Momentum Pinball v.1

Investment Strategy Testing Summary

The Momentum Pinball (MP) v.1 strategy is a faithful, daily adaptation of **Linda Bradford Raschke's approach:** it's based on the **LBR/RSI indicator** (Lindy Bradford Raschke/RSI) – a 3-period RSI calculated on **a one-day price change (ROC-1).** After **a signal of extremes** (long: LBR/RSI below the threshold, short: above 100 minus the threshold), **a position is opened** with **a stop order** set at the high/low breakout of the signal candle, with **the initial stop** on the opposite side of that candle. **The position** is closed **after a few days** or **at the stop,** whichever comes first. **The design retains the spirit of Momentum Pinball** while being fully mechanical on the daily time frame.

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.

Contents

Step 1: Formulate an investment strategy

Momentum Pinball (MP) v.1 is a faithful, daily implementation of **Linda Bradford Raschke's method,** which combines **a signal of an extreme** with **price confirmation in the next session.** At the core of the system is **the LBR/RSI** – a multi-day RSI calculated on **a one-day price change (ROC).** We treat the day the LBR/RSI reaches an extreme level as **a signal day** (setup). However, **we don't enter** immediately; instead, we prepare **a stop order** for the **following day,** so that the market itself "draws" us into a trade **only when it confirms the direction** by breaking out of the previous extreme.

Long logic: when **the LBR/RSI drops below the oversold threshold (RSITreshold),** we have a signal to trade. We set **a buy stop for the next session. 1 tick above** today's candle high. If the market **breaks** this high, the position **is activated; at the same time, the initial stop** applies from the start. **1 tick below** the low of today's candle. If **there is no breakout,** the order **expires** and we wait for a new, fresh LBR/RSI signal. The **short version** is created when **the LBR/RSI exceeds the level (100 – RSIThreshold):** then we place **a sell stop for the next session. 1 tick below** today's low and **initial stop 1 tick above** today's high.

The trading horizon is by definition **short** – the strategy targets **1–5 follow-through sessions.** Therefore, **the exit** is **time-exit:** after **exitBars,** the position is closed **at the open;** alternatively, the position can end **with a stop** if the market negates the breakout. The Momentum Pinball strategy **does not use trailing stops** or additional filters – the entire advantage comes from **the quick diagnosis of extremes** (LBR/RSI) and **discipline in confirming the entry** (breakout). This design limits "catching knives" on the oscillator signal itself and forces **market evidence of strength** the following day.

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;
- **Defined initial stop** – on the opposite side of the signal candle;
- **Short horizon** – **time-exit** after several sessions or **stop loss,** no trailing.

Characteristics of the strategy and its strengths and weaknesses:

- **Minimalistic, easy to program** – a few simple rules ensure transparency and low computational costs;
- **Fast, reactive inputs at the extremes** – they aim for 1–5-day follow-through;
- **Sensitivity to gaps/slippages** (breakout entries);
- **No trend filters** – increases the number of signals, but also exposure to greater volatility.

Momentum Pinball (MP) v.1, 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.1 strategy** on daily data:

1. **Calculating Indicators:**
    a. **LBR/RSI(X/Y)** – X-period RSI calculated on **the Y-period price change (ROC).**
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. **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.
    c. **Starting Stop:** defense order Place **your stop loss one tick below the low of** the signal day candle.
3. **Generating Entry Signals – Short Position:**
    a. **Extreme condition:** A signal day occurs when the LBR/RSI(X/Y) reading rises **above the (100 – RSIThreshold) level,** which indicates extreme overbought.
    b. **Setting an entry order (after the signal):** for the next session, set **a sell stop order** placed **one tick below the low** of the candle on the signal day.
    c. **Starting Stop:** defense order Place **your stop loss one tick above the high of** the signal day candle.
4. **Generating Output Signals:**
    a. **Timed exit:** If the position remains open, **close it at the opening of the session that falls after Z sessions have passed** since the entry date.
    b. **Stop Exit:** Whenever the price reaches the defined **initial stop loss level, close the position** according to that order.
5. **Position direction:** long and short positions.
6. **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, **count down the next sessions** to **Z** and execute **a timed exit** or **stop exit,** depending on how the situation develops.

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.

Tests are performed assuming that the risk of one position is **1.0% of total capital.**

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.

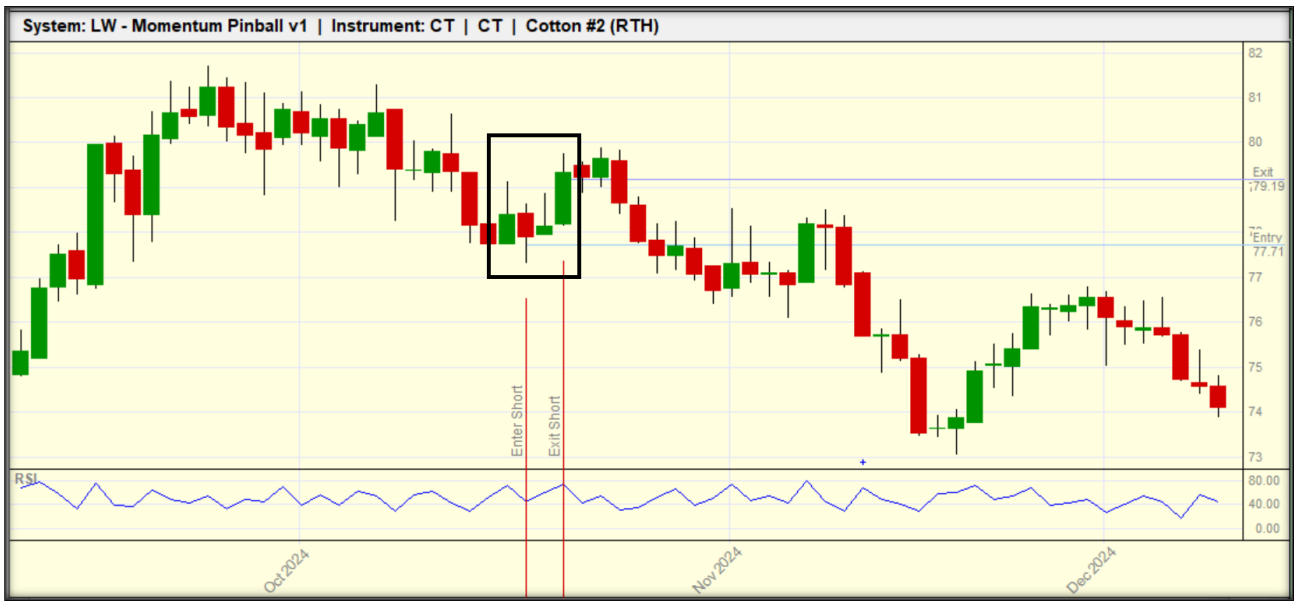
The first transaction was executed on a futures contract on the Nikkei 225 index. At the end of December 2024, a long MP position signal appeared (first candle in the left-hand rectangle): the 3-day RSI calculated on a 1-period price change (ROC) dropped below 30 points, indicating the formation of a signal candle. According to the strategy's rules, **a buy stop order was set for the next session one tick above the signal candle's high,** along with a defensive **stop loss order set one tick below the low of that 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 after five days or when a defensive order is triggered.** Since the stop loss order wasn't reached within five days, we close the position on the sixth day at the opening (the second candle in the right-hand rectangle). **The system worked correctly.**

The second transaction was executed on a cotton futures contract. In mid-October 2024, a short MP position signal appeared (first candle in the rectangle): the 3-day RSI calculated on a 1-period price change

(ROC) rose above 70 points, indicating the formation of a signal candle. According to the strategy's rules, **a sell stop order was set for the next session one tick below the low of the signal candle,** along with a defensive **stop loss order set one tick above the high of that candle. The position was opened the next day** (second candle in the rectangle). **The system worked correctly.**

The strategy assumes **closing the position after 5 days or when a defense order is activated.** On the third day after opening the position, the defense order was activated (fourth candle in the 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.

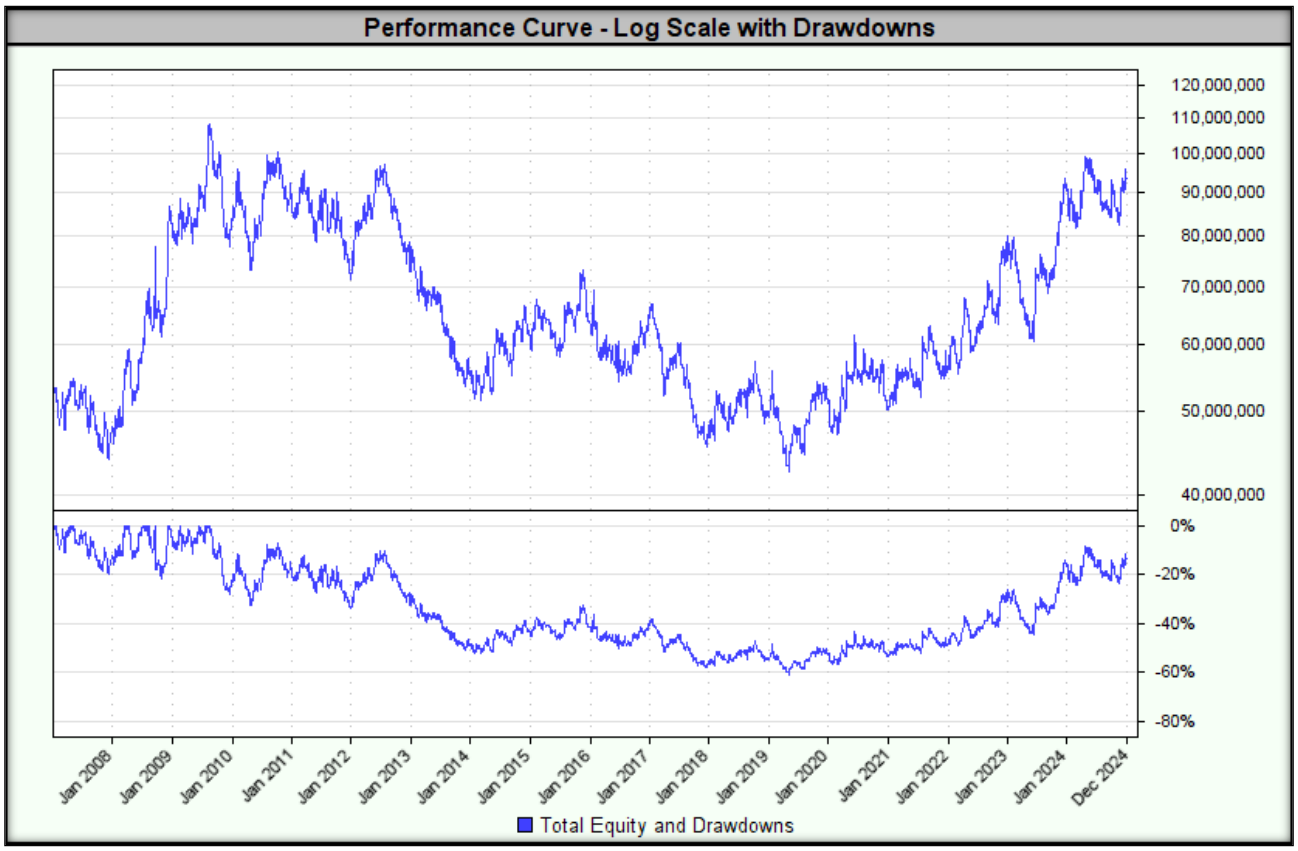
First, **we reject strategies that linearly lose capital.** If a strategy exhibits this pattern, it's a clear signal that any parameter optimization is pointless.

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 (long/short position):** 30/70;
- **Method of opening a position (long/short):** buy stop one tick above the high of the signal candle/sell stop one tick below the low of the signal candle;
- **Order validity:** the order remains active only in the next session;
- **Stop loss (long/short position):** one tick below the low of the signal candle/one tick above the high of the signal candle;
- **Closing the position:** 5 days after opening;
- **Position direction:** long and short positions;
- **Position sizes:** corresponding to a risk of 1.0% of total capital.

The test result is shown below.



Indicators/Measures	Concluding a transaction at the opening price
CAGR%	3.53%
MAR Ratio	0.06
RAR%	-0.54%
R-Cubed	-0.01
Robust Sharpe Ratio	-0.03
Max Drawdown	60.7%
Wins	41.9%
Losses	58.1%
Average Win%	1.38%
Average Loss%	0.95%
Win/Loss Ratio	1.46
Average Trade Duration (days)	5
Percent Profit Factor	1.05
SQN	0.21
Number of transactions	3683

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.1 strategy involves optimizing parameters using the Grid Search** method. This method involves **fully optimizing 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 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 **1-2 (step: 1);**
  - **RSI:** range **3-5 (step: 1);**
- **LBR/RSI Threshold:** range **23-35 (step: 1);**
- **Closing position:** range **15-25 (step: 1).**

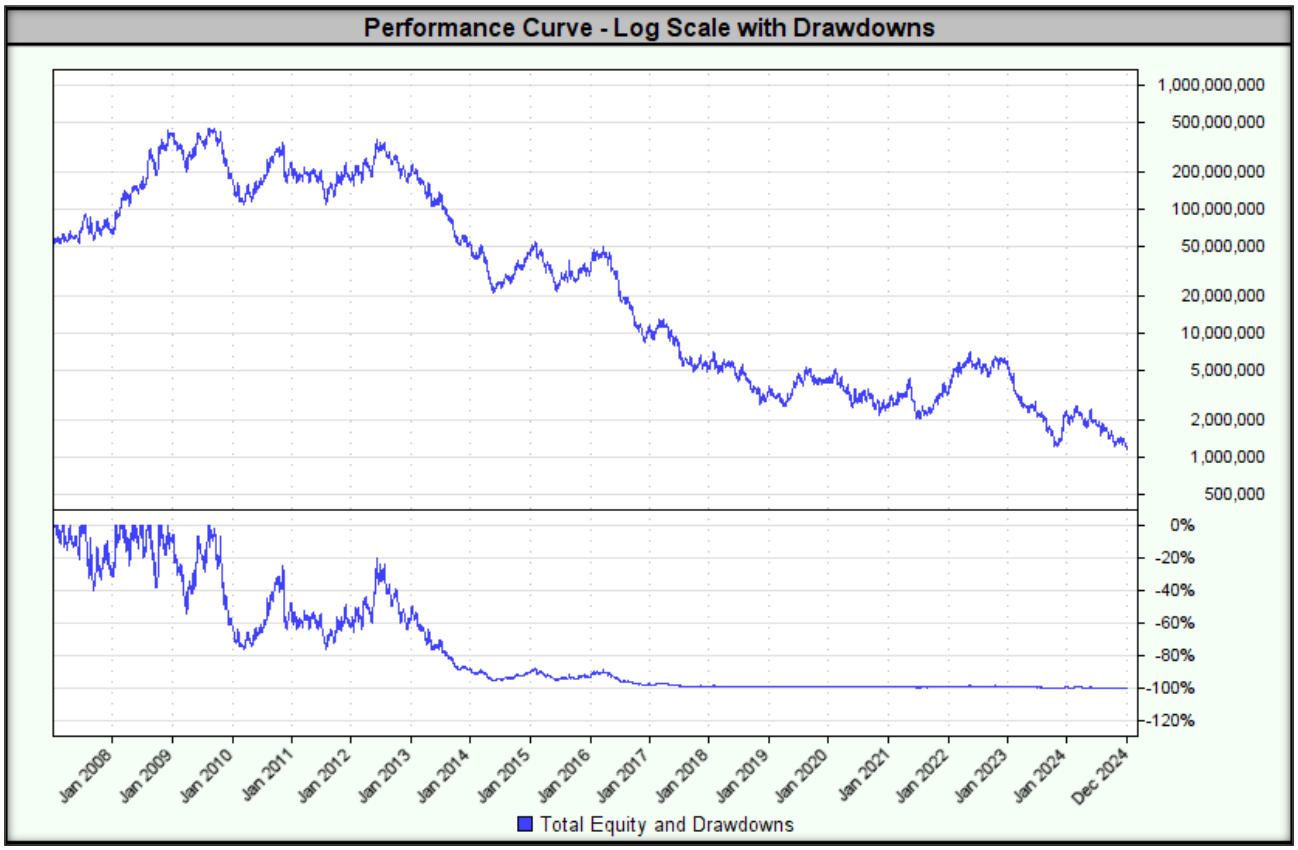
The lowest MAR value of -0.19 was achieved for the following parameters:

- **LBR/RSI:**
  - **ROC:** 2;

- **RSI:** 3;
- **LBR/RSI Threshold:** 35;
- **Closing position:** 23.

Test	Rate of Change (# bars)	RSI (# bars)	RSI Threshold	Exit (bars)	End Balance	CAGR%	MAR	Sharpe	Ann. Sharpe	Max TE DD	Longest DD	Trades	R3	RAR [%]
570	2	3	35	23	$1,165,191.29	-18.85%	-0.19	-0.01	-0.14	99.7%	184.6	7542	-0.16	-27.40
571	2	3	35	24	$1,278,885.12	-18.43%	-0.18	0.02	-0.13	99.8%	191.8	7418	-0.19	-29.31
560	2	3	34	24	$1,618,494.38	-17.35%	-0.17	0.03	-0.11	99.8%	191.8	7169	-0.19	-29.15
567	2	3	35	20	$1,978,921.67	-16.43%	-0.16	0.02	-0.13	99.7%	184.7	7944	-0.16	-26.55
131	1	3	34	24	$2,090,534.11	-16.17%	-0.16	-0.15	-0.20	98.3%	149.4	4624	-0.11	-19.90
572	2	3	35	25	$2,041,058.90	-16.28%	-0.16	0.05	-0.10	99.7%	191.8	7297	-0.18	-27.00
559	2	3	34	23	$2,163,002.31	-16.01%	-0.16	0.04	-0.10	99.6%	192.9	7263	-0.17	-25.96
556	2	3	34	20	$2,166,529.46	-16.00%	-0.16	0.03	-0.12	99.8%	192.0	7673	-0.18	-26.67
549	2	3	33	24	$2,210,707.34	-15.91%	-0.16	0.03	-0.13	99.5%	151.0	6944	-0.13	-25.87
561	2	3	34	25	$2,398,582.59	-15.53%	-0.16	0.05	-0.09	99.7%	192.1	7071	-0.18	-27.33

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



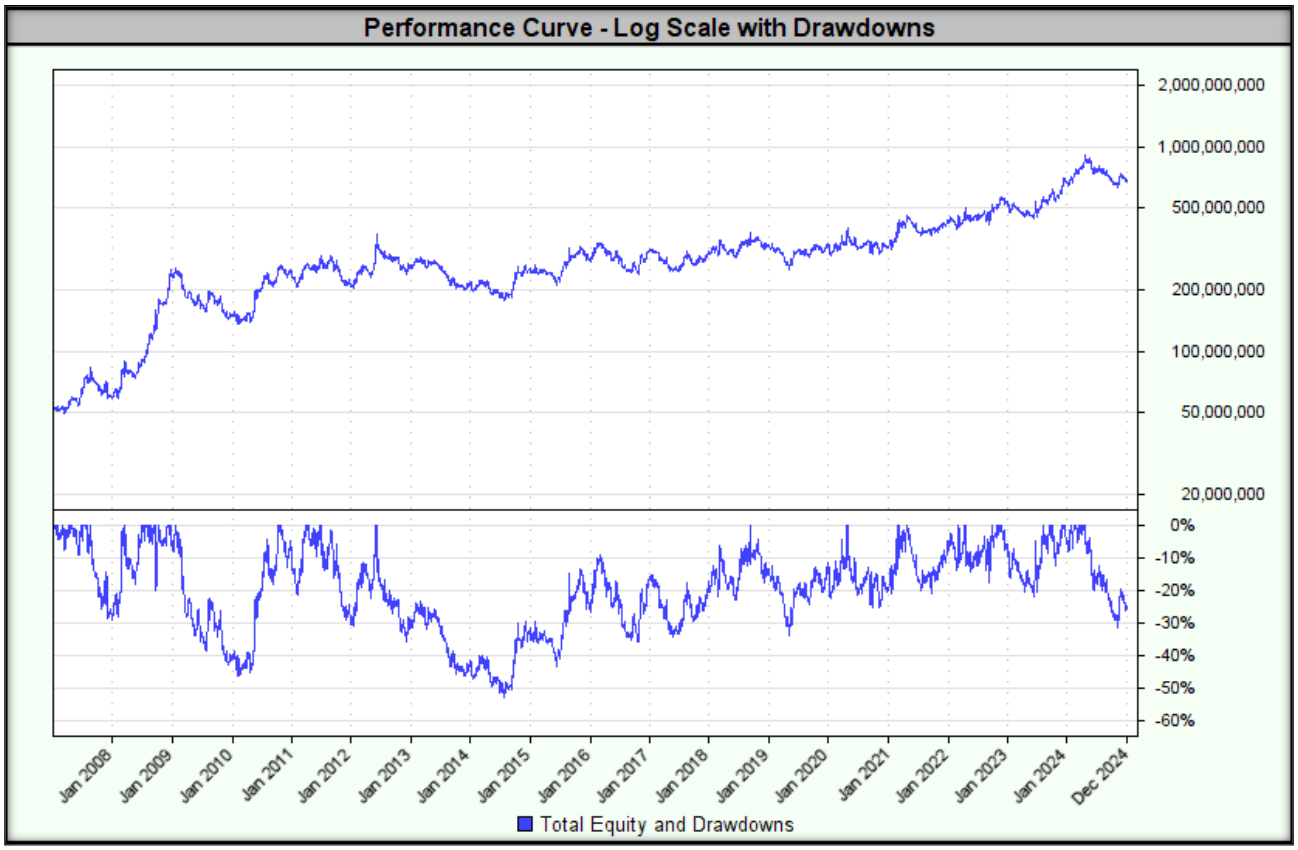
The highest MAR value of 0.30 was achieved for the following parameters:

- **LBR/RSI:**
  - **ROC:** 1;
  - **RSI:** 4;
- **LBR/RSI Threshold:** 34;
- **Closing position:** 19.

The highest MAR value was accompanied by **a drawdown of 52.7%.**

Test	Rate of Change (# bars)	RSI (# bars)	RSI Threshold	Exit (bars)	End Balance	CAGR%	MAR	Sharpe	Ann. Sharpe	Max TE DD	Longest DD	Trades	R3	RAR [%]
269	1	4	34	19	$683,878,232.84	15.64%	0.30	0.63	0.23	52.7%	75.2	2348	0.11	10.07
268	1	4	34	18	$648,297,877.49	15.30%	0.29	0.63	0.28	52.5%	66.7	2367	0.14	11.17
81	1	3	30	18	$818,090,672.44	16.80%	0.29	0.62	0.28	57.9%	44.7	3149	0.11	10.81
70	1	3	29	18	$740,803,682.98	16.16%	0.28	0.62	0.28	56.8%	44.3	2743	0.11	10.59
82	1	3	30	19	$727,560,451.77	16.04%	0.27	0.59	0.22	58.8%	63.6	3119	0.08	8.65
270	1	4	34	20	$598,069,884.64	14.78%	0.26	0.58	0.18	56.7%	135.9	2327	0.06	6.94
80	1	3	30	17	$587,347,332.10	14.67%	0.26	0.57	0.20	56.6%	79.7	3178	0.06	7.67
71	1	3	29	19	$621,674,104.99	15.03%	0.26	0.59	0.24	58.5%	44.3	2722	0.08	8.78
59	1	3	28	18	$580,958,447.13	14.60%	0.25	0.61	0.37	58.2%	65.6	2386	0.12	9.85
60	1	3	28	19	$533,484,361.58	14.06%	0.23	0.58	0.31	60.7%	86.5	2370	0.08	8.14

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



For all combinations of tested parameter ranges, **the highest drawdown was almost 100%.**

Test	Rate of Change (# bars)	RSI (# bars)	RSI Threshold	Exit (bars)	End Balance	CAGR%	MAR	Sharpe	Ann. Sharpe	Max TE DD	Longest DD	Trades	R3	RAR [%]
571	2	3	35	24	$1,278,885.12	-18.43%	-0.18	0.02	-0.13	99.8%	191.8	7418	-0.19	-29.31
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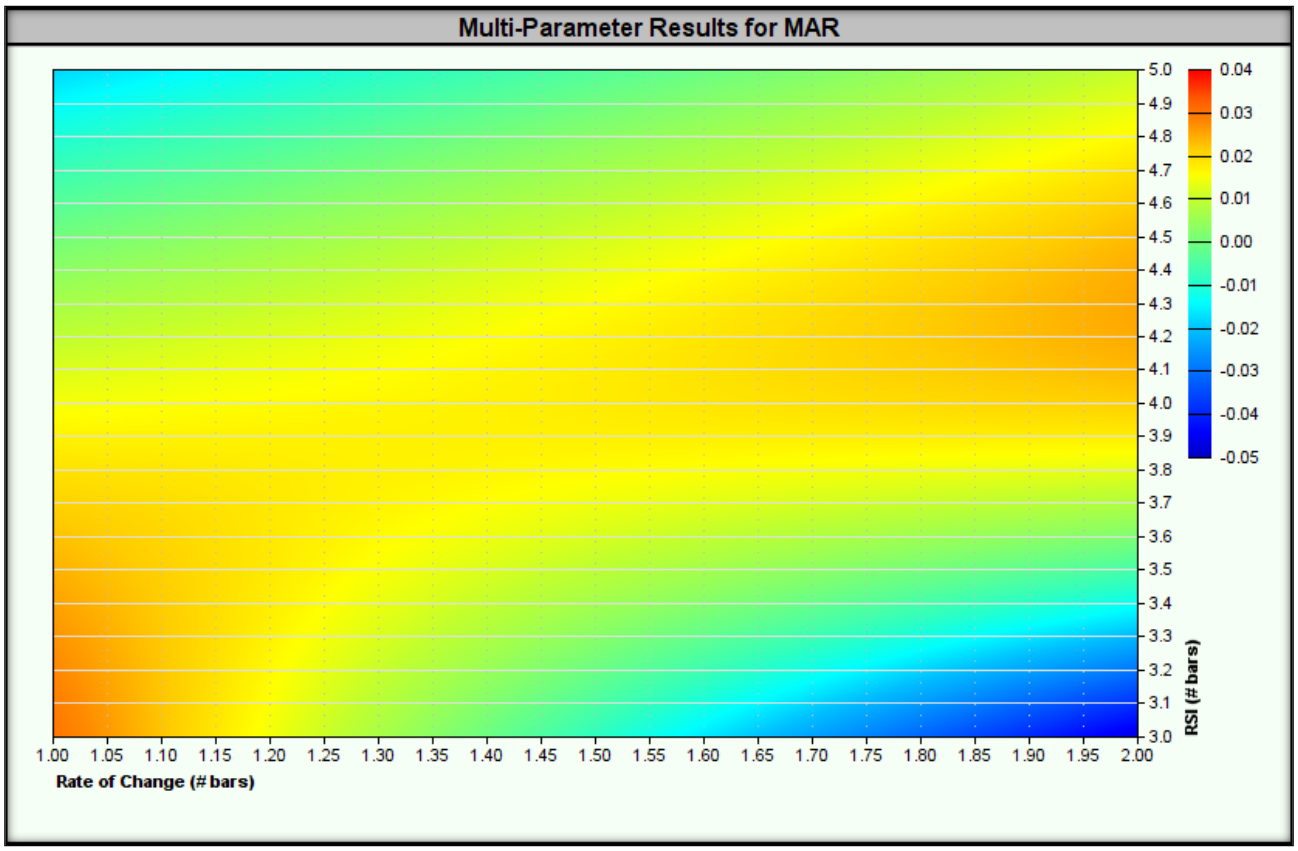
555	2	3	34	19	$3,777,470.41	-13.37%	-0.13	0.08	-0.12	99.5%	192.0	7807	-0.15	-23.44
549	2	3	33	24	$2,210,707.34	-15.91%	-0.16	0.03	-0.13	99.5%	151.0	6944	-0.13	-25.87

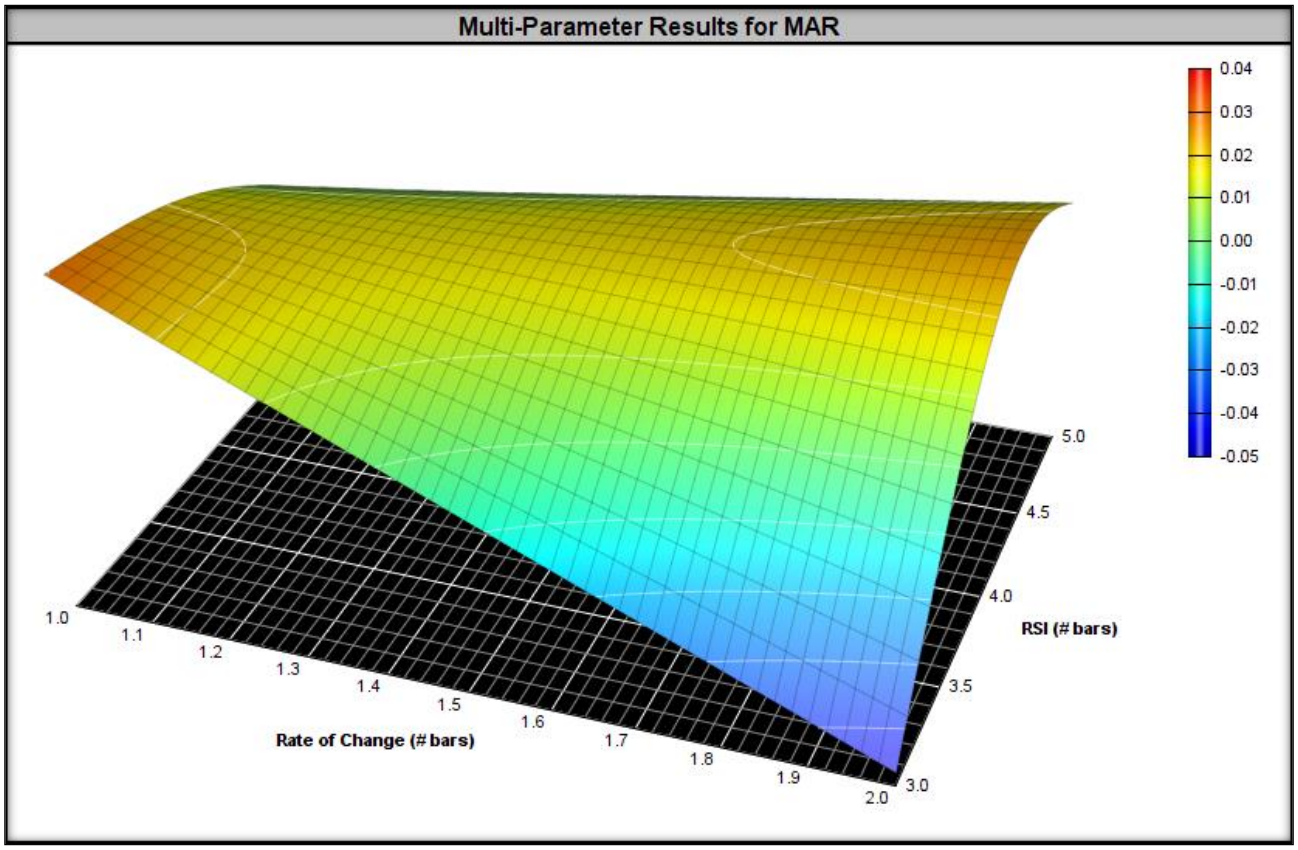
In summary, the strategy **failed the stability test** over a wide range of optimized parameters because:

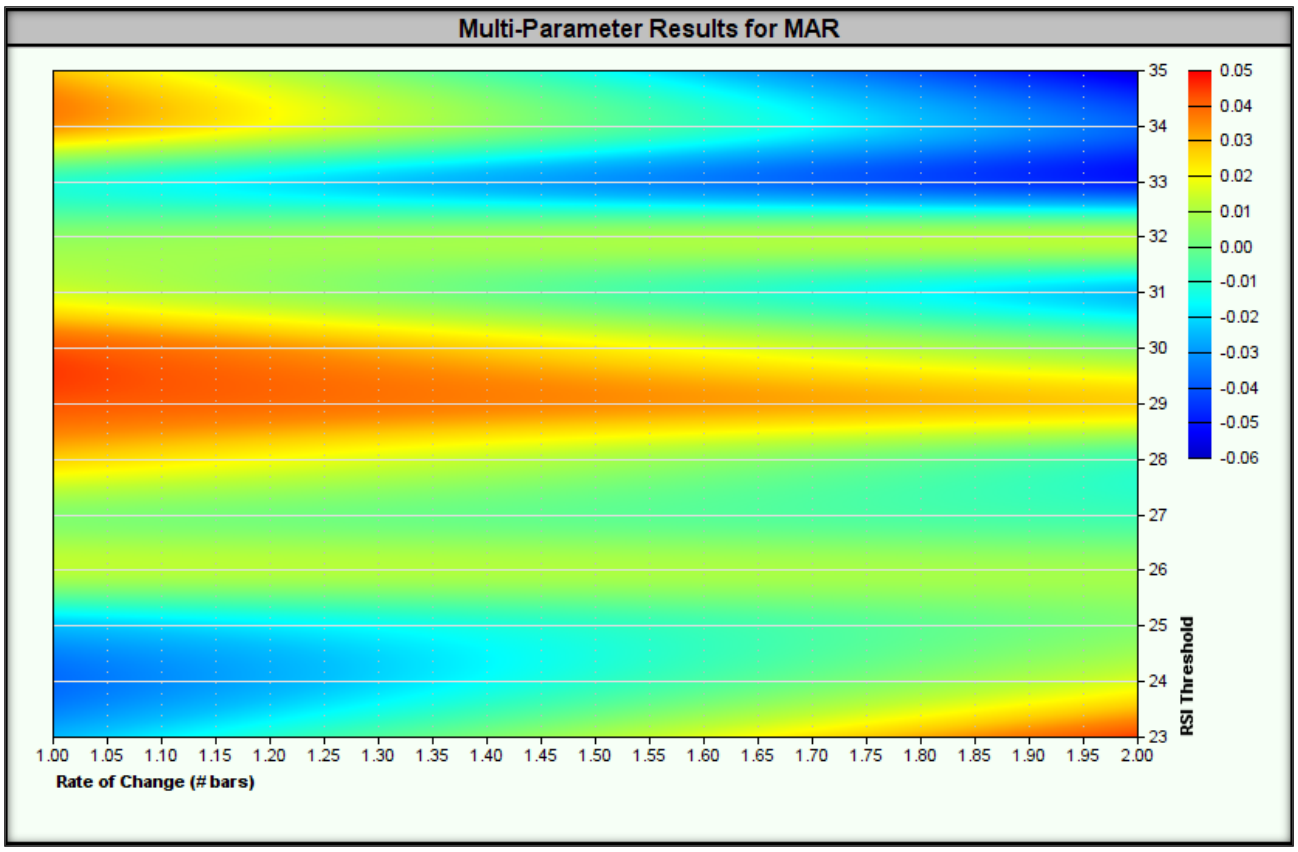
- **Not all test results showed a positive MAR value** – which indicates low stability of the strategy in various market conditions.

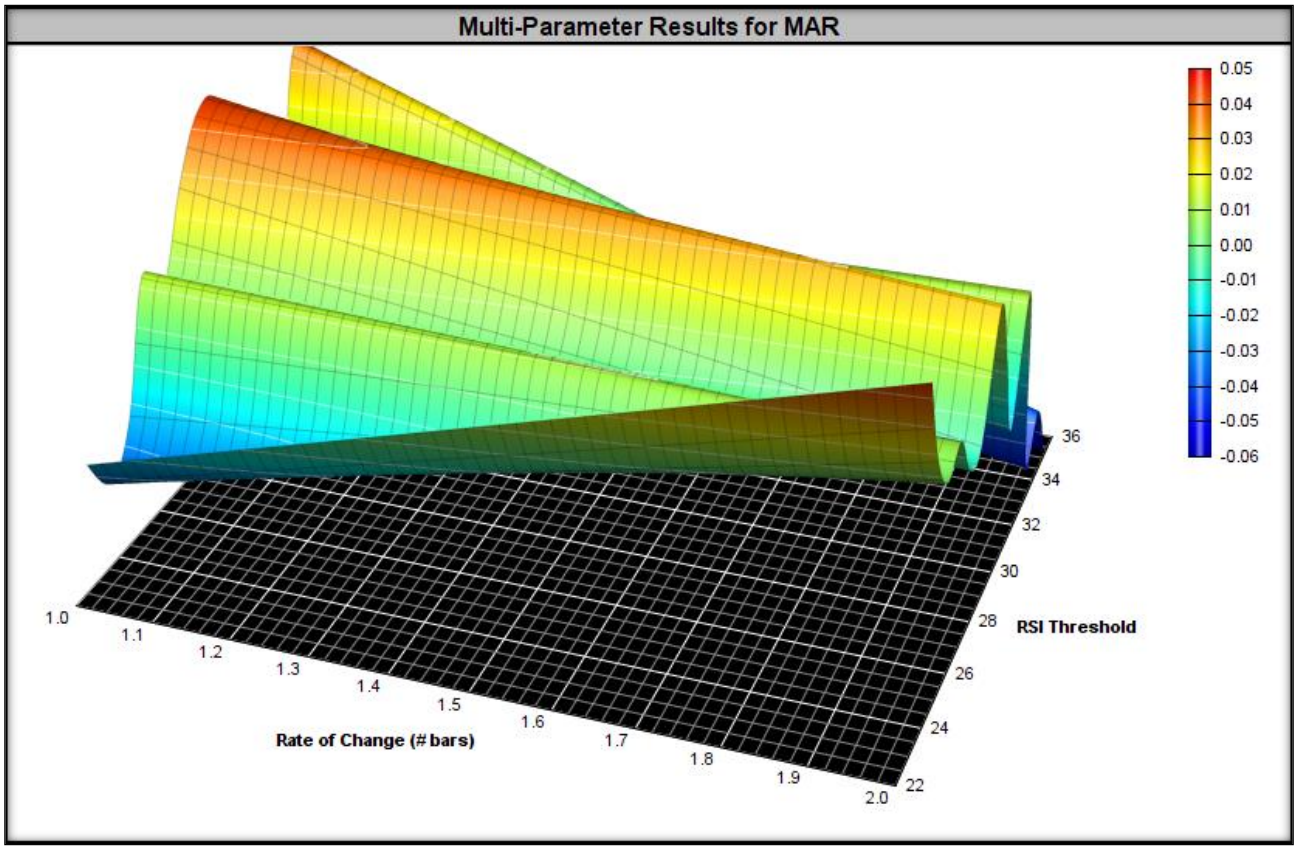
Therefore, **<u>further testing of the strategy is not justified,</u>** as its use in real transactions **is highly doubtful.**

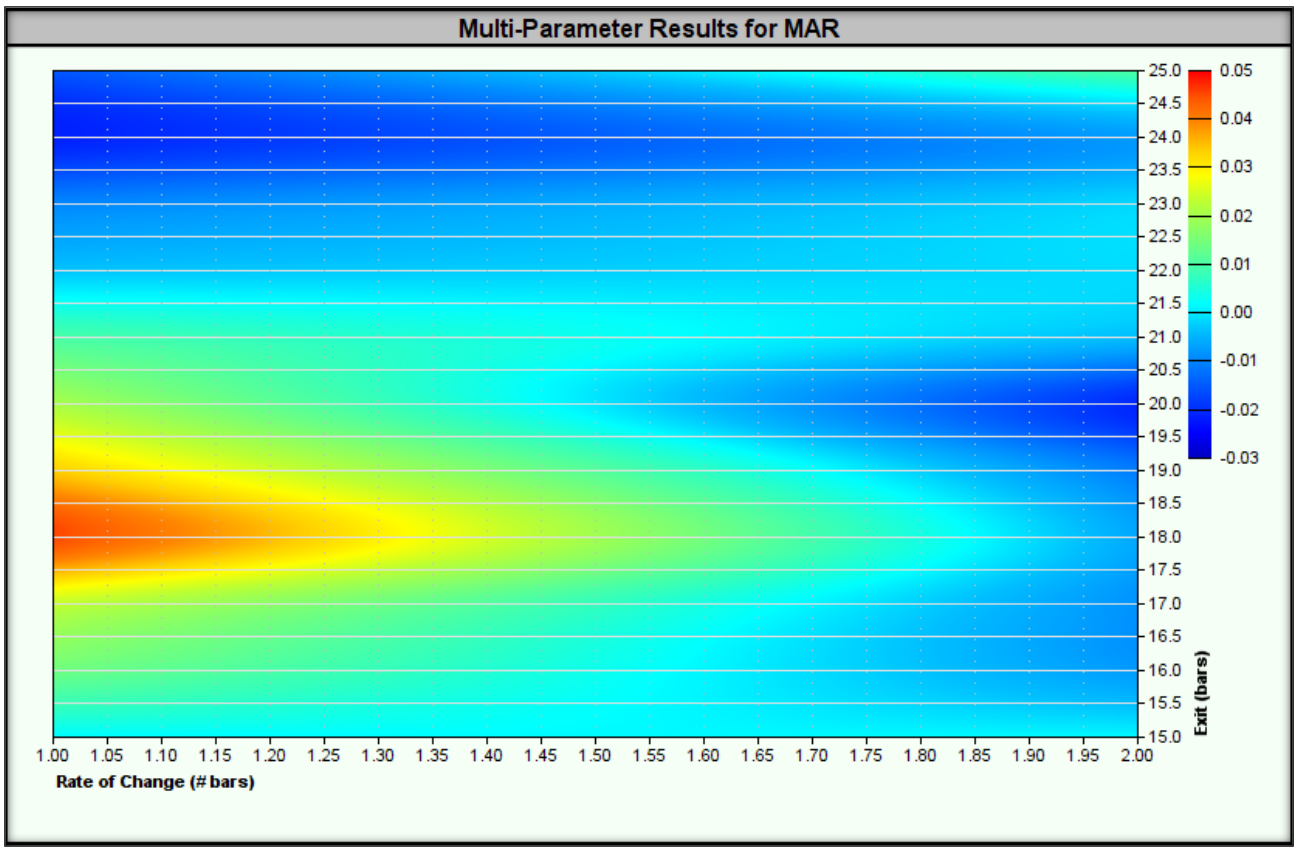
Heatmaps for the tested ranges are shown below.

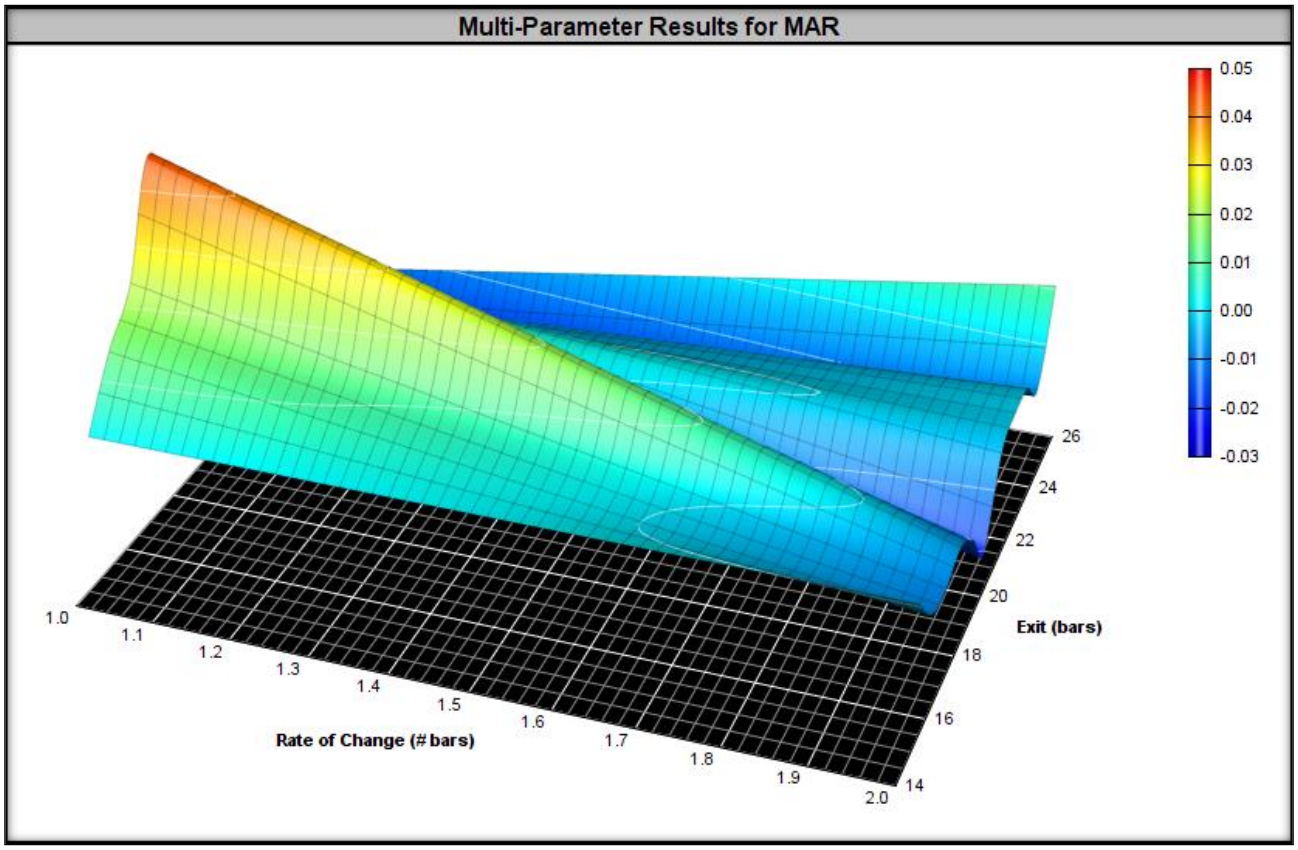


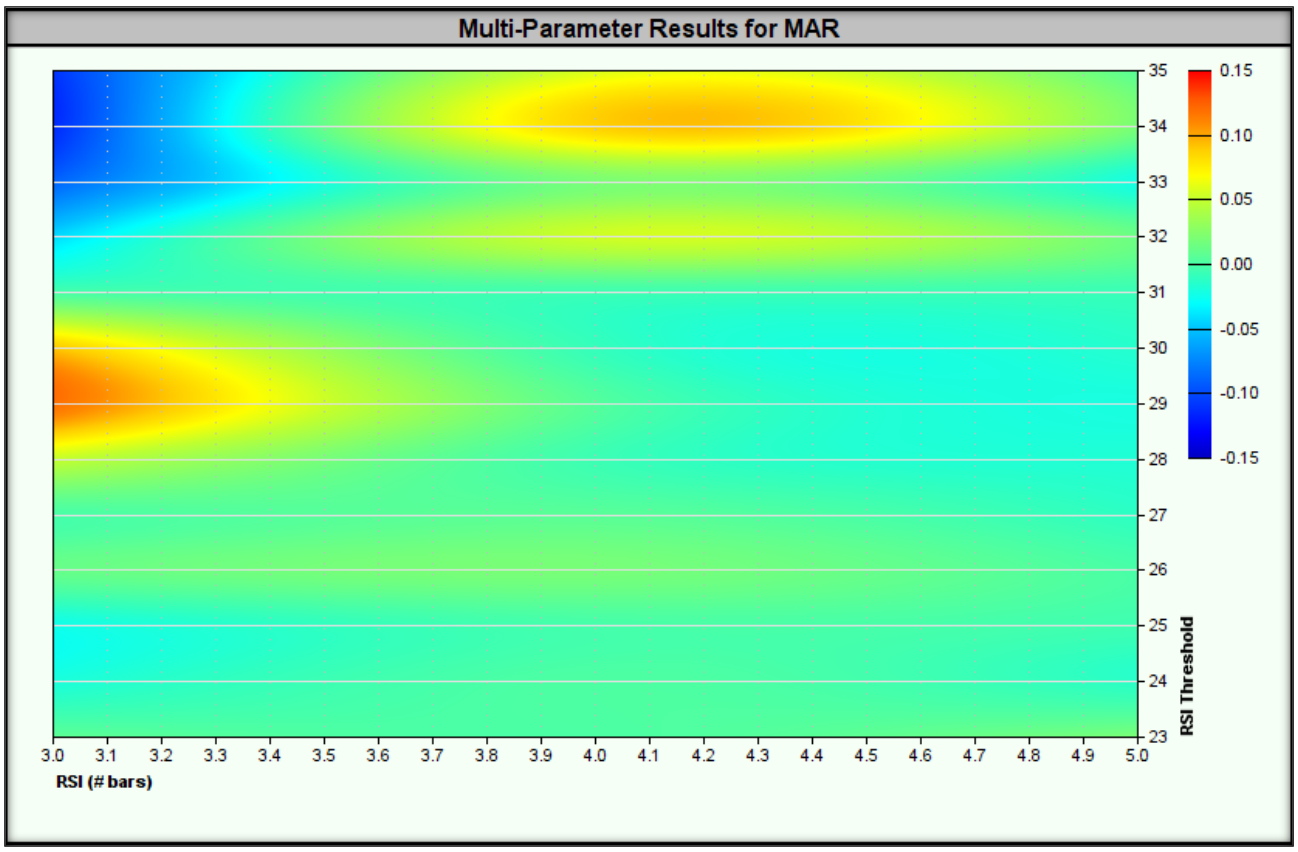

Multi-Parameter Results for MAR
0.04
0.03
0.02
0.01
0.00
-0.01
-0.02
-0.03
-0.04
-0.05
1.0
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2.0
Rate of Change (# bars)
3.0
3.5
4.0
4.5
5.0
RSI (# bars)

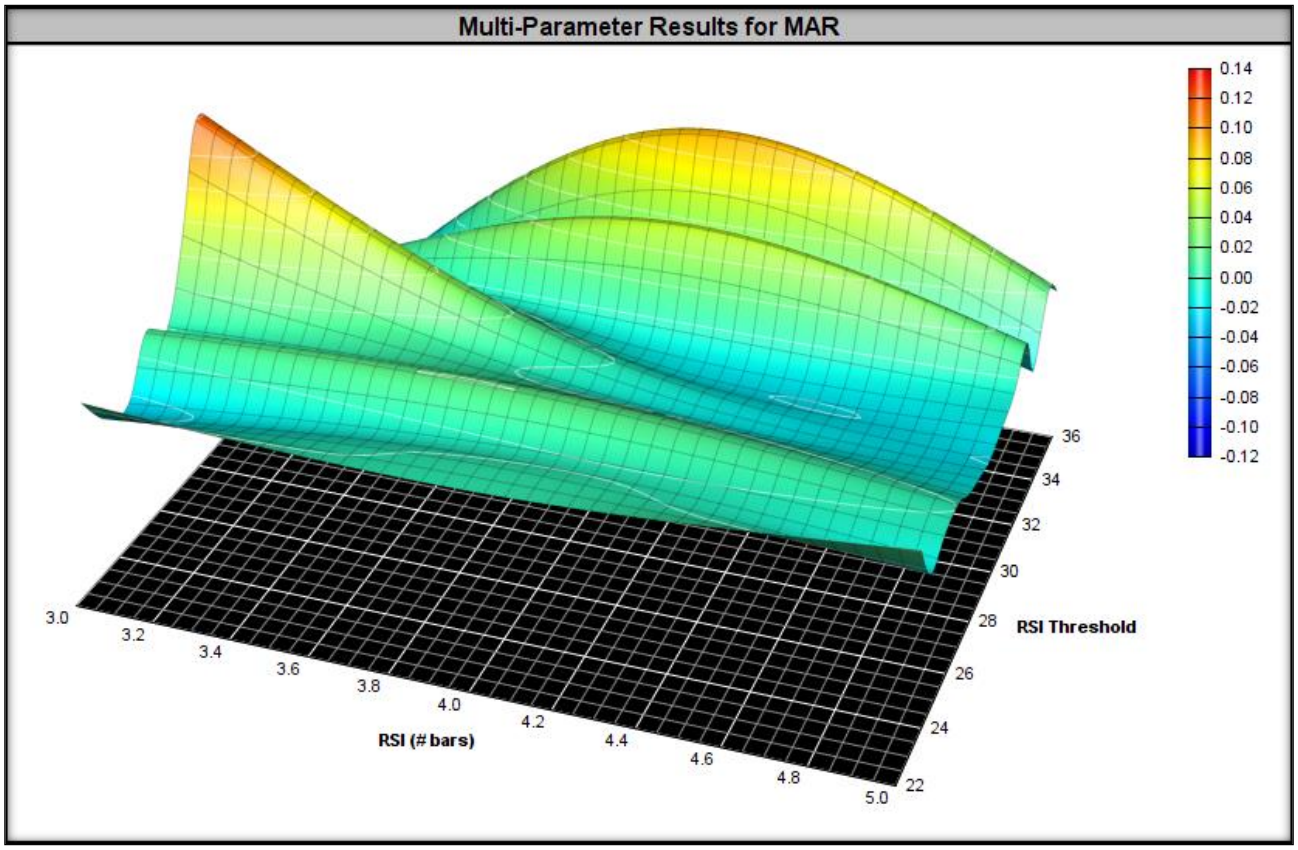

Multi-Parameter Results for MAR
0.05
0.04
0.03
0.02
0.01
0.00
-0.01
-0.02
-0.03
-0.04
-0.05
-0.06
35
34
33
32
31
30
29
28
27
26
25
24
23
RSI Threshold
1.00 1.05 1.10 1.15 1.20 1.25 1.30 1.35 1.40 1.45 1.50 1.55 1.60 1.65 1.70 1.75 1.80 1.85 1.90 1.95 2.00
Rate of Change (# bars)

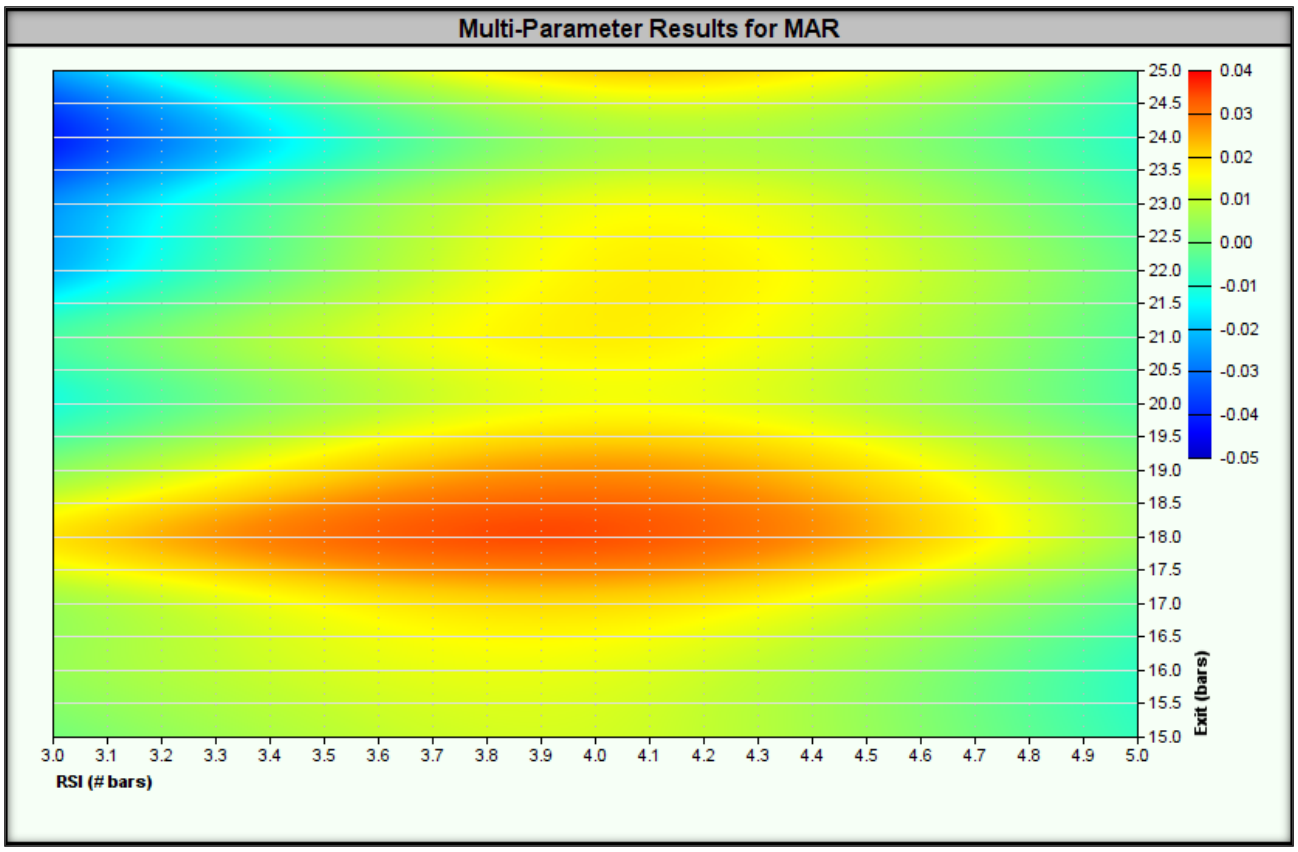

Multi-Parameter Results for MAR
0.05
0.04
0.03
0.02
0.01
0.00
-0.01
-0.02
-0.03
-0.04
-0.05
-0.06
36
34
32
30
28
26
24
22
RSI Threshold
1.0
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2.0
Rate of Change (# bars)

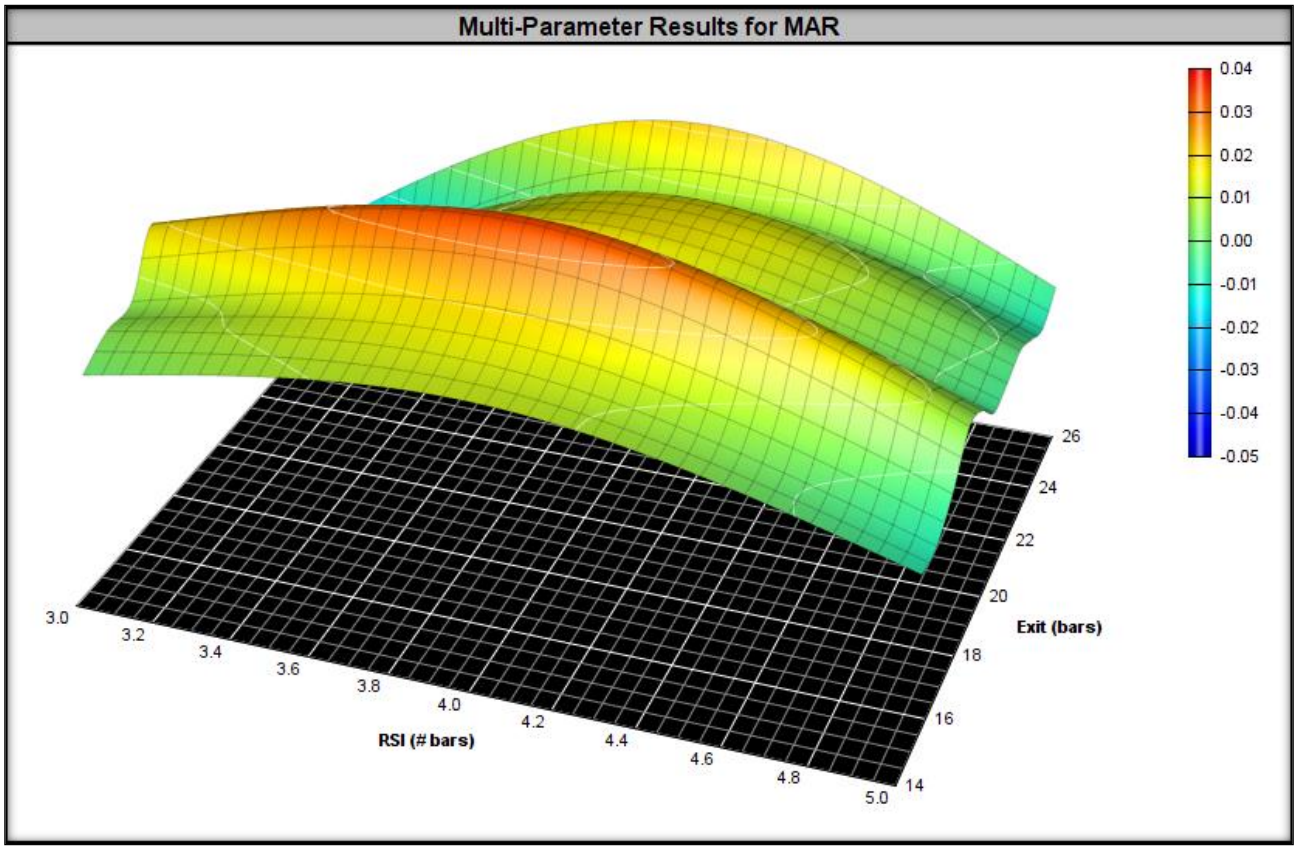

Multi-Parameter Results for MAR
0.05
0.04
0.03
0.02
0.01
0.00
-0.01
-0.02
-0.03
25.0
24.5
24.0
23.5
23.0
22.5
22.0
21.5
21.0
20.5
20.0
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
15.0
Exit (bars)
1.00 1.05 1.10 1.15 1.20 1.25 1.30 1.35 1.40 1.45 1.50 1.55 1.60 1.65 1.70 1.75 1.80 1.85 1.90 1.95 2.00
Rate of Change (# bars)

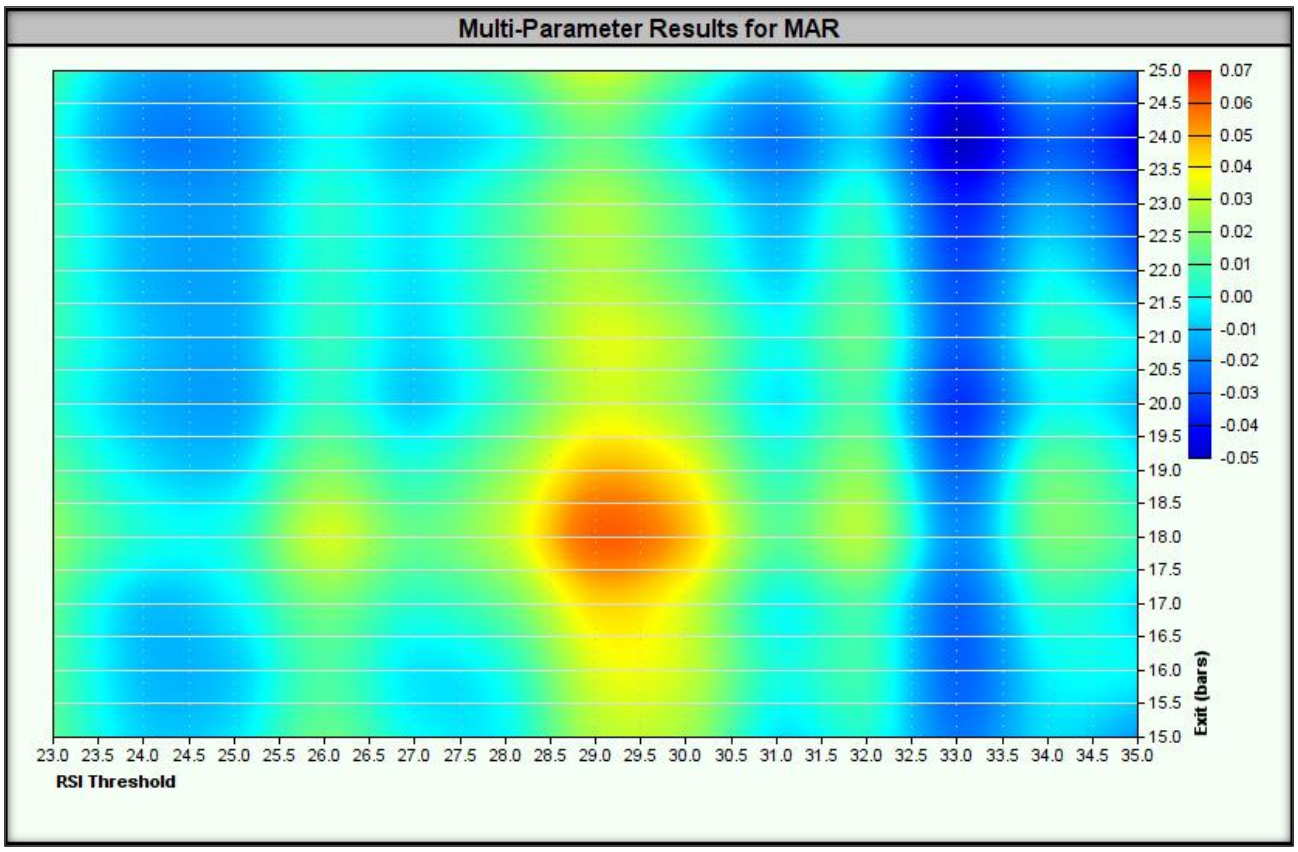

Multi-Parameter Results for MAR
0.05
0.04
0.03
0.02
0.01
0.00
-0.01
-0.02
-0.03
1.0
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2.0
Rate of Change (# bars)
26
24
22
20
18
16
14
Exit (bars)

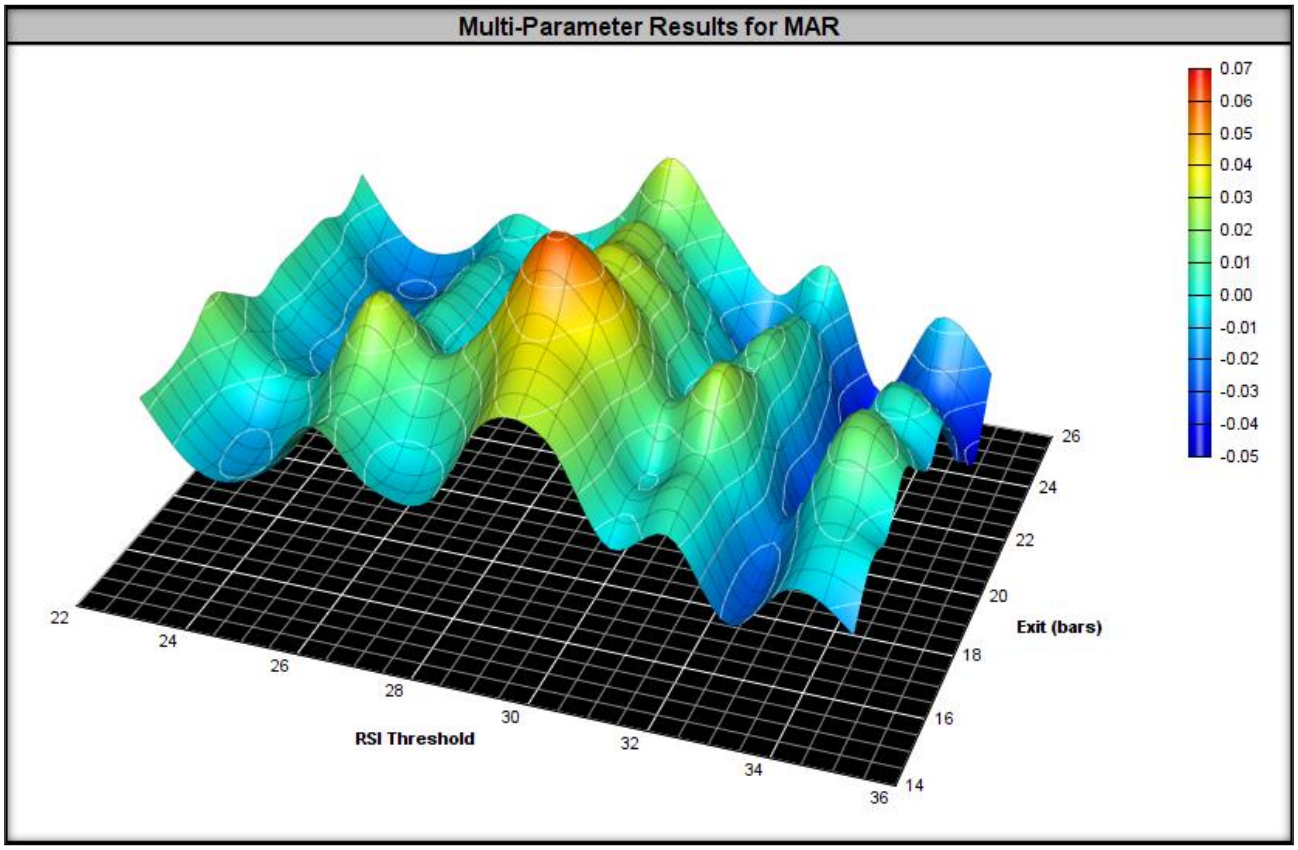

Multi-Parameter Results for MAR
0.15
0.10
0.05
0.00
-0.05
-0.10
-0.15
3.0
3.1
3.2
3.3
3.4
3.5
3.6
3.7
3.8
3.9
4.0
4.1
4.2
4.3
4.4
4.5
4.6
4.7
4.8
4.9
5.0
RSI (# bars)
35
34
33
32
31
30
29
28
27
26
25
24
23
RSI Threshold

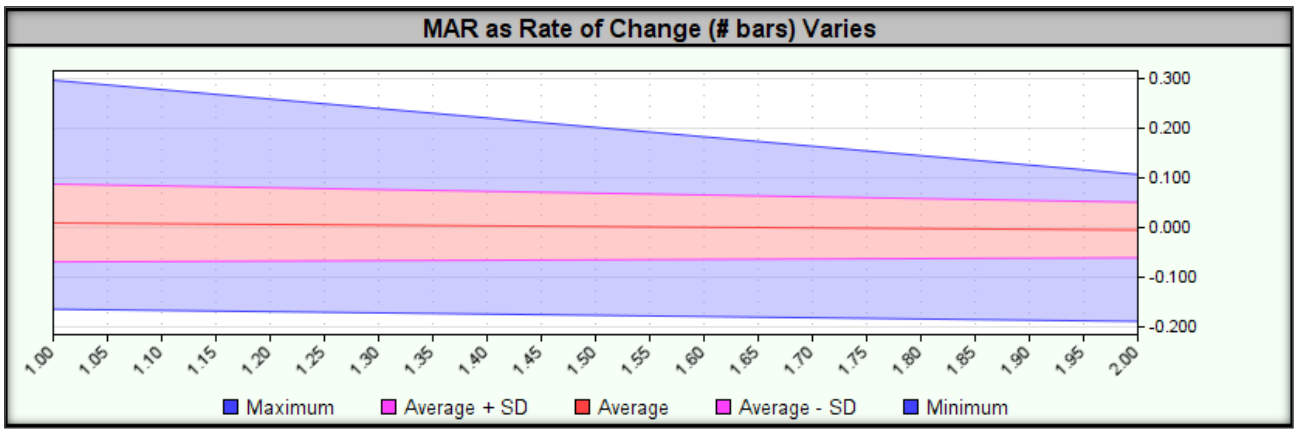

Multi-Parameter Results for MAR
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
-0.02
-0.04
-0.06
-0.08
-0.10
-0.12
3.0
3.2
3.4
3.6
3.8
4.0
4.2
4.4
4.6
4.8
5.0
RSI (# bars)
22
24
26
28
30
32
34
36
RSI Threshold

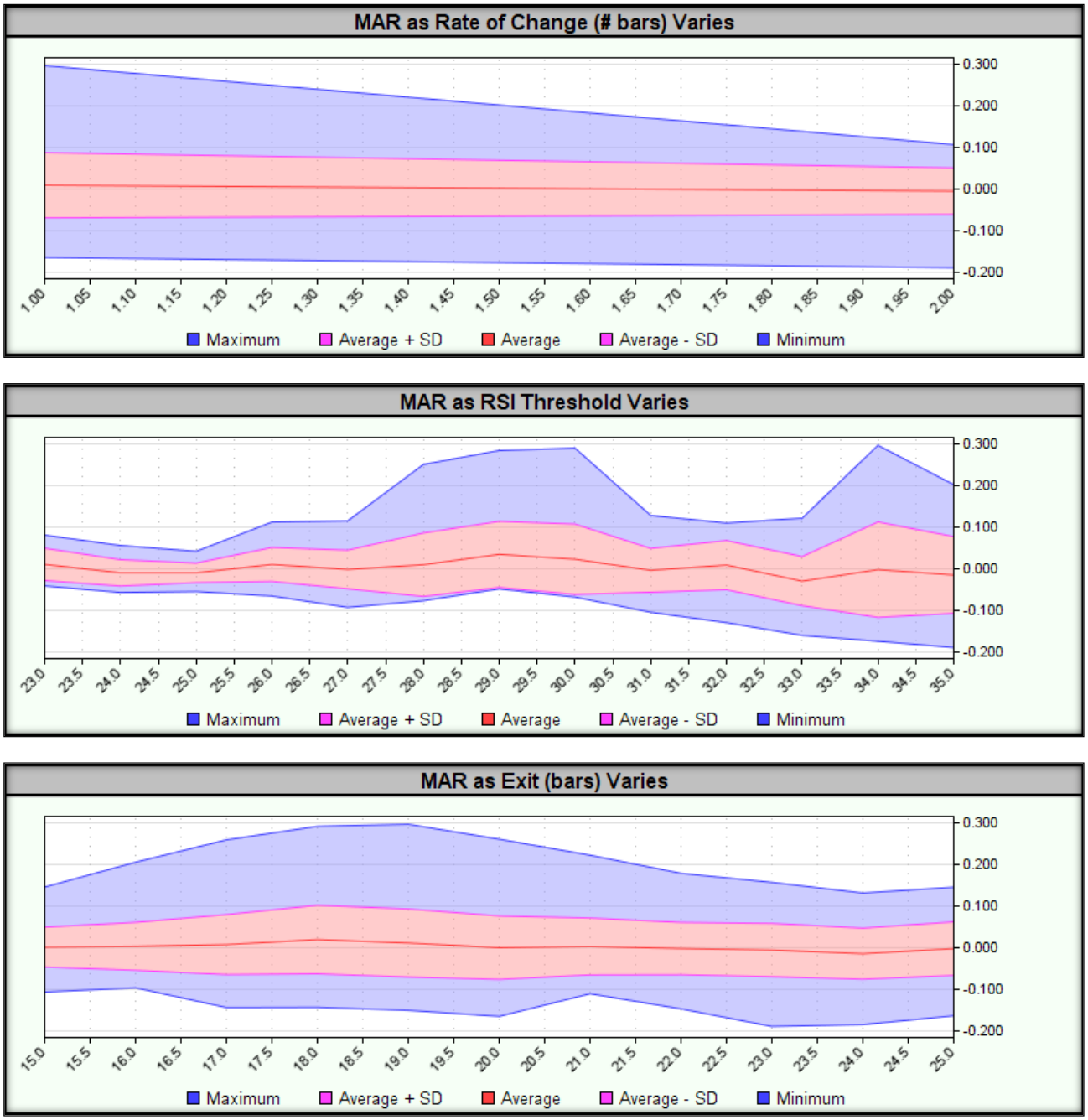

Multi-Parameter Results for MAR
0.04
0.03
0.02
0.01
0.00
-0.01
-0.02
-0.03
-0.04
-0.05
25.0
24.5
24.0
23.5
23.0
22.5
22.0
21.5
21.0
20.5
20.0
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
15.0
Exit (bars)
3.0
3.1
3.2
3.3
3.4
3.5
3.6
3.7
3.8
3.9
4.0
4.1
4.2
4.3
4.4
4.5
4.6
4.7
4.8
4.9
5.0
RSI (# bars)


Multi-Parameter Results for MAR
0.04
0.03
0.02
0.01
0.00
-0.01
-0.02
-0.03
-0.04
-0.05
3.0
3.2
3.4
3.6
3.8
4.0
4.2
4.4
4.6
4.8
5.0
RSI (# bars)
14
16
18
20
22
24
26
Exit (bars)


Multi-Parameter Results for MAR
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
-0.01
-0.02
-0.03
-0.04
-0.05
23.0 23.5 24.0 24.5 25.0 25.5 26.0 26.5 27.0 27.5 28.0 28.5 29.0 29.5 30.0 30.5 31.0 31.5 32.0 32.5 33.0 33.5 34.0 34.5 35.0
RSI Threshold
25.0 24.5 24.0 23.5 23.0 22.5 22.0 21.5 21.0 20.5 20.0 19.5 19.0 18.5 18.0 17.5 17.0 16.5 16.0 15.5 15.0
Exit (bars)


Multi-Parameter Results for MAR
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
-0.01
-0.02
-0.03
-0.04
-0.05
22
24
26
28
30
32
34
36
RSI Threshold
26
24
22
20
18
16
14
Exit (bars)


MAR as Rate of Change (# bars) Varies
0.300
0.200
0.100
0.000
-0.100
-0.200
1.00
1.05
1.10
1.15
1.20
1.25
1.30
1.35
1.40
1.45
1.50
1.55
1.60
1.65
1.70
1.75
1.80
1.85
1.90
1.95
2.00
Maximum
Average + SD
Average
Average - SD
Minimum



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)**

This 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

Walk-Forward Analysis (WFA) is a key tool for assessing **a strategy's ability to perform in real-world market conditions.** It provides **reliable measures of reward and risk** after the optimization process and allows you to answer several key questions:

1. **What rate of return can you expect from the strategy?**
    - The optimization result often overestimates the expected rate of return, which can lead to unrealistic forecasts.
    - WFA provides more **reliable and realistic measures of return** by minimizing the impact of overfitting to historical data.
2. **What set of parameters should be used in the next period?**
    - Thanks to **WFA,** it is possible **to dynamically adjust the strategy parameters** to **the latest market changes,** increasing its adaptability.

WFA tests the strategy over multiple time periods, minimizing the risk of overfitting (overfitting the strategy to historical data). The WFA process consists of **two repeated steps:**

1. **Optimization (In-Sample):**
    - The strategy is optimized over a specific **training period** (**in-sample)**.
    - This step adjusts the parameters to obtain **the best results.**
2. **Testing (Out-of-Sample):**
    - The strategy, using **the parameters optimized in step 1,** is tested on **a test period** (**out-of-sample)**.
    - This stage verifies the effectiveness of the strategy in new market conditions that **were not used** during optimization.

Walk-Forward Efficiency (WFE) is a key metric that assesses a strategy's potential to perform under real-world market conditions. WFE compares:

- **The rate of return achieved in the in-sample window** (where parameters were optimized)
- **Rate of return in the out-of-sample window** (where the strategy was running on unknown data)

Similarly, **for the drawdown value,** WFE checks whether the strategy does not lose significant stability outside the optimization period.

A strategy considered **stable (robust) should meet the following conditions:**

- **WFE ≥ 50% for the rate of return** – means that the strategy retains at least half of its effectiveness beyond the optimization period.
- **WFE ≤ 150% for drawdown** – means that the drawdown outside the optimization period is not significantly higher than during the optimization period.

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

Step 6: Using the strategy in real time

After **extensive testing, implementing a real-time** investment strategy becomes **relatively simple. Buy/sell signals and stop loss orders are automatically generated** by the computer based on pre-established rules and formulas.

The most important element **of strategy execution** is **consistent execution of all signals, without exception. As Larry Williams noted:** *"Trading strategies work. Traders do not."*

Before making **a final decision to implement a strategy,** it's important to verify **whether it actually adds value** to the overall portfolio performance. It doesn't make sense to implement a strategy that **generates similar signals** or **has a similar equity curve.**

Key criteria for evaluating strategies before implementation:

1. **Daily return correlation**
   - The **lower the correlation** with other strategies, the better.
   - **Optimal values:** Correlation **close to zero or negative.**
2. **Reducing maximum drawdown**
   - If adding a strategy to a portfolio results in **a lower maximum drawdown,** this is **a strong positive signal.**
3. **Objective Function Improvement (MAR)**
   - If adding a strategy causes **the MAR to increase,** this indicates that **it has added value** to the portfolio.
4. **Better results in Monte Carlo simulation**
   - Monte Carlo simulation determines the potential **maximum drawdown.**
   - If Monte Carlo results **improve** after adding a strategy, this is **a strong positive signal.**

The above elements are often interrelated – usually **all** or **none of them are met.**

Once you decide to add a strategy to your portfolio, **the question arises:** *Should you implement the strategy immediately or is it better to wait?*

Some studies suggest **an incubation period** of **3-6 months,** during which:

- The strategy is **monitored** but **does not execute real transactions.**
- **Generated signals, positions and results** are observed to detect **potential anomalies.**

In our case, **the incubation period** lasts from the moment **the strategy is launched in a live environment** until **a drawdown occurs at approximately half the maximum drawdown** observed in historical data. **Only after this threshold is reached does the strategy begin to be used with real funds.**

Thanks to this:

- **We avoid investing real money in an untested environment.**
- **We wait for a drawdown to occur** before launching the strategy, which **reduces the risk of starting at an unfavorable moment.**

The final decision on its full implementation should be based on **thorough testing and analysis of the value added to the portfolio,** so that the strategy actually supports long-term investment goals and does not increase unnecessary risk.