The lowest MAR value of 0.00 was achieved for the following parameters:

- LBR/RSI:
 - ROC: 3;



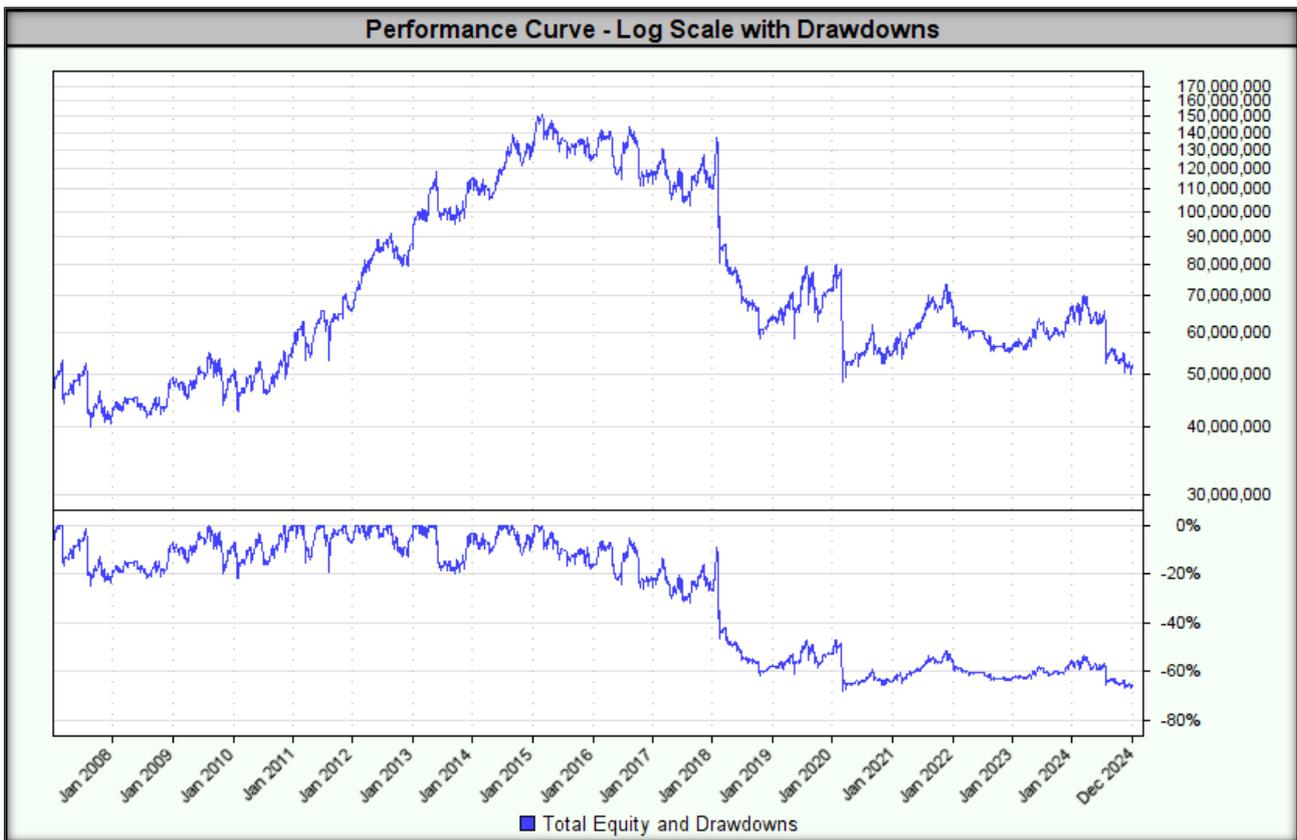
- RSI: 3;
- LBR/RSI Threshold: 30;
- MA: 105.

Historical or simulated results do not guarantee that similar outcomes will be achieved in the future.

Test	Rate of Change (# bars)	RSI (# bars)	RSI Threshold	MA (bars)	End Balance	CAGR%	MAR	Sharpe	Ann. Sharpe	Max TE DD	Longest DD	Trades	R3	RAR[%]
482	3	3	30	105	\$52,042,115.90	0.22%	0.00	0.13	0.01	67.8%	118.1	1618	0.01	1.04
483	3	3	30	110	\$53,775,462.71	0.41%	0.01	0.14	0.02	66.8%	118.1	1628	0.01	0.91
481	3	3	30	100	\$54,023,052.06	0.43%	0.01	0.14	0.02	68.0%	118.1	1614	0.01	1.22
495	3	3	30	170	\$57,147,143.17	0.75%	0.01	0.15	0.04	66.9%	118.1	1651	0.01	1.20
466	3	3	29	100	\$59,307,658.14	0.95%	0.02	0.16	0.05	62.7%	116.2	1513	0.02	1.48
164	2	3	30	165	\$60,174,484.48	1.03%	0.02	0.16	0.06	67.9%	118.1	1364	-0.01	-0.73
165	2	3	30	170	\$60,200,299.34	1.04%	0.02	0.16	0.06	68.0%	118.1	1373	-0.01	-0.81
493	3	3	30	160	\$60,400,050.65	1.06%	0.02	0.17	0.05	67.3%	118.1	1639	0.02	1.37
487	3	3	30	130	\$60,679,916.25	1.08%	0.02	0.17	0.05	67.2%	118.1	1635	0.02	1.57
494	3	3	30	165	\$61,141,884.74	1.12%	0.02	0.17	0.06	67.3%	118.1	1642	0.02	1.36
484	3	3	30	115	\$60,855,584.81	1.10%	0.02	0.17	0.06	65.7%	118.1	1634	0.02	1.70
467	3	3	29	105	\$60,362,003.20	1.05%	0.02	0.17	0.06	62.5%	116.2	1517	0.02	1.54

Below is a graph of the equity curve for **the strategy with the lowest MAR.**

Historical or simulated results do not guarantee that similar outcomes will be achieved in the future.



The highest MAR value of 0.56 was achieved for the following parameters:

- LBR/RSI:
 - ROC: 2;
 - RSI: 4;
- LBR/RSI Threshold: 29;



- MA: 150.

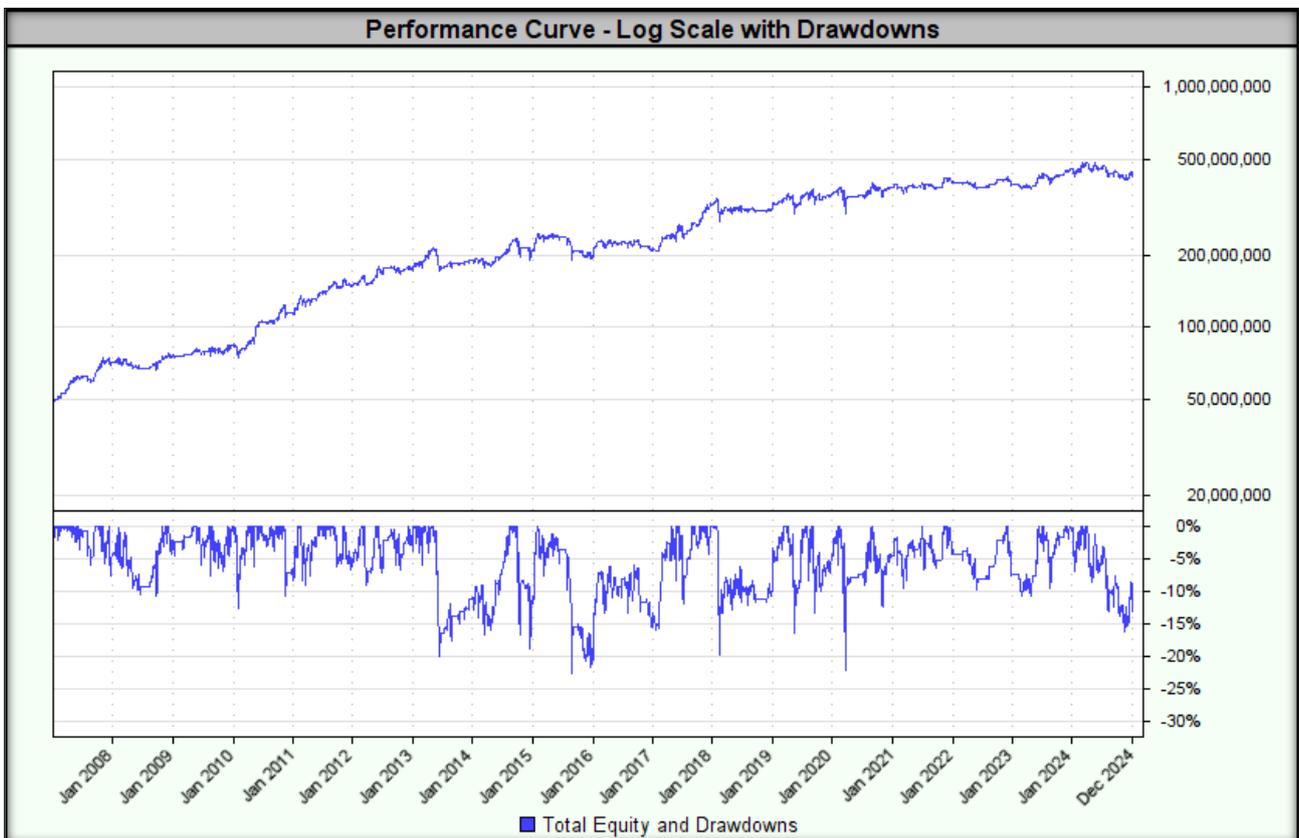
The highest MAR value was accompanied by a drawdown of 22.6%.

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Test	Rate of Change (# bars)	RSI (# bars)	RSI Threshold	MA (bars)	End Balance	CAGR%	MAR	Sharpe	Ann. Sharpe	Max TE DD	Longest DD	Trades	R3	RAR [%]
311	2	4	29	150	\$423,516,710.60	12.60%	0.56	0.86	0.73	22.6%	27.7	564	0.46	12.38
312	2	4	29	155	\$409,103,713.87	12.39%	0.55	0.85	0.72	22.4%	26.6	560	0.45	12.23
310	2	4	29	145	\$407,596,098.18	12.36%	0.55	0.85	0.77	22.6%	26.6	563	0.45	12.60
309	2	4	29	140	\$390,010,365.97	12.09%	0.54	0.83	0.77	22.6%	27.7	561	0.43	12.26
304	2	4	29	115	\$380,924,712.01	11.94%	0.53	0.84	0.80	22.6%	25.3	557	0.43	12.00
313	2	4	29	160	\$364,168,421.20	11.66%	0.52	0.79	0.68	22.5%	27.7	562	0.40	11.11
315	2	4	29	170	\$356,976,443.72	11.54%	0.51	0.79	0.67	22.5%	27.7	568	0.39	10.93
303	2	4	29	110	\$355,818,800.27	11.52%	0.51	0.82	0.82	22.6%	24.6	556	0.43	11.74
49	2	3	23	115	\$340,046,892.25	11.24%	0.51	0.75	0.80	22.1%	25.8	616	0.36	11.83
314	2	4	29	165	\$346,054,557.49	11.35%	0.51	0.78	0.66	22.4%	27.7	566	0.39	10.83
308	2	4	29	135	\$381,589,598.18	11.95%	0.49	0.82	0.79	24.3%	27.7	561	0.41	11.93
48	2	3	23	110	\$318,678,527.50	10.84%	0.48	0.73	0.83	22.6%	25.7	614	0.36	11.55

Below is a graph of the equity curve for the strategy with the highest MAR.

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For all combinations of tested parameter ranges, the highest drawdown was almost 86%.

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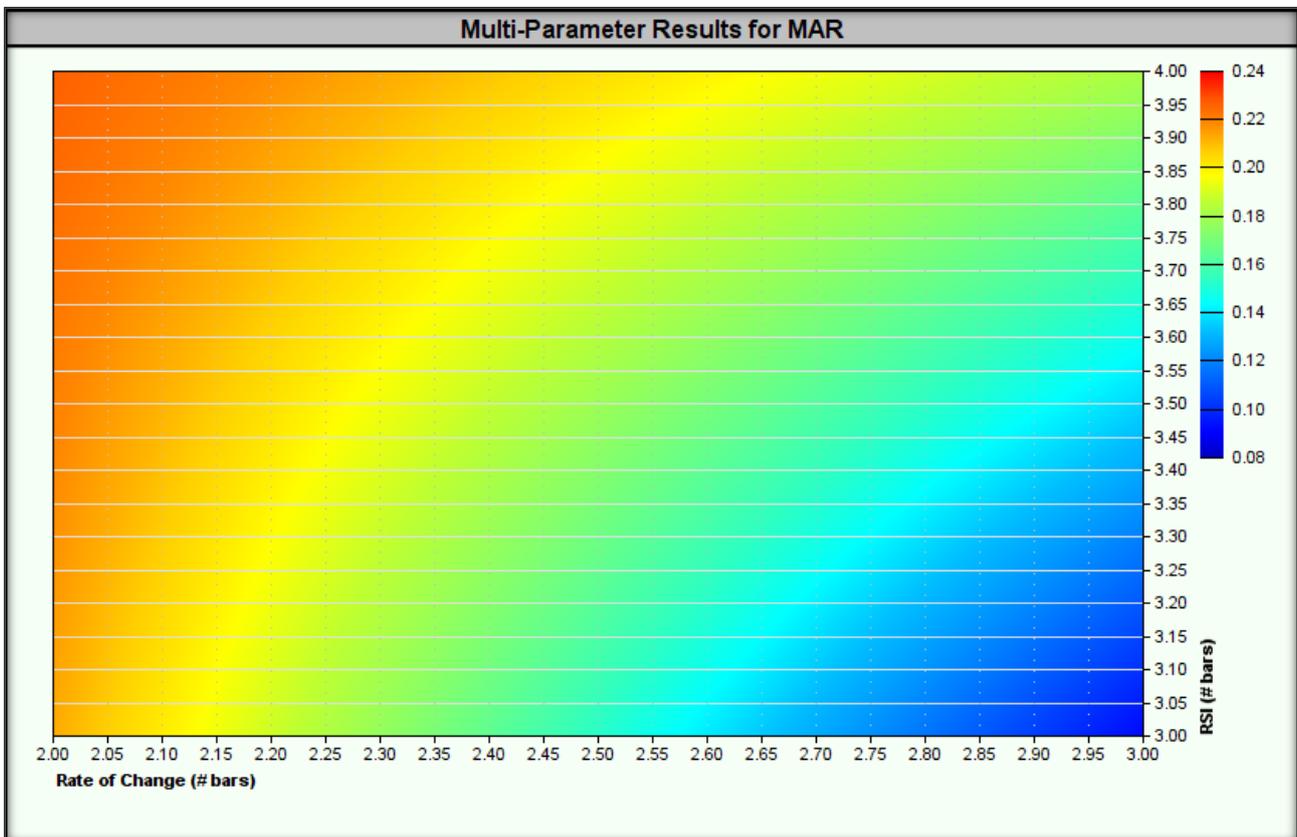
Test	Rate of Change (# bars)	RSI (# bars)	RSI Threshold	MA (bars)	End Balance	CAGR%	MAR	Sharpe	Ann. Sharpe	Max TE DD	Longest DD	Trades	R3	RAR [%]
184	2	4	21	115	\$112,929,474.23	4.63%	0.05	0.31	0.29	86.0%	102.3	116	0.06	7.06
189	2	4	21	140	\$136,472,526.44	5.74%	0.07	0.35	0.33	86.0%	90.6	115	0.08	8.51
186	2	4	21	125	\$131,106,409.51	5.50%	0.06	0.34	0.32	86.0%	90.5	113	0.07	8.18
187	2	4	21	130	\$131,106,409.51	5.50%	0.06	0.34	0.32	86.0%	90.5	113	0.07	8.18
183	2	4	21	110	\$115,618,334.72	4.77%	0.06	0.31	0.30	85.9%	102.3	115	0.07	7.25
188	2	4	21	135	\$134,601,542.25	5.66%	0.07	0.34	0.32	85.9%	90.6	114	0.08	8.41
185	2	4	21	120	\$125,460,869.00	5.24%	0.06	0.33	0.31	85.9%	90.5	114	0.07	7.80
182	2	4	21	105	\$91,439,830.66	3.41%	0.04	0.27	0.21	85.9%	105.4	116	0.05	5.93
181	2	4	21	100	\$90,728,845.40	3.37%	0.04	0.27	0.21	85.9%	105.4	116	0.05	5.79
195	2	4	21	170	\$152,225,759.05	6.38%	0.08	0.37	0.35	84.9%	98.9	118	0.08	9.46
194	2	4	21	165	\$152,225,759.05	6.38%	0.08	0.37	0.35	84.9%	98.9	118	0.08	9.46
192	2	4	21	155	\$137,532,162.73	5.78%	0.07	0.35	0.32	84.9%	99.2	117	0.07	8.72

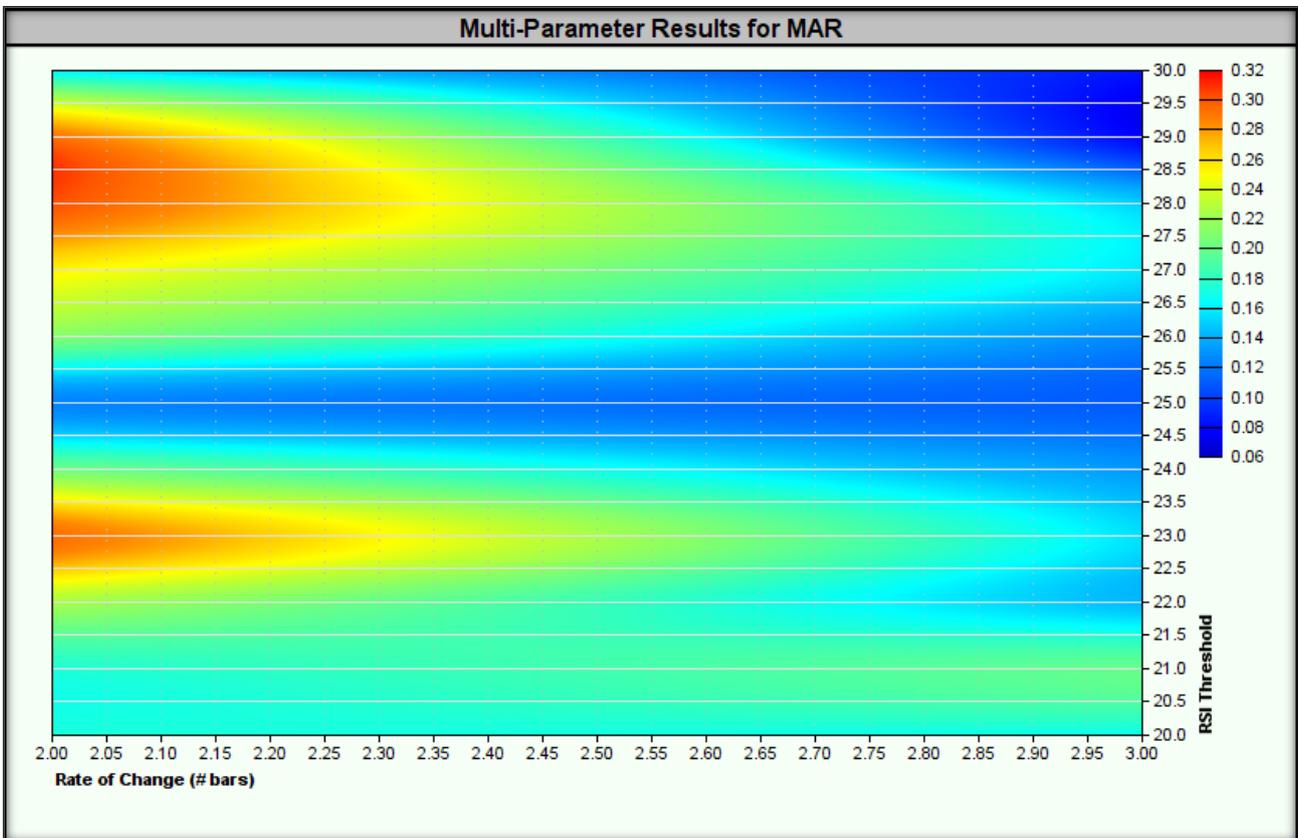
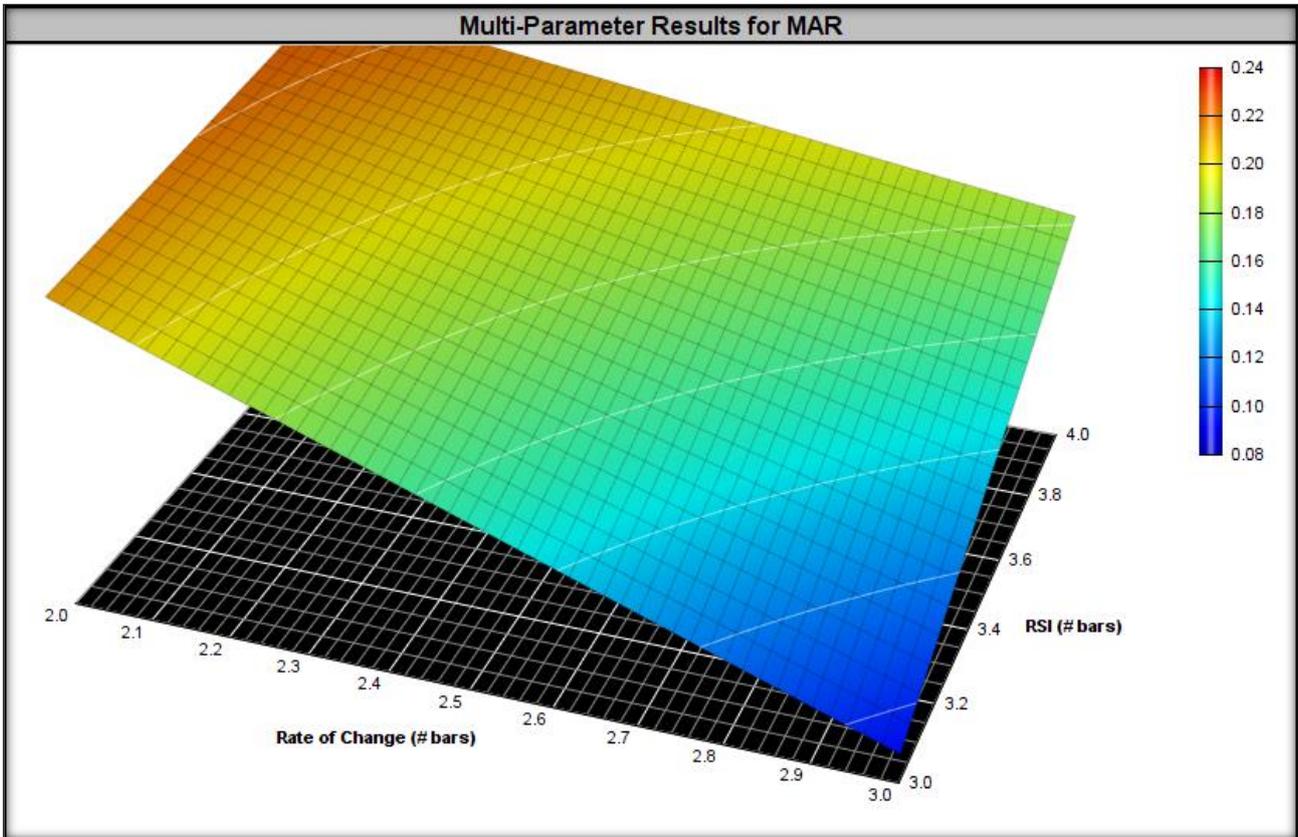
In summary, the strategy failed the stability test over a wide range of optimized parameters because:

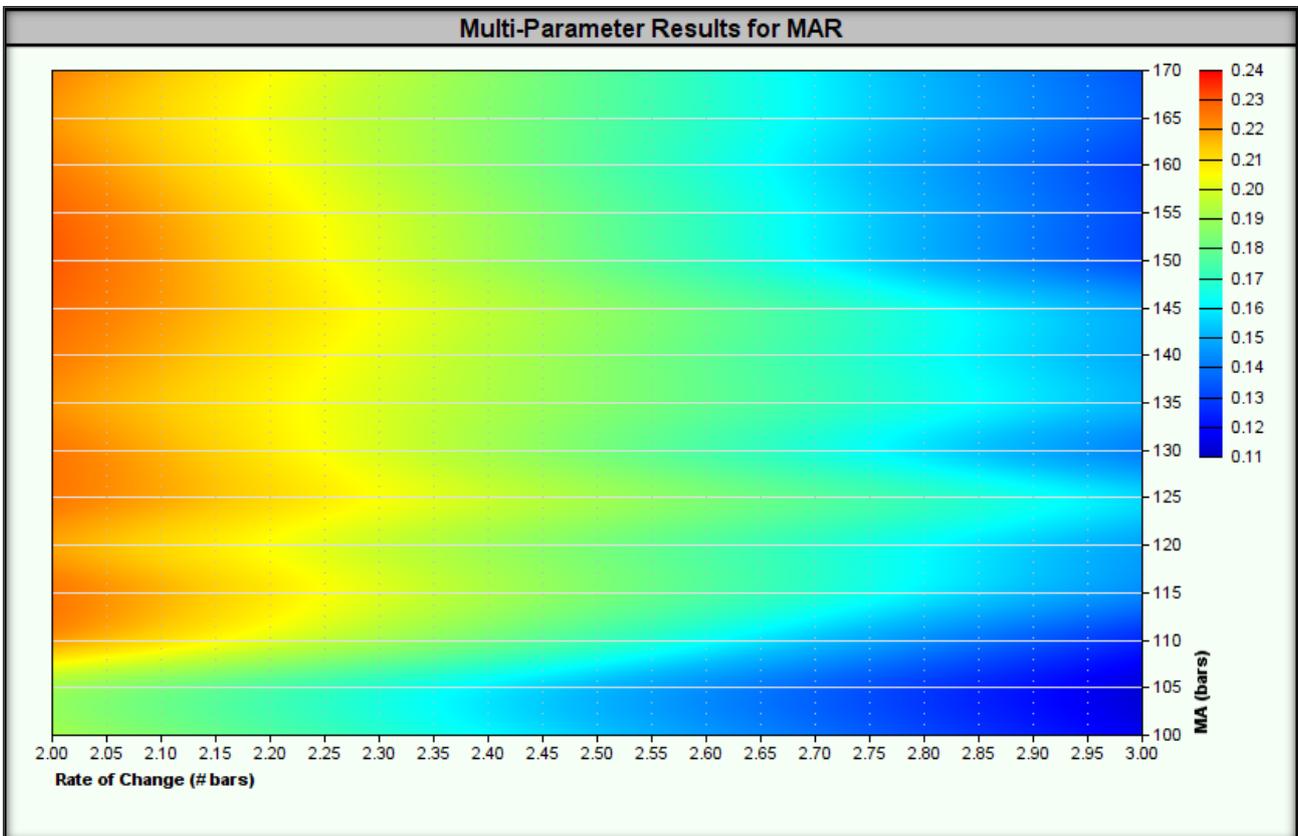
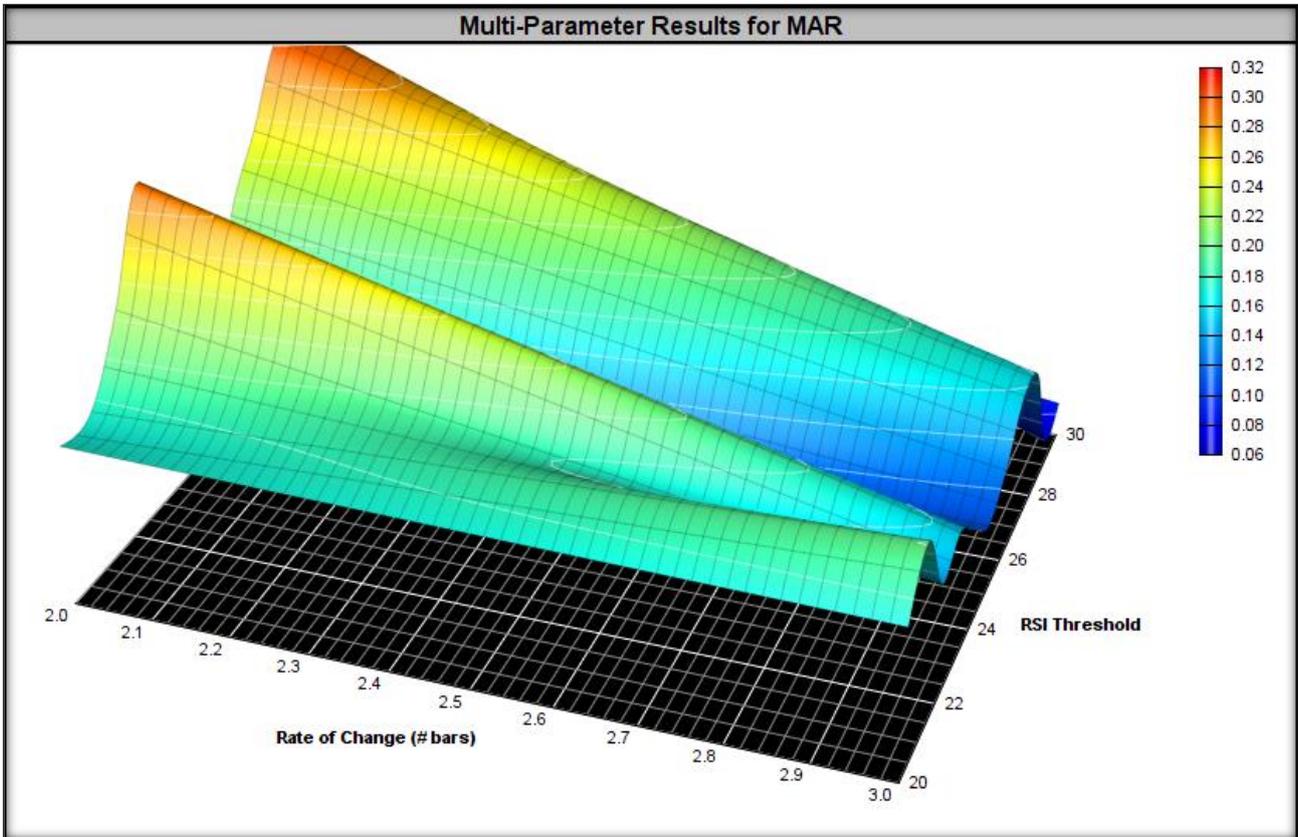
- The maximum drawdown exceeded 250% of the drawdown value for the result with the highest MAR (86.9% vs. 22.6%) – which means a high risk of deep capital drawdowns.

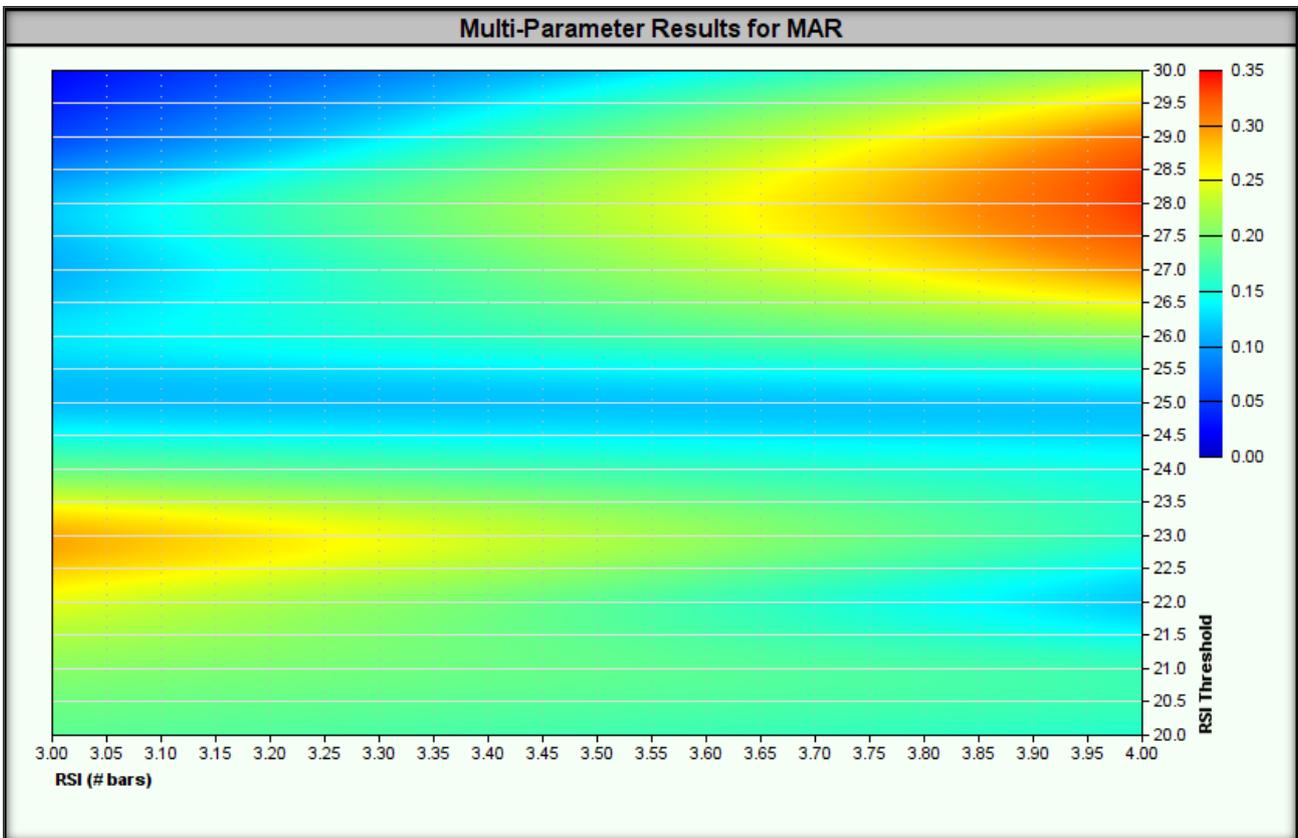
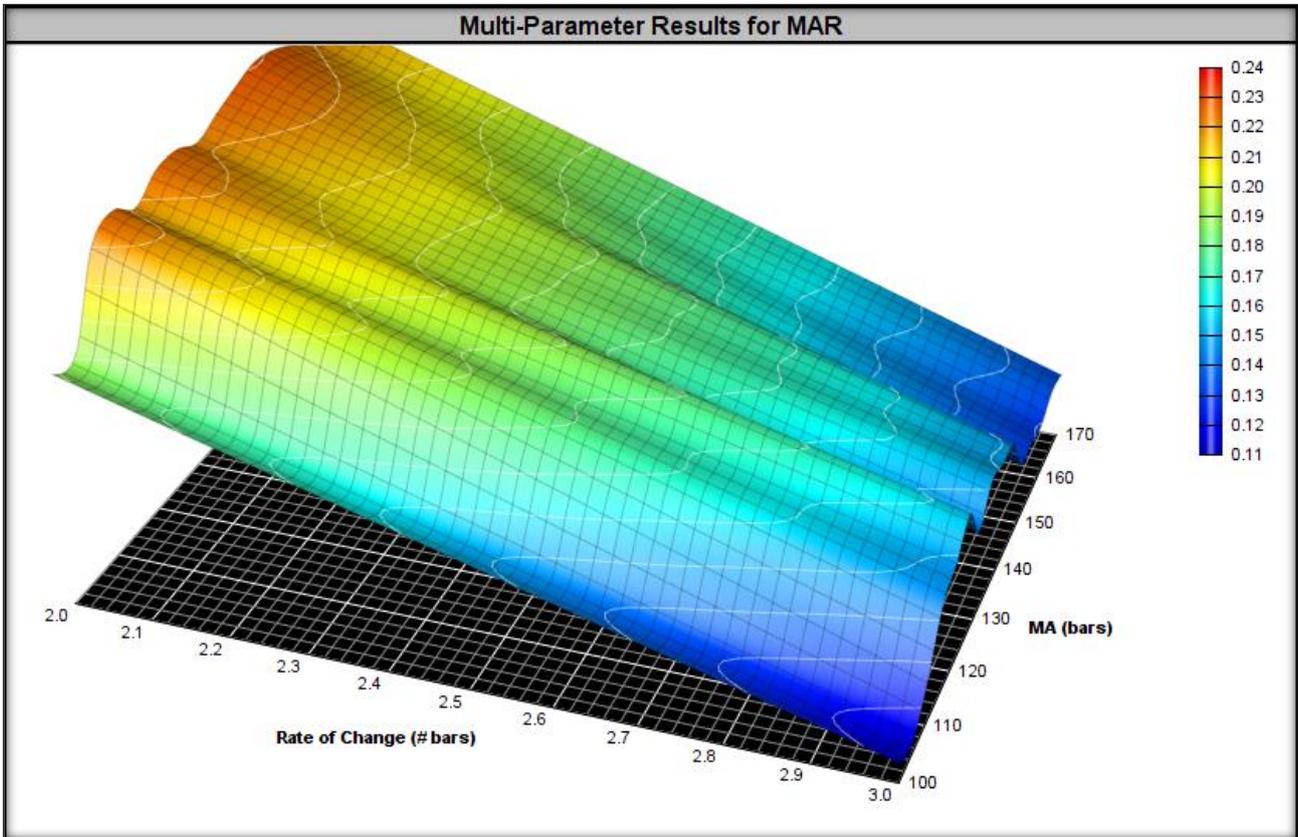
Therefore, further testing of the strategy is not justified, as its use in real transactions is highly doubtful.

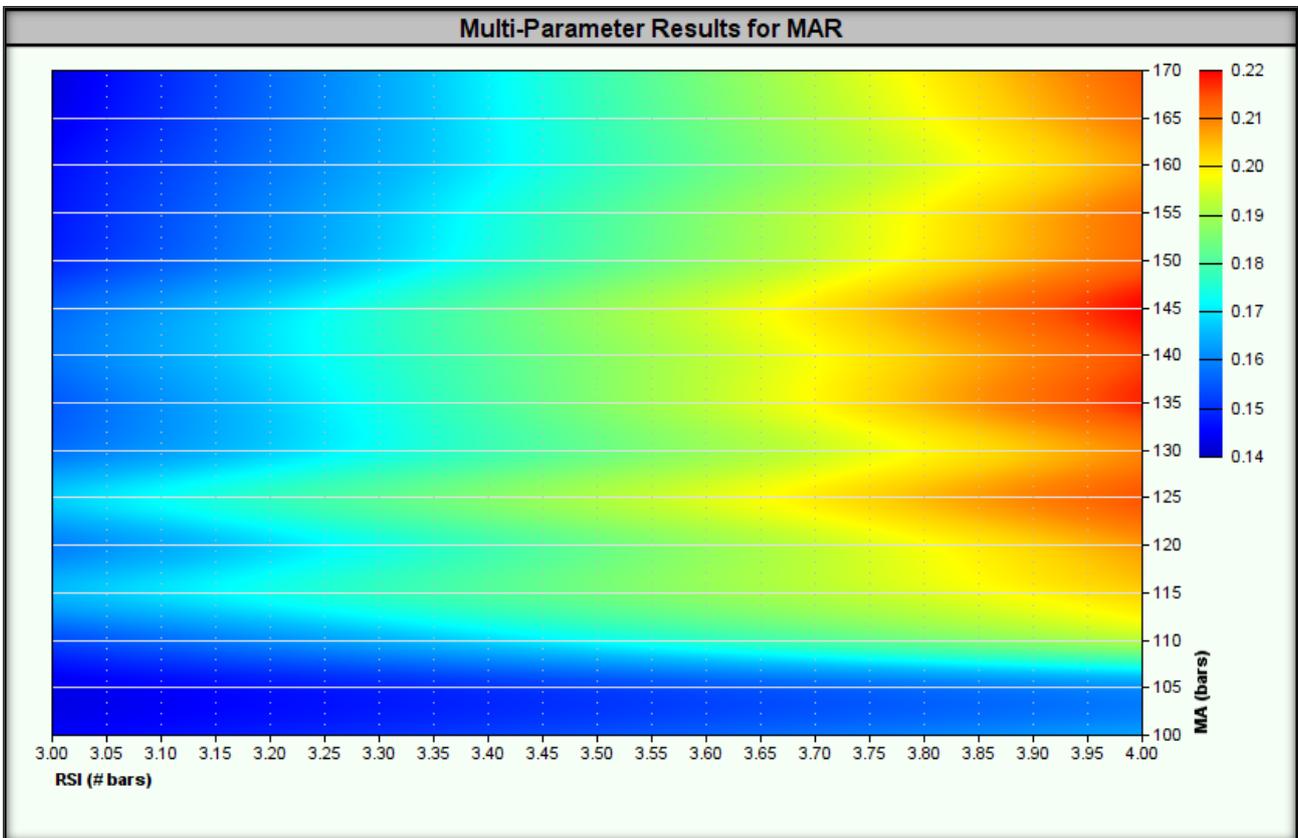
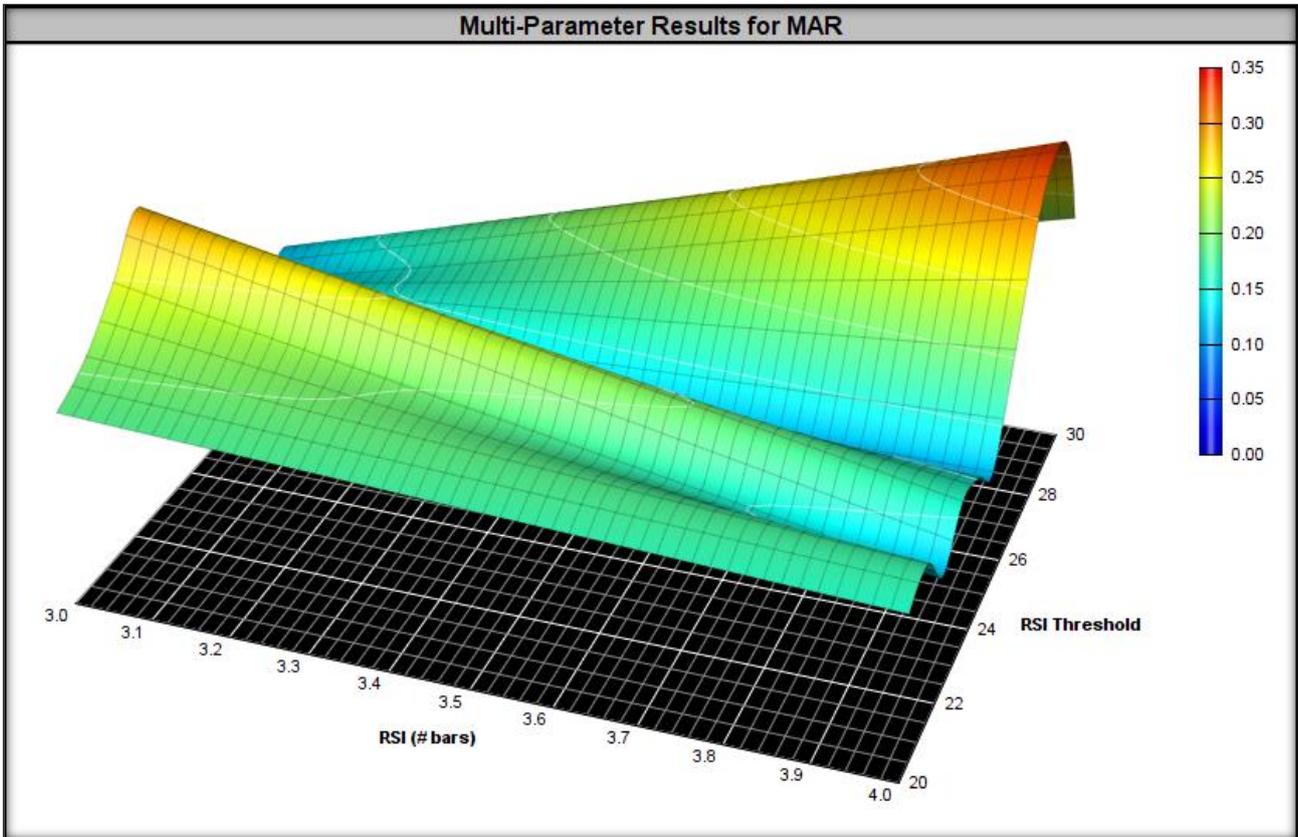
Heatmaps for the tested ranges are shown below.

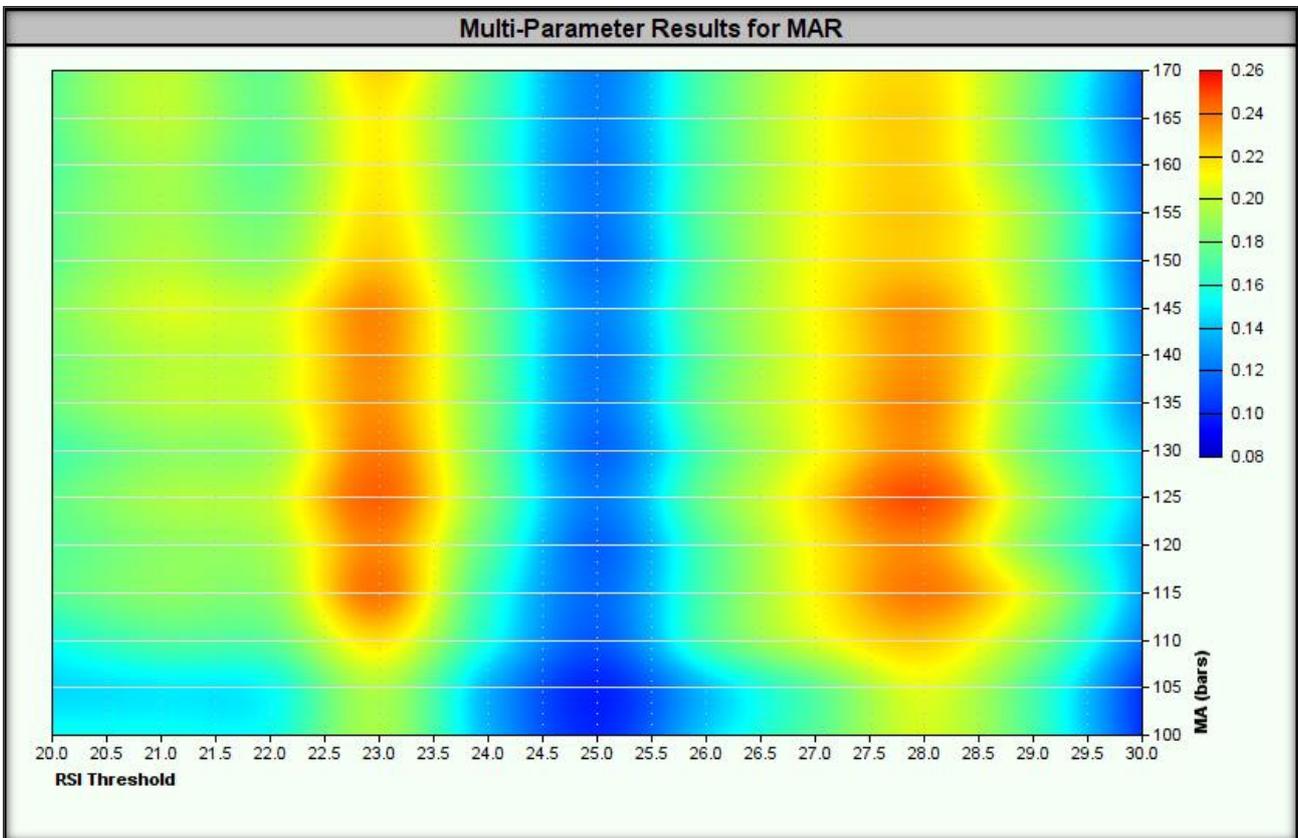
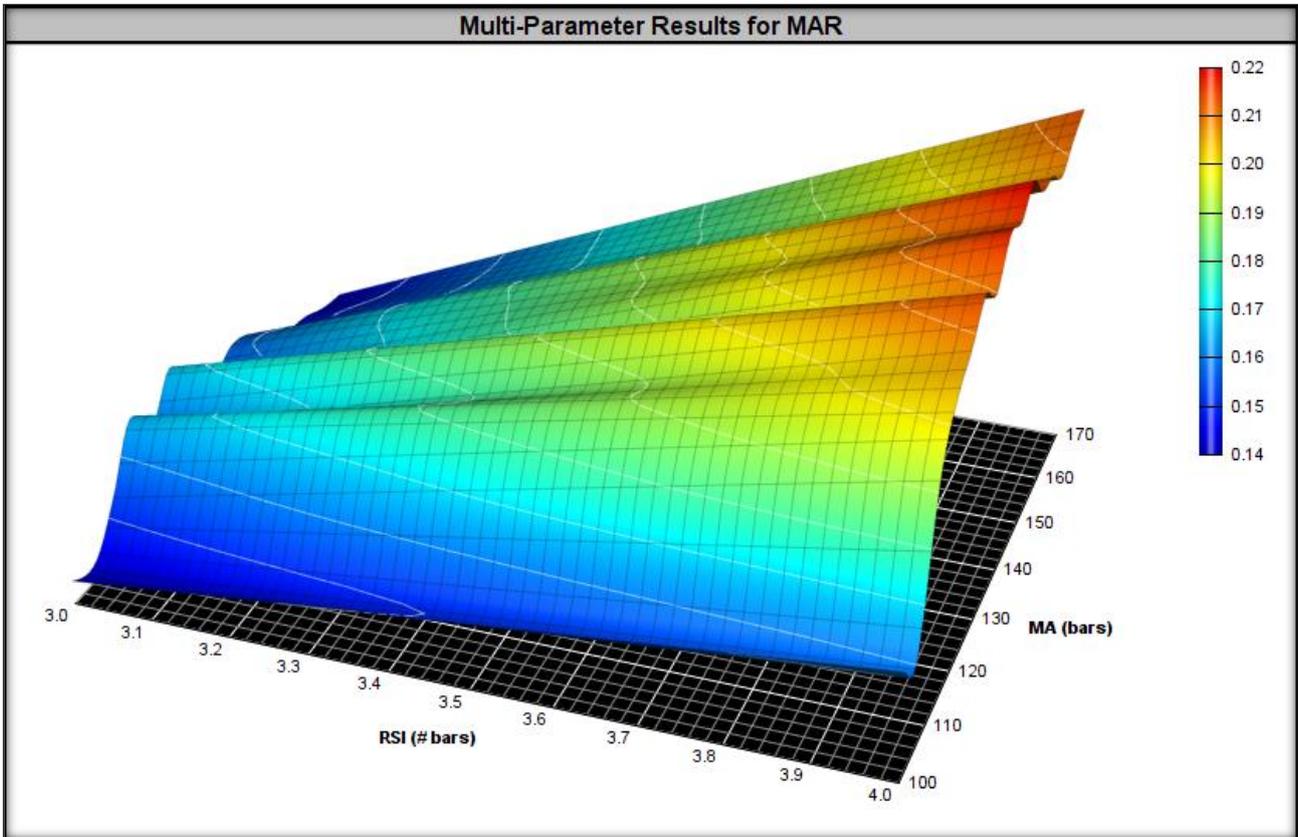


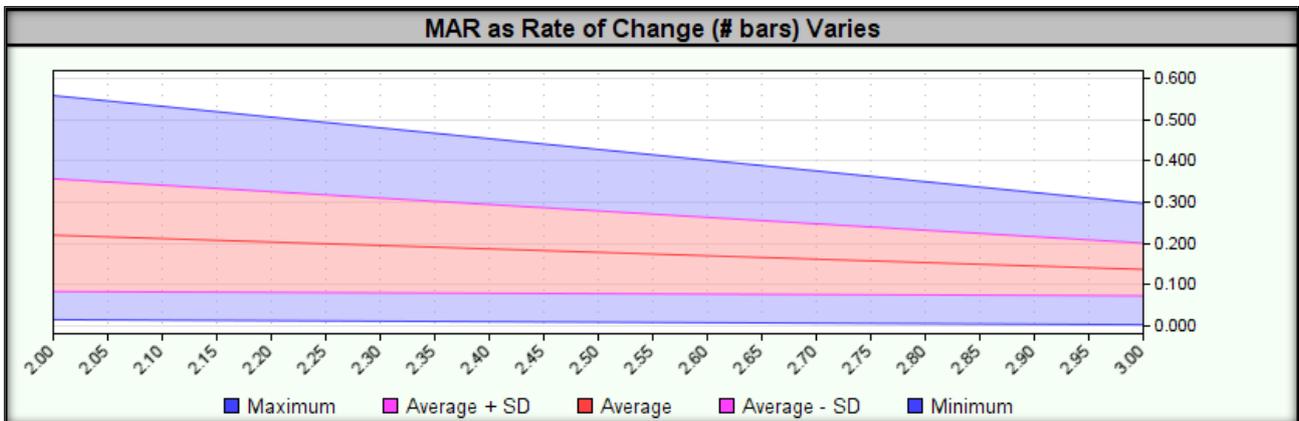
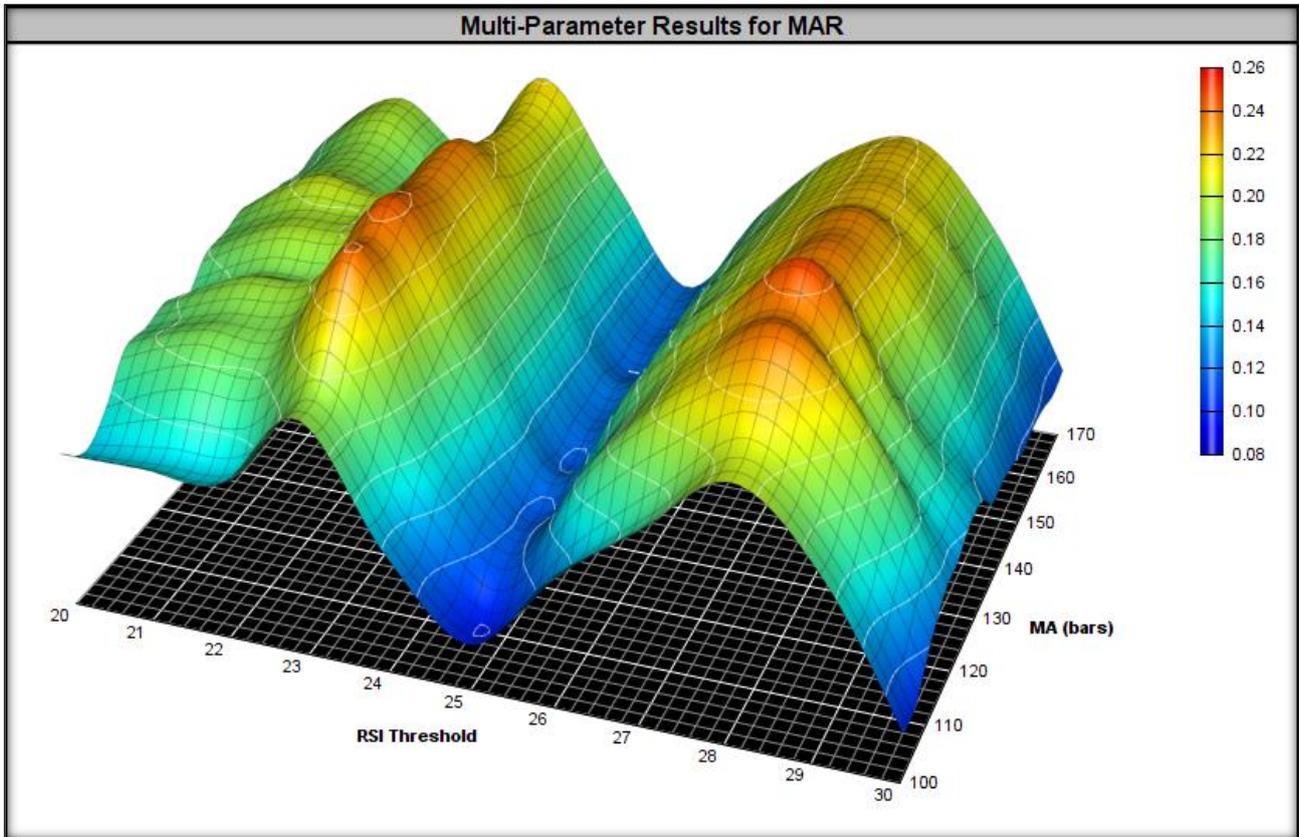


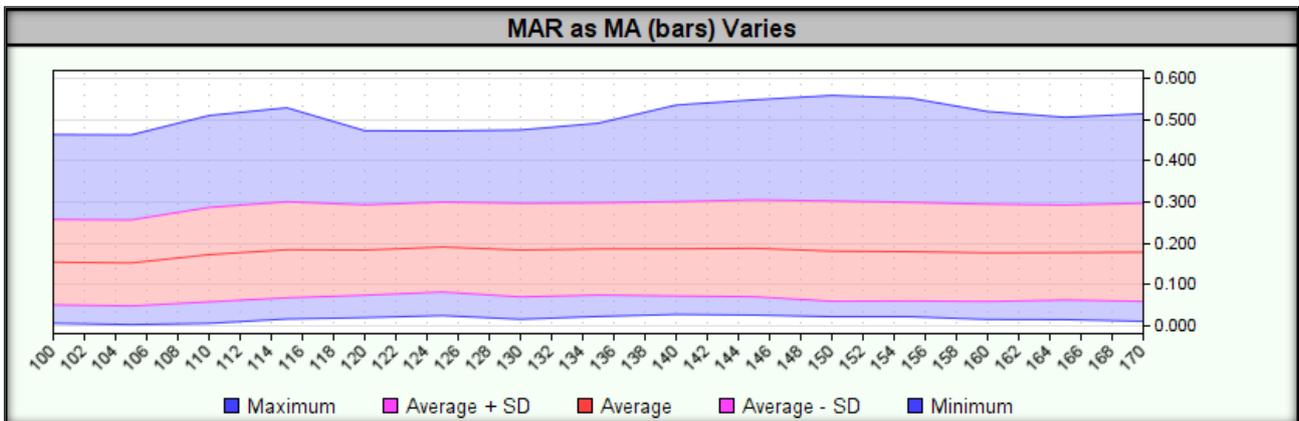
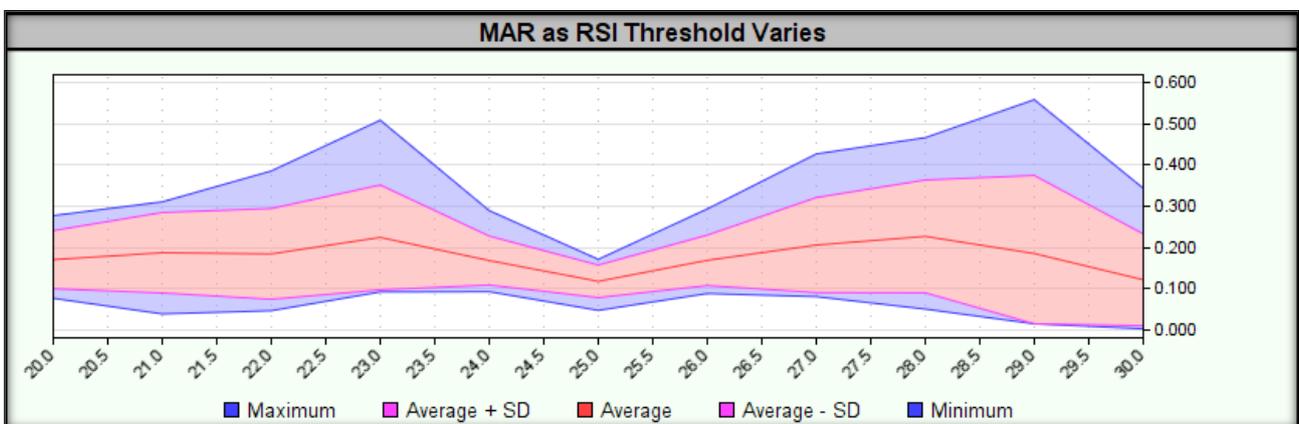
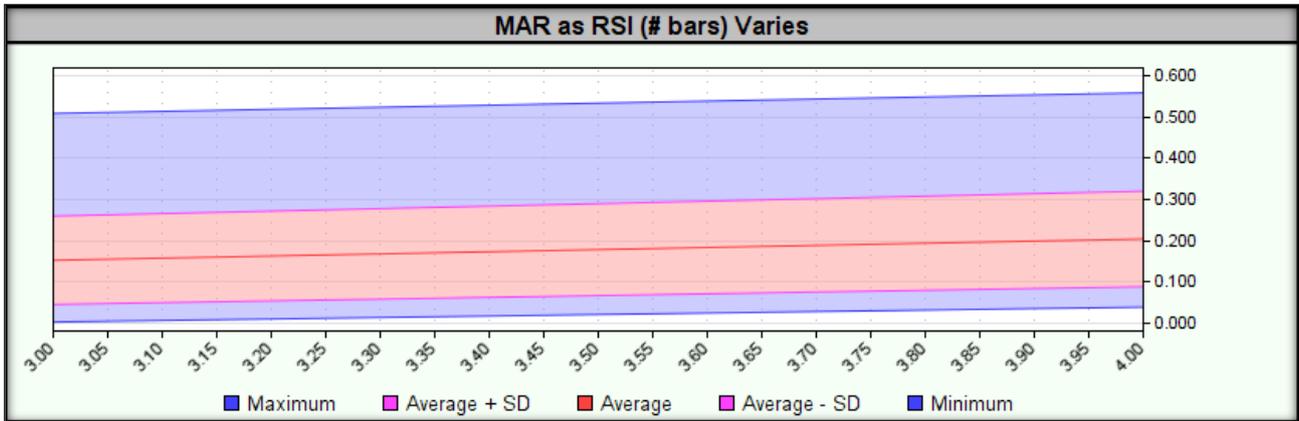












2. Monte Carlo simulation

The step was omitted due to failure of previous stability tests.

3. Stability over a moving time window

The step was omitted due to failure of previous stability tests.

4. Long/short stability

The step was omitted due to failure of previous stability tests.



5. Stability in the portfolio of financial instruments

The step was omitted due to failure of previous stability tests.

6. Money Management (Position Sizing)

The step was omitted due to failure of previous stability tests.

7. Strategy Risk Management

The step was omitted due to failure of previous stability tests.



Step 5: Walk-Forward Analysis

The step was omitted due to failure of previous stability tests.



Step 6: Using the strategy in real time

The step was omitted due to **failure of previous stability tests.**