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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.



ATR Ignition v.3

Investment Strategy Testing Summary

The **ATR Ignition strategy** is a **trend following trading technique** developed by Larry Connors that is based on **price breakouts above historical volatility as measured by the ATR** (Average True Range) indicator. The strategy aims to capture strong market moves that occur after key volatility levels are broken – situations where **the market emerges from a low volatility phase and initiates a new directional impulse**.

Compared to **ATR Ignition v.2**, this strategy has been expanded to include the **Narrow Range candlestick pattern**, described by Toby Crabel, which requires that the candle preceding a price breakout be **the smallest (in terms of high-low range)** compared to the candles from the past few days. Adding this element should strengthen the strategy's effectiveness, as periods of **low volatility** statistically often **precede dynamic price movements**.

Although **the strategy's results on in-sample data are decent**, **the strategy failed the stability test on a portfolio of financial instruments**. This means that the strategy loses its profitability when tests are performed on a suboptimal set of instruments. Therefore, **it is not recommended to use it in real transactions**.

Our goal is to have a strategy that remains **profitable and effective over a wide range of parameters**, because the market is a changing organism and the optimal parameters can change over different periods. **I cannot emphasize enough that for a strategy to work in real conditions, it must also work on suboptimal parameters and in suboptimal conditions**. In a word - **it must be stable** to changing market conditions.

I don't know who said these words, but they perfectly reflect 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

The ATR Ignition strategy is a trend following investment technique developed by Larry Connors, based on **price breakouts above historical volatility measured by the ATR (Average True Range) indicator**. In the analyzed version, the strategy has been expanded with the **Narrow Range** candlestick formation, described by Toby Crabel, which requires that the candle preceding the price breakout is **the smallest (in terms of high - low range)** compared to the candles from the last few days. Adding this element should strengthen the effectiveness of the strategy, because periods of **low volatility** statistically often **precede dynamic price movements**.

The strategy aims to capture strong market moves that occur after key volatility levels are breached – situations where **the market emerges from a phase of low volatility and initiates a new directional impulse**.

For the purposes of the test, the daily volatility of financial instruments was used, analyzing moments when **the price breaks above or below the last close by a value equal to a multiple of the ATR (e.g. 150%)**. However, this breakout must occur in **the direction of the long-term trend** (measured by the moving average) and must be preceded by a candle that is the smallest in several days (e.g. 5).

The strategy uses:

- **Average volatility (ATR)** to determine the level of order activation (breakout);
- **Buy stop and sell stop orders** activated above/below the previous day's close;
- **Stop loss order** set one tick below (for a long position) or above (for a short position) the last candle;
- **Following the dominant trend** defined by the long-term moving average;
- **Mechanism of closing positions** when the trend changes.

Why can a volatility breakout be effective? A breakout above a certain volatility level means that the market is breaking through a barrier of “natural price noise.” When prices move too quickly by historical standards, a strong trend is often initiated—investors and algorithms respond to increased activity, volume, and breaks of psychological support and resistance levels. Relative volatility strategies like ATR Ignition don't try to predict market direction, but rather respond to market momentum—making them immune to forecast bias and well-suited to momentum environments.

Characteristics of the strategy and its strengths and weaknesses:

- **Directional neutrality** – allows you to react to movements in both directions without predetermining the direction of the breakout.
- **Volatility-based** – adapts better to current market conditions than strategies with fixed price thresholds.
- **Defined risk level** – strict stop loss limits potential losses.
- **Lack of directional prediction** – strategy is based on reaction to movement, not prediction.
- **Potential false breakouts** – losses may occur in the event of short-term movements without continuation (so-called false breakouts).
- **Playing with the trend** – transactions are opened only in the direction of the dominant trend.



- **Sensitivity to the ATR parameter** – the threshold value (e.g. 150%) should be adjusted to the instrument and the market environment.

ATR Ignition is a strategy that, despite its simplicity, provides access to an effective breakout trading mechanism. **Its strength lies in its reactivity to market behavior and its ability to adapt to current volatility conditions.** However, it requires careful calibration and conscious risk management, especially in the environment of false price signals.



Step 2: Define investment principles

Below is the pseudocode for the **ATR Ignition v.3 strategy** on daily data:

1. **Calculating Indicators:**
 - a. **ATR-N-day** – used to determine order activation levels.
 - b. **The previous day's closing price** – reference base for setting stop orders.
 - c. **X-day moving average (SMA)** – determines the dominant trend in a given instrument.
2. **Generating Entry Signals (at the start of the day):**
 - a. **Each day, designate:**
 - i. Buy stop = Previous day's closing price + $K * ATR$
 - ii. Sell stop = Previous day's closing price - $K * ATR$where K is the ATR multiplier (e.g. 1.5, i.e. 150% ATR).
 - b. **Trend direction condition:**
 - i. We set a buy stop only if the previous day's low > SMA-X (uptrend).
 - ii. We set a sell stop only if the previous day's high < SMA-X (downtrend).
 - c. **Condition (Narrow Range):**
 - i. We set a buy stop only if the range of price changes of yesterday's candle (high-low) is the smallest compared to the candles from the last Y days.
 - ii. We set a sell stop only if the range of price changes of yesterday's candle (high-low) is the smallest compared to the candles from the last Y days.
 - d. **Set an appropriate pending order (buy stop or sell stop).**
3. **Position Opening Rules:**
 - a. **Long position:**
 - i. If the market price rises to the buy stop level, a long position will be opened.
 - ii. Set your stop loss one tick below the low of the previous day's candle.
 - b. **Short position:**
 - i. If the market price falls to the sell stop level, a short position will be opened.
 - ii. Set your stop loss one tick above the high of the previous day's candle.
4. **Generating Exit Signals** – the position is closed when any of the following conditions is met:
 - Activation of stop loss order (original),
 - Price violates SMA-X:
 - i. for long position: if low < SMA-X;
 - ii. for short position: if high > SMA-X.
5. **Daily Monitoring** – every day:
 - Calculate ATR and update order activation levels based on last close.
 - Calculate SMA and update defense order.
 - Verify if a breakout up or down has occurred.
 - Set new orders, cancel outdated ones.

The above rules have been 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 performed assuming that **the risk of one position corresponds to 0.5% of the total capital.**



Step 3: Conduct a preliminary test of the investment strategy

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

- **Correctness of generated signals;**
- **Direction of opening position;**
- **Moment of opening a position;**
- **Position opening price;**
- **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 does not matter** whether the transactions are **profitable**, what **instrument was used** or whether they took place **recently** or **in the distant past**. The key is **to check whether the transactions are generated correctly** and in accordance with the assumptions described in the previous step.

The first transaction was made on a futures contract on the Nasdaq 100. In mid-September 2023 (first candle in the rectangle on the left), the **ATR(20) volatility was 297.3 points**, the **closing price that day was 14867.25**, and we set the **ATR multiplier at 150%**. In addition, this candle had the smallest price range (high-low) in 3 days (Narrow Range). Since the quotes are in a downward trend (below the 200-day moving average), the next day we set a **sell stop order at 14421.25** ($14867.25 - 150\% \times 297.3$; rounded). **The order was executed** (second candle in the rectangle on the left) and a short position was opened (taking into account price slippage, the execution price was 14399.00).

Stop loss (red steps) was set tick above the high candle from the day preceding the opening of the position. However, it should be noted that after a dozen or so days, our **stop loss begins to follow the market**, because **its level is set at the lower of the two values**: 1) the high candle from the day preceding the opening of the position; 2) the level of the moving average. At the end of January 2023, the moving stop loss was activated (candle in the rectangle on the right) and **the position was closed**. **The system worked correctly.**





The second transaction was made on the HSI index futures contract. In mid-June 2024 (the first candle in the rectangle on the left), the ATR(20) volatility was 307.1 points, the closing price that day was 17892, and we set the ATR multiplier at 150%. In addition, this candle had the smallest price range (high-low) in 3 days (Narrow Range). Since the quotes are in an upward trend (above the 200-day moving average), the next day we set a buy stop order at 18353 ($17892 + 150\% \times 307.1$; rounded). The order was executed (second candle in the rectangle on the left) and a long position was opened (taking into account slippage, the execution price was 18361).

Stop loss (red steps) was set tick below the low of the candle from the day before the position was opened. After a few days our original stop loss order was activated (candle in the rectangle on the right) and the position was closed. 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 performed on **the base parameters**, which in my opinion correspond to the assumed goals of the strategy.

First of all, **we reject strategies that linearly lose capital**. If a strategy exhibits such a pattern, it is a clear signal that any parameter optimization does not make sense.

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

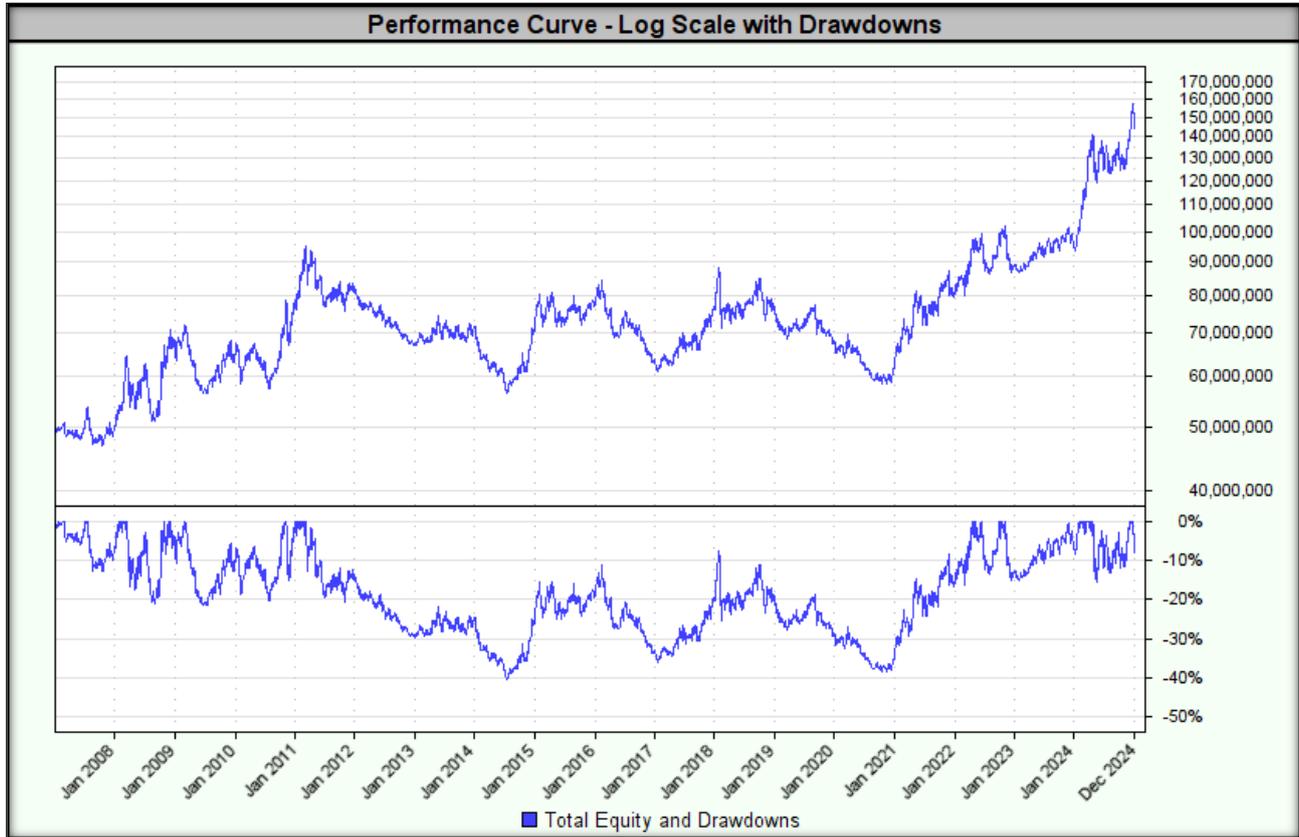
Tested base parameters:

- **Distance of buy/sell order from last closing price:** 150% ATR;
- **ATR lengths:** 10 days;
- **Moving average:** 200 days;
- **Narrow Range:** 3 days;
- **Stop loss:** for long position, tick below the minimum of the candle preceding the day the position was opened; for a short position, tick above the maximum of the candle preceding the day the position was opened;
- **Trailing stop loss:** moving average;
- **How to open a position:** buy stop/sell stop order;
- **Position size:** corresponding to a risk of 0.5% of total capital;
- **Position direction:** long (buy) and short (sell) positions.



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%	6.4%
MAR Ratio	0.16
RAR%	2.8%
R-Cubed	0.05
Robust Sharpe Ratio	0.16
Max Drawdown	40.7%
Wins	20.2%
Losses	79.8%
Average Win%	2.95%
Average Loss%	0.50%
Win/Loss Ratio	5.85
Average Trade Duration (days)	81
Percent Profit Factor	1.48
SQN	0.45
Number of transactions	777



In summary, the system works properly and generates signals as expected. Additionally, tests on basic parameters have yielded acceptable results. We can now move on to the most interesting stage of creating an investment strategy – **optimization**.



Step 4: Optimization and assessment of investment strategy stability

This stage of strategy creation and testing is crucial, as it determines how effective the strategy will be in real conditions. **I cannot emphasize enough that for a strategy to work in real conditions, it must also work on suboptimal parameters and in suboptimal conditions.** In a word – **it must be stable** to changing market conditions.

I don't know who said these words, but they perfectly reflect 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 subject of consideration in **Step 5 of the "Walk-Forward Analysis,"** but before we get to that, **we need to know whether our strategy is stable** at all.

1. Stability across a wide range of optimized parameters

The **ATR Ignition v.3 strategy** in this version assumes **the optimization of the parameters proposed by the creator of the strategy, Larry Connors, and the addition and optimization of:** i) parameters for the moving average filtering out transactions that are inconsistent with the dominant trend, ii) **Narrow Range parameter**, defining the number of previous days taken into account when comparing the price range of the last candle (i.e. the candle from the day preceding the opening of the position).

The **Grid Search** method, which involves **full optimization of all specified parameters by creating a wide range of possible combinations.** Our goal is to find such **parameter ranges that the strategy remains stable (robust),** which will allow us to assess its usefulness in real market conditions.

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

In the first step, we test the stability of parameters on **in-sample data.** For this purpose, we determine **the ranges of parameter values** so that **the quotient of the highest and lowest value of the range is at least 150%.**

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

- **ATR lengths:** range 6-16 days (step: 1);
- **Narrow Range:** range 3-6 days (step: 1);
- **Distance of buy/sell order from last closing price:** range 100%-160% ATR (step: 10 pp);
- **Moving average:** range 170-270 days (step: 10).



The lowest MAR value of 0.05 was achieved for the following parameters:

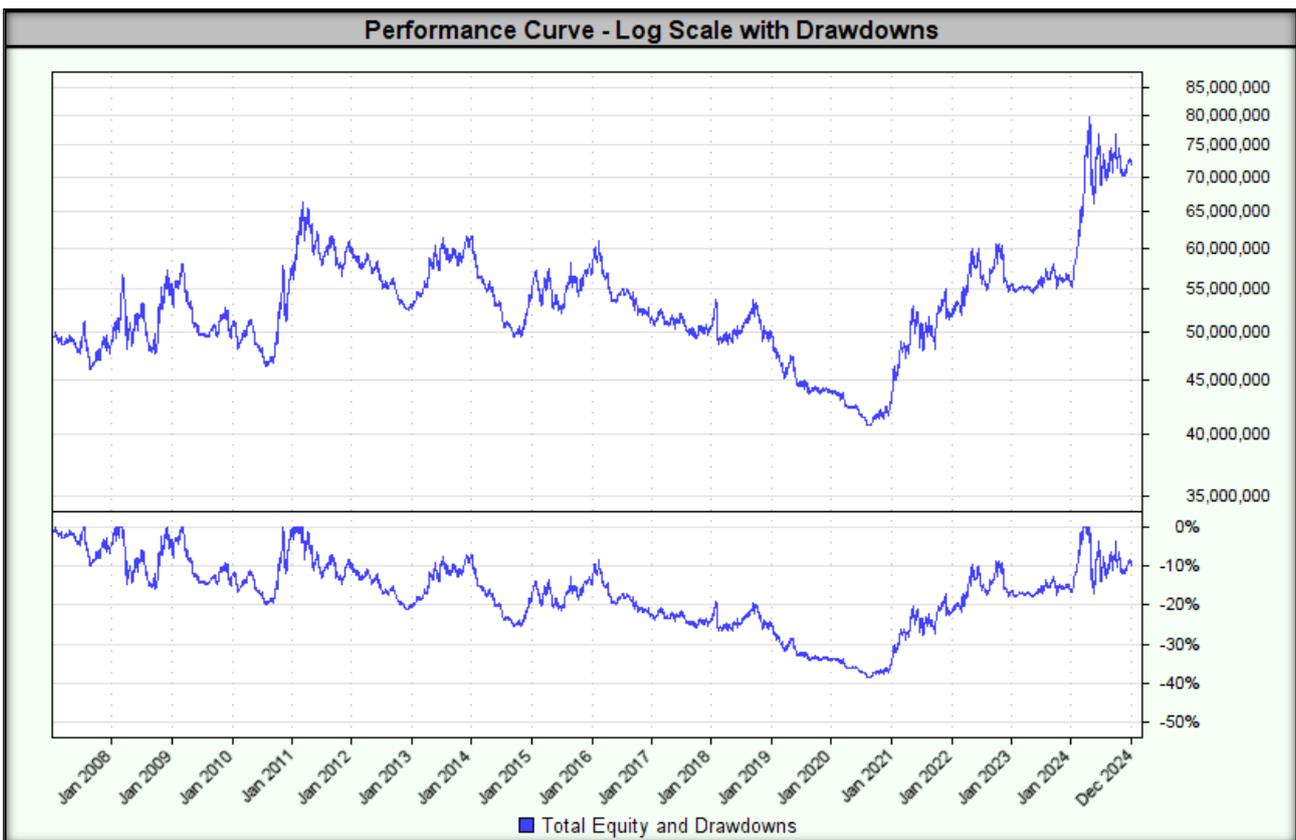
- **ATR lengths:** 9 days;
- **Narrow Range:** 6 days;
- **Distance of buy/sell order from last closing price:** 160% ATR;
- **Moving average:** 180 days.

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

Test	ATR Bars	NR Bars	ATR Multiplier (%)	Moving Average (bars)	End Balance	CAGR%	MAR	Sharpe	Ann. Sharpe	Max TE DD	Longest DD	Trades	R3
1223	9	6	160%	180	\$72,458,259.51	2.08%	0.05	0.23	0.18	38.4%	156.2	454	0.00
1531	10	6	160%	180	\$72,437,806.62	2.08%	0.06	0.23	0.19	36.8%	155.8	441	0.01
1839	11	6	160%	180	\$70,846,403.51	1.96%	0.06	0.23	0.19	34.2%	156.3	428	0.01
1212	9	6	150%	180	\$84,334,950.53	2.95%	0.06	0.28	0.21	47.5%	156.6	546	0.00
277	6	6	140%	180	\$95,492,418.78	3.66%	0.06	0.29	0.21	58.0%	156.7	756	-0.00
1224	9	6	160%	190	\$74,369,092.84	2.23%	0.06	0.24	0.21	34.8%	155.6	456	0.01
1520	10	6	150%	180	\$84,104,853.58	2.93%	0.06	0.28	0.21	45.7%	156.5	535	0.01
2411	13	6	120%	180	\$103,639,709.50	4.13%	0.06	0.30	0.21	64.4%	157.2	919	0.00
1213	9	6	150%	190	\$84,574,811.66	2.96%	0.06	0.28	0.22	46.1%	156.5	550	0.00
299	6	6	160%	180	\$80,203,487.32	2.66%	0.07	0.27	0.20	40.4%	155.5	530	0.01
1795	11	6	120%	180	\$107,274,124.96	4.33%	0.07	0.31	0.21	65.8%	157.2	947	0.00

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 0.45 was achieved for the following parameters:

- **ATR lengths:** 6 days;
- **Narrow Range:** 3 days;



- Distance of buy/sell order from last closing price: 110% ATR;
- Moving average: 240 days.

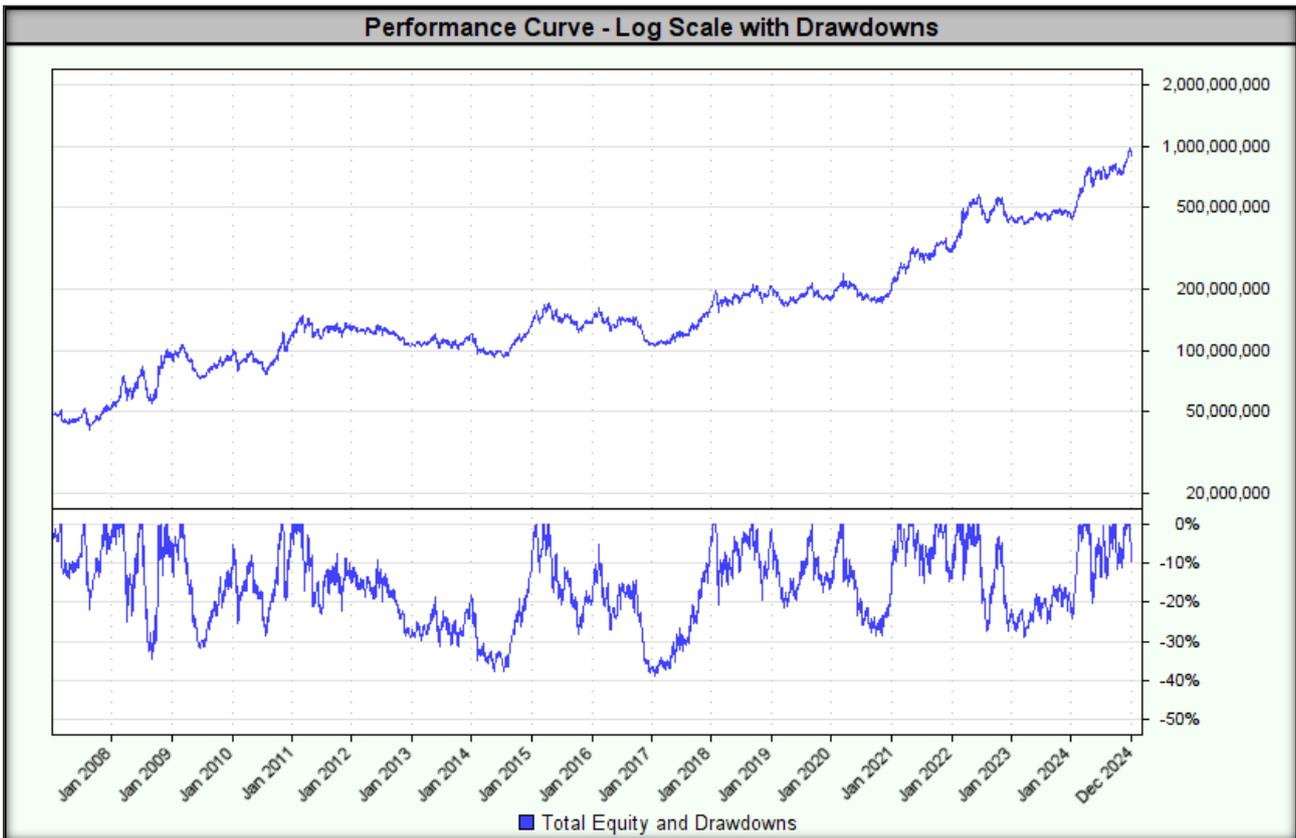
The highest MAR value was accompanied by a drawdown of 38.8%.

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Test	ATR Bars	NR Bars	ATR Multiplier (%)	Moving Average (bars)	End Balance	CAGR%	MAR	Sharpe	Ann. Sharpe	Max TE DD	Longest DD	Trades	R3
19	6	3	110%	240	\$928,320,795.13	17.62%	0.45	0.73	0.54	38.8%	46.7	1371	0.18
327	7	3	110%	240	\$946,849,038.72	17.75%	0.44	0.74	0.56	40.6%	46.3	1342	0.19
20	6	3	110%	250	\$867,350,792.28	17.18%	0.43	0.71	0.53	39.5%	46.6	1357	0.17
18	6	3	110%	230	\$804,212,428.96	16.69%	0.43	0.70	0.52	38.9%	46.7	1397	0.16
328	7	3	110%	250	\$880,967,877.58	17.28%	0.42	0.72	0.54	41.2%	46.3	1331	0.16
8	6	3	100%	240	\$887,155,586.32	17.33%	0.42	0.69	0.60	41.3%	45.9	1553	0.19
326	7	3	110%	230	\$838,819,971.71	16.96%	0.42	0.72	0.54	40.8%	46.4	1370	0.16
9	6	3	100%	250	\$843,688,789.34	17.00%	0.41	0.69	0.59	41.4%	45.7	1538	0.18
17	6	3	110%	220	\$724,506,893.86	16.01%	0.41	0.68	0.53	39.1%	46.8	1428	0.15
316	7	3	100%	240	\$804,064,863.69	16.69%	0.41	0.68	0.58	40.9%	46.0	1537	0.17
2164	13	3	100%	240	\$772,778,415.35	16.43%	0.40	0.69	0.57	40.7%	45.9	1462	0.17

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 67.3%.

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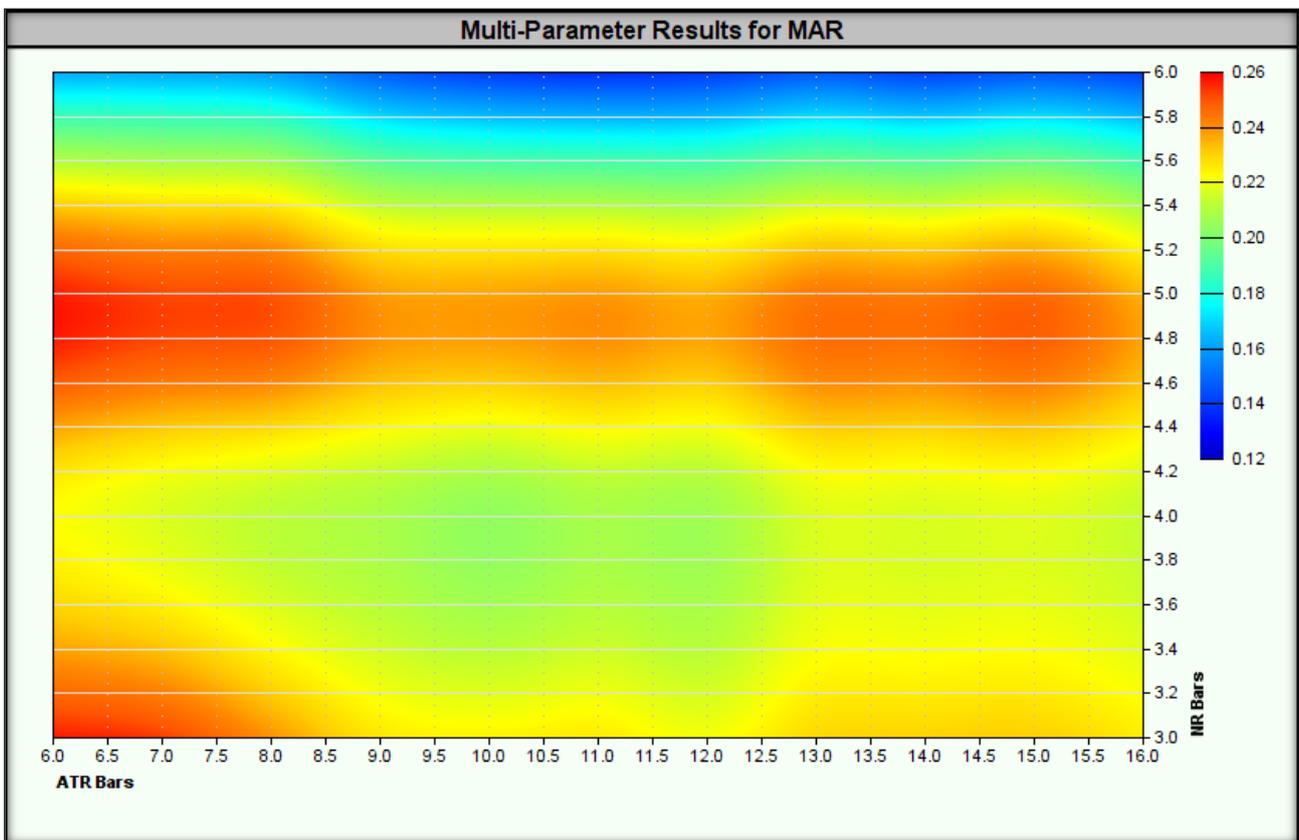


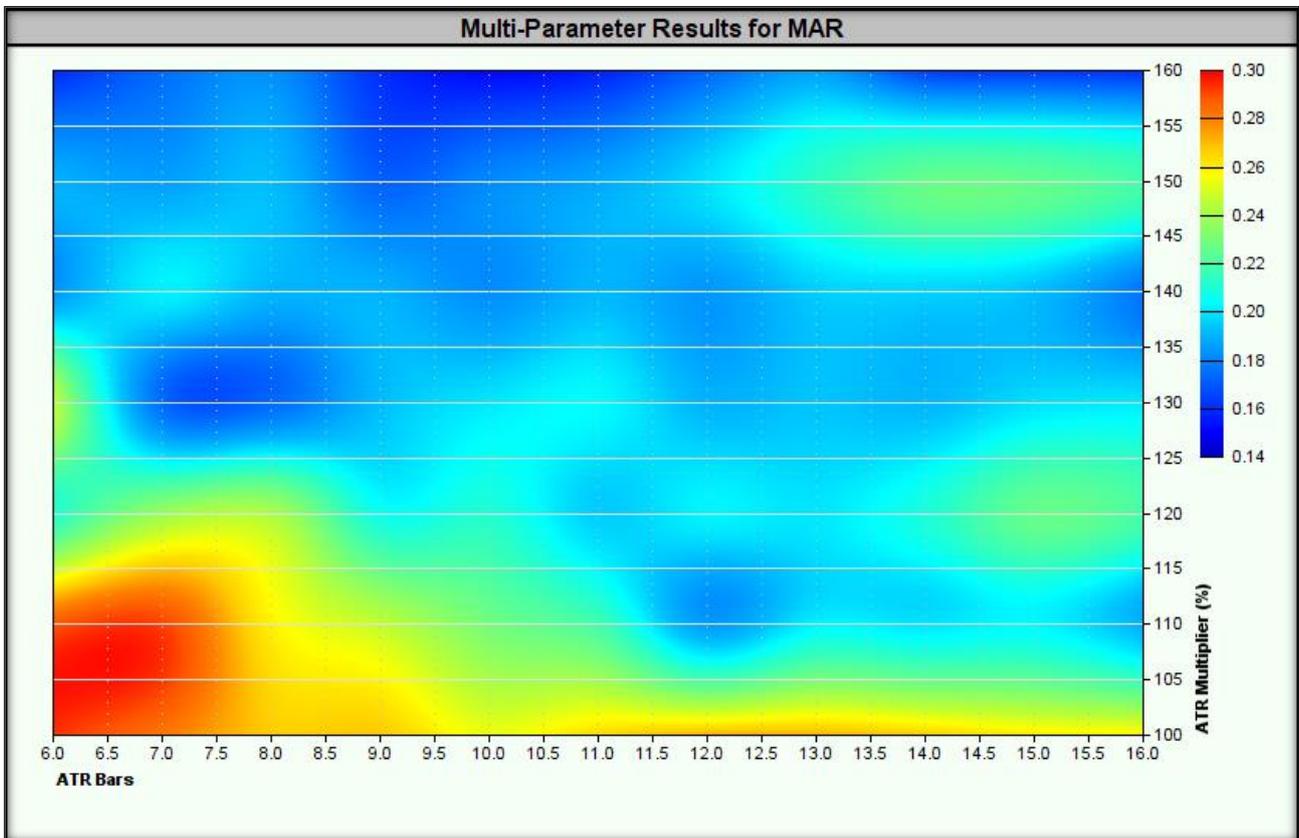
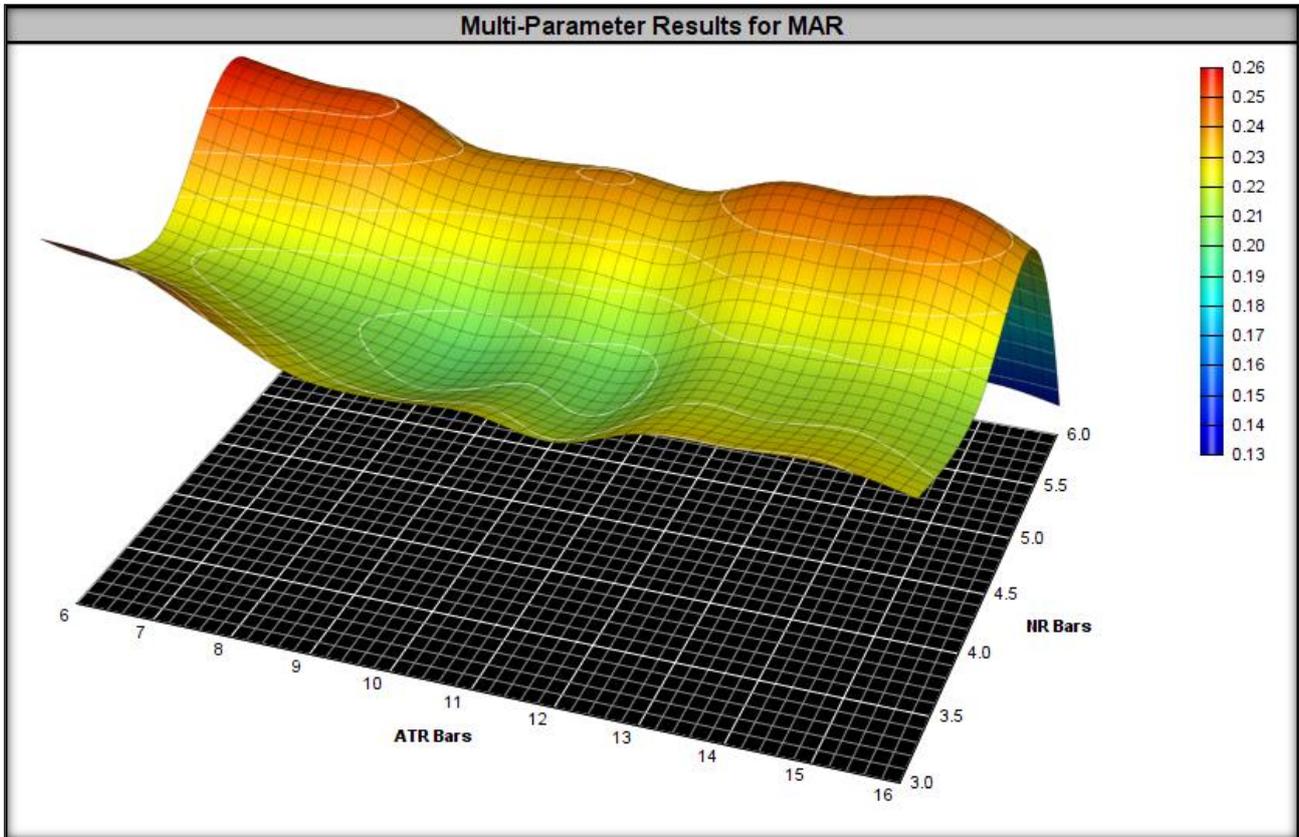
Test	ATR Bars	NR Bars	ATR Multiplier (%)	Moving Average (bars)	End Balance	CAGR%	MAR	Sharpe	Ann. Sharpe	Max TE DD	Longest DD	Trades	R3
256	6	6	120%	180	\$148,424,308.46	6.23%	0.09	0.38	0.27	67.3%	155.6	1081	0.01
1795	11	6	120%	180	\$107,274,124.96	4.33%	0.07	0.31	0.21	65.8%	157.2	947	0.00
2411	13	6	120%	180	\$103,639,709.50	4.13%	0.06	0.30	0.21	64.4%	157.2	919	0.00
3324	16	6	110%	180	\$129,008,667.88	5.41%	0.08	0.35	0.25	64.3%	155.7	1075	0.02
2103	12	6	120%	180	\$106,377,854.29	4.28%	0.07	0.31	0.21	64.1%	157.0	928	0.00
254	6	6	120%	170	\$183,946,098.03	7.51%	0.12	0.44	0.34	64.0%	135.2	1078	0.03
2708	14	6	110%	180	\$135,718,008.35	5.70%	0.09	0.36	0.26	63.5%	155.7	1094	0.02
1487	10	6	120%	180	\$114,496,865.86	4.71%	0.07	0.33	0.23	63.4%	156.6	962	0.01
3016	15	6	110%	180	\$141,652,901.18	5.96%	0.09	0.37	0.27	62.7%	135.2	1082	0.02
1794	11	6	120%	170	\$130,551,941.05	5.48%	0.09	0.37	0.28	62.7%	156.7	946	0.01
563	7	6	120%	180	\$159,944,437.06	6.67%	0.11	0.41	0.31	62.4%	135.2	1031	0.02

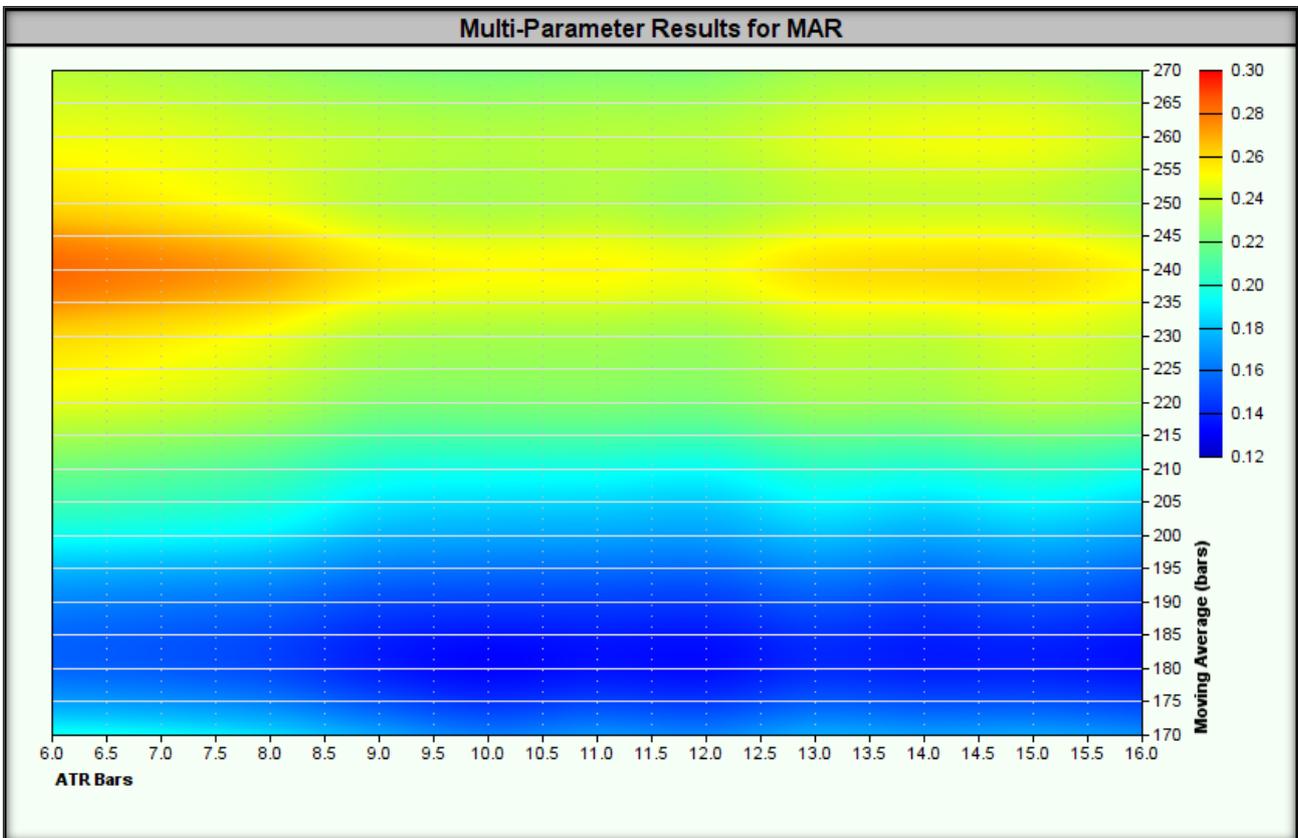
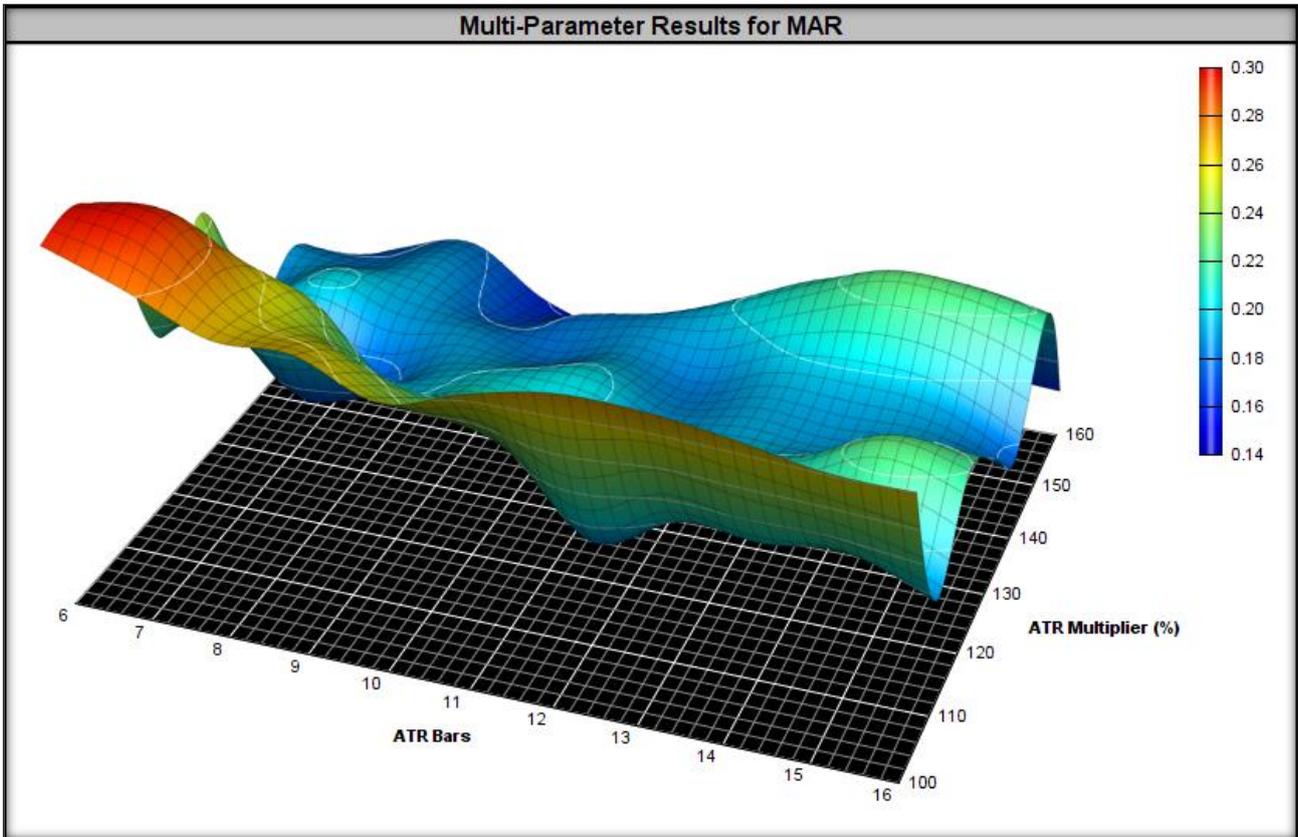
In summary, the strategy passed the stability test over a wide range of optimized parameters on in-sample data because:

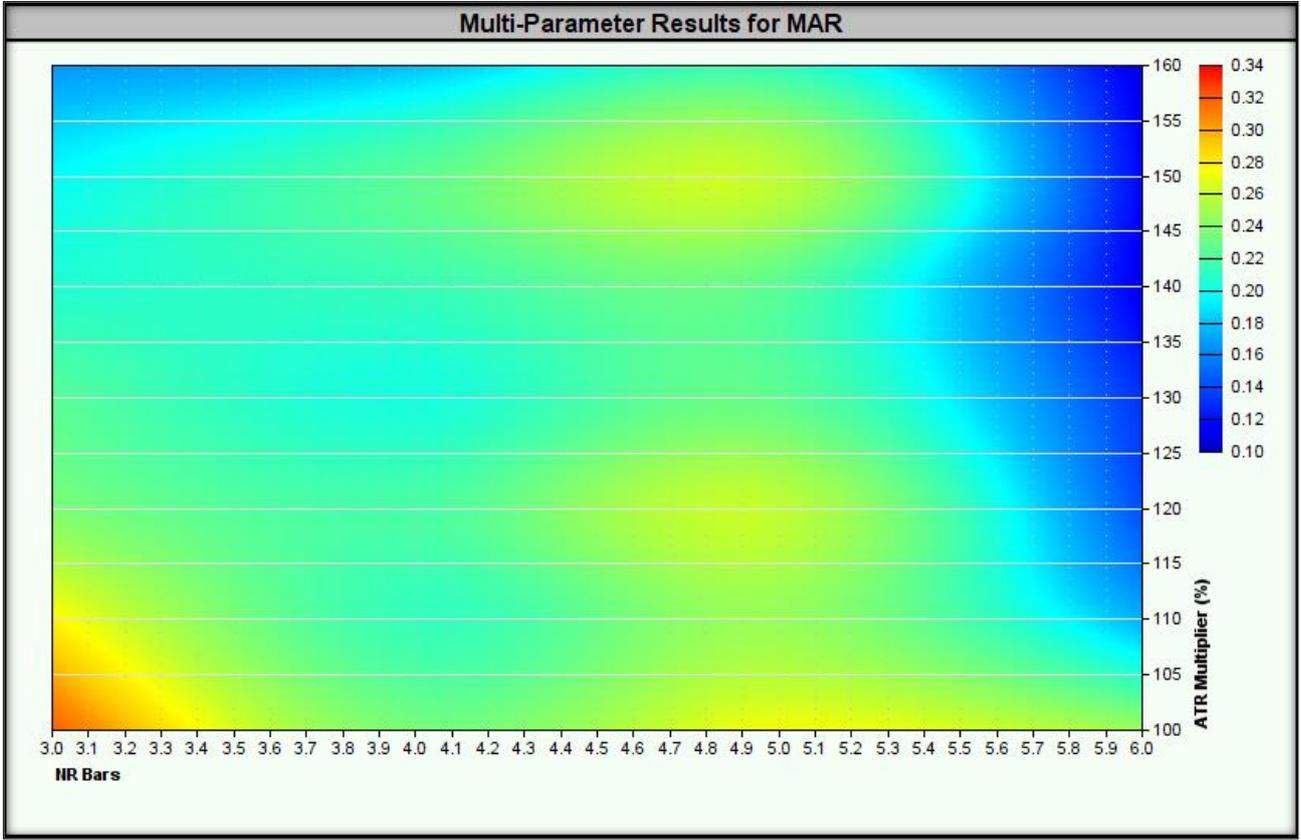
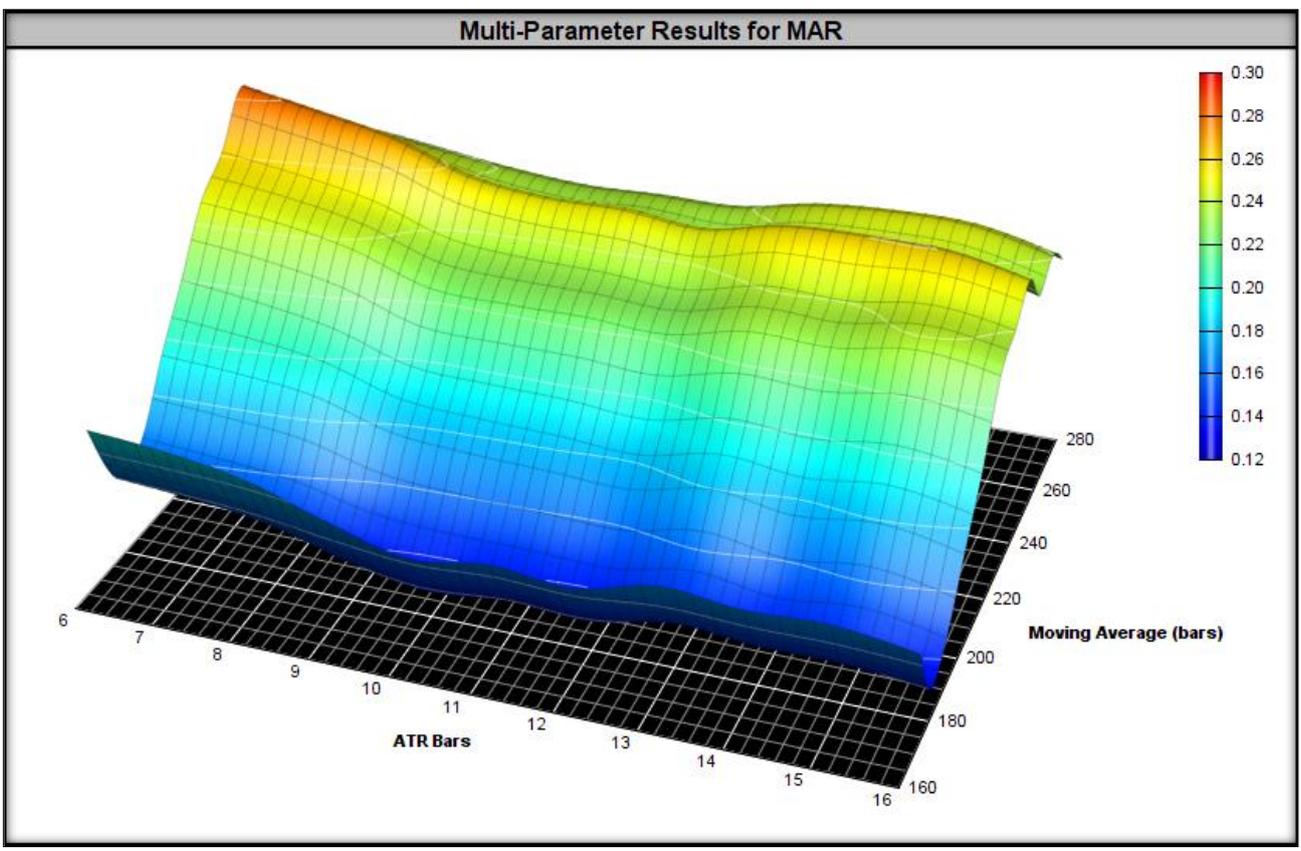
- All test results showed a positive MAR value – which indicates the stability of the strategy in various market conditions.
- The maximum drawdown did not exceed 250% of the drawdown value for the result with the highest MAR (67.3 % vs. 38.8 %) – which means an acceptable risk of deep capital drawdowns.

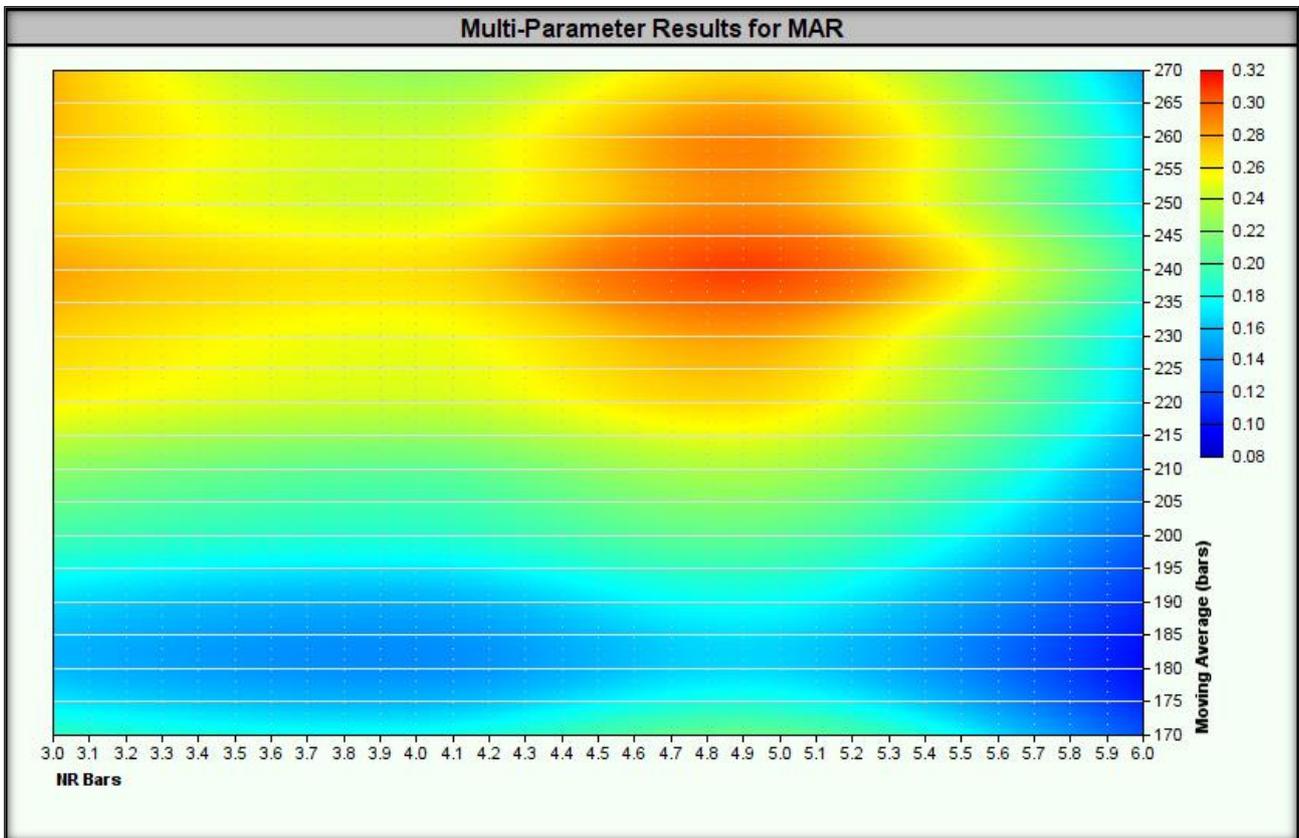
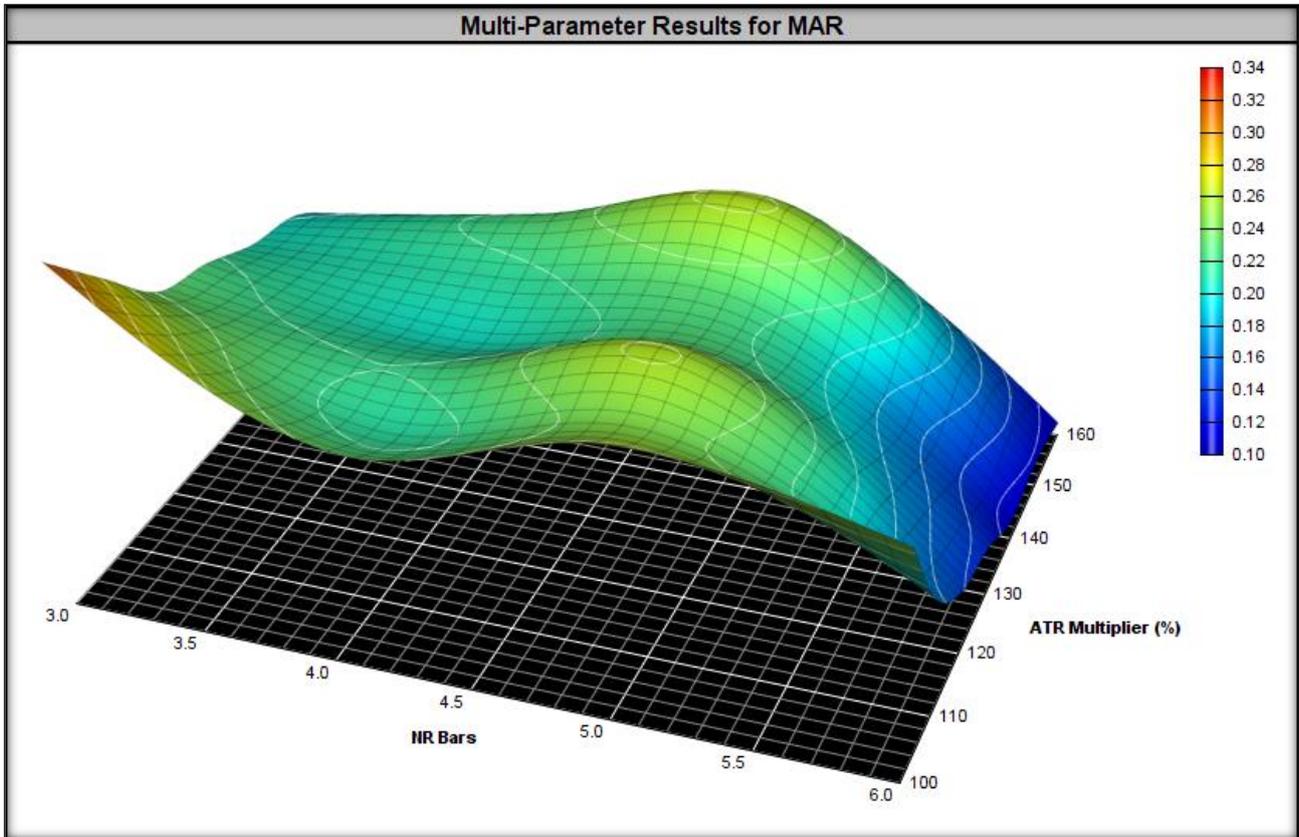
Heatmaps for the tested ranges are presented below.

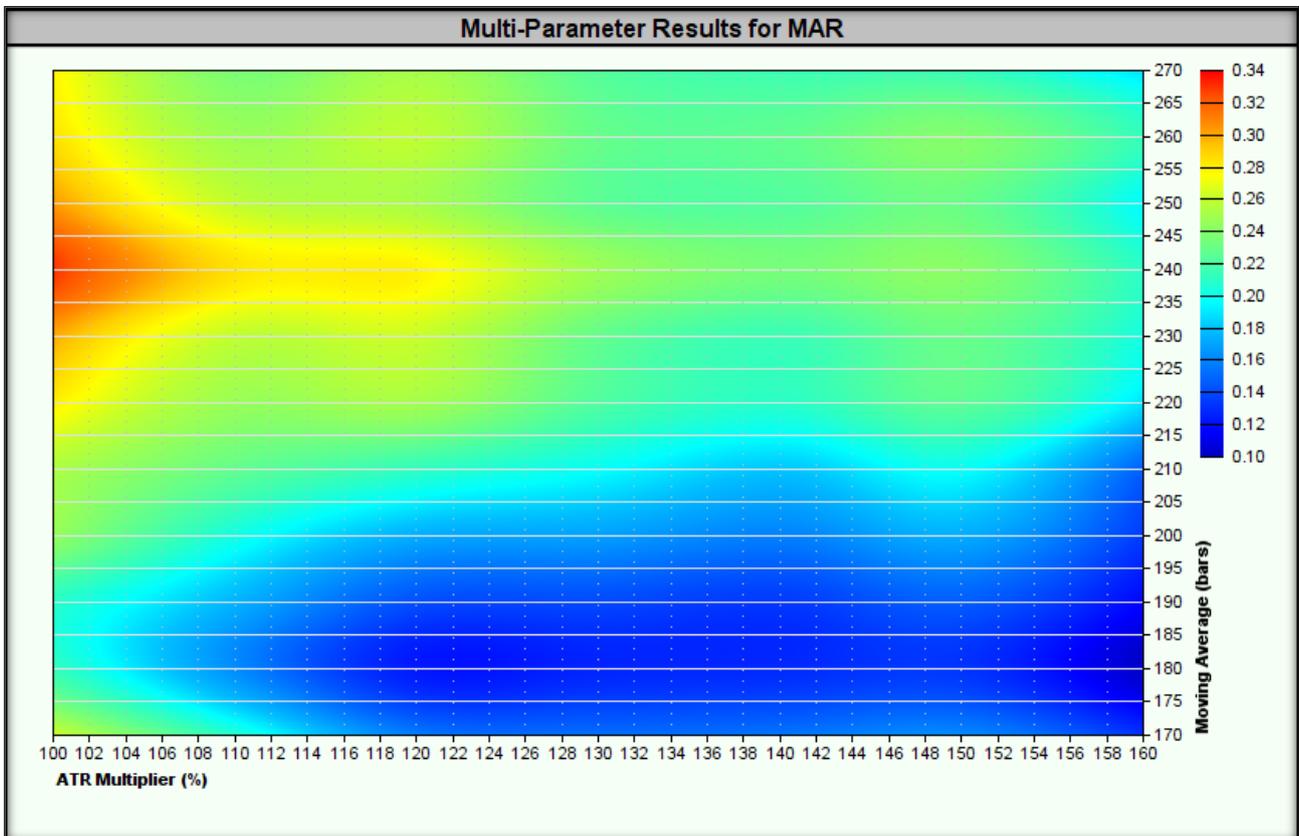
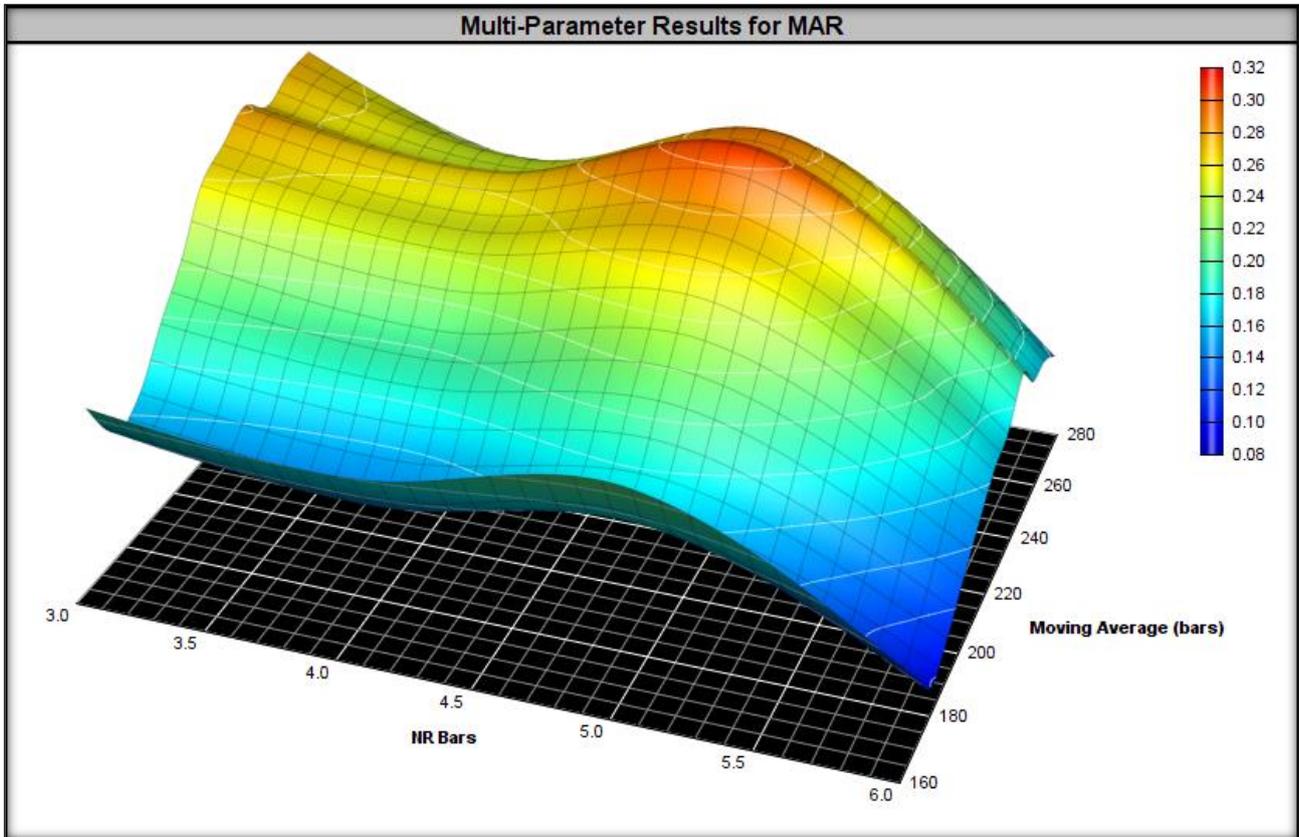


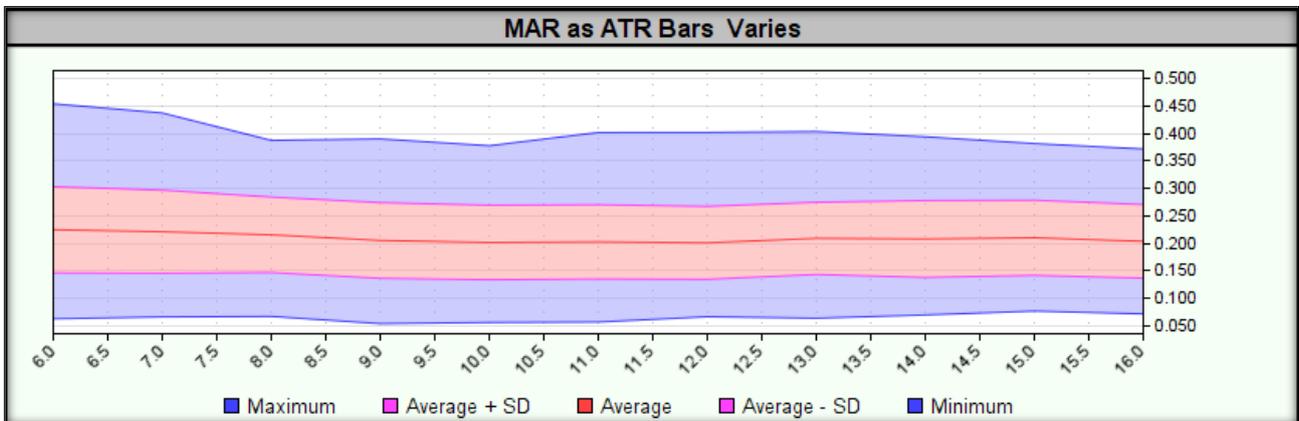
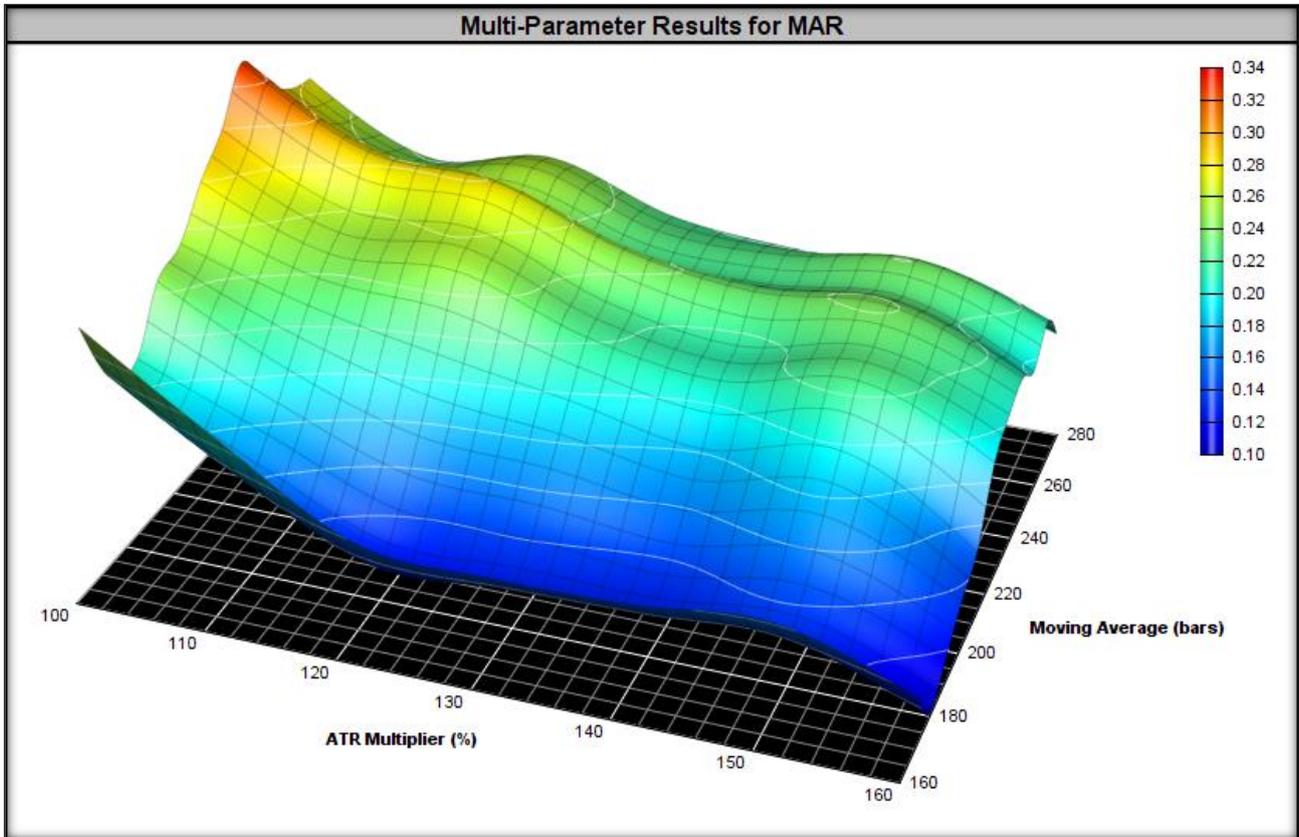


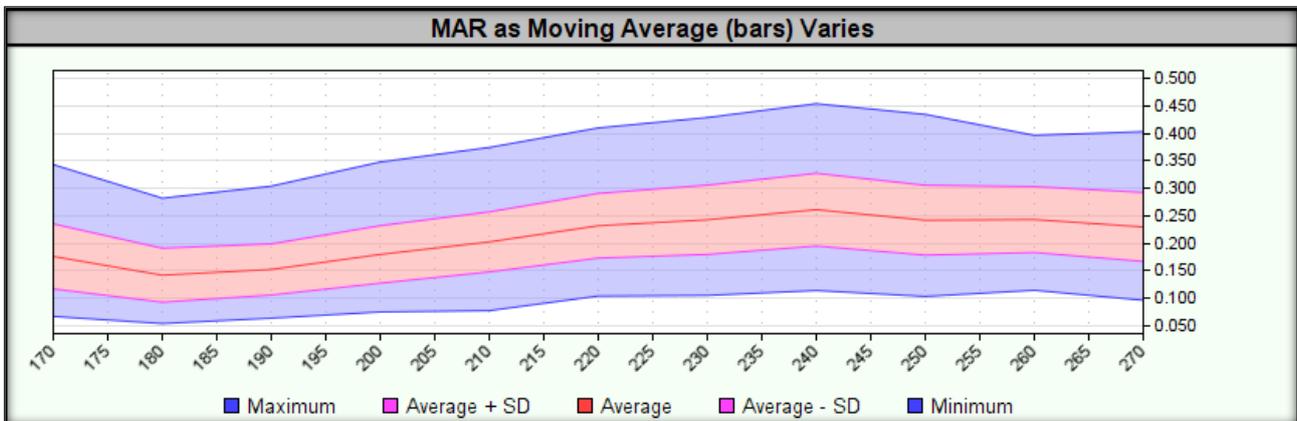
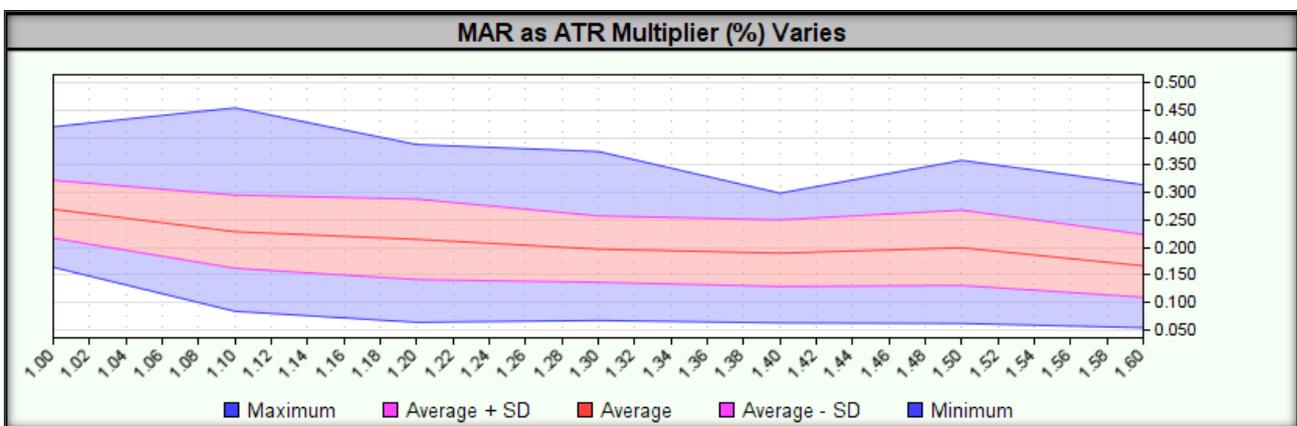
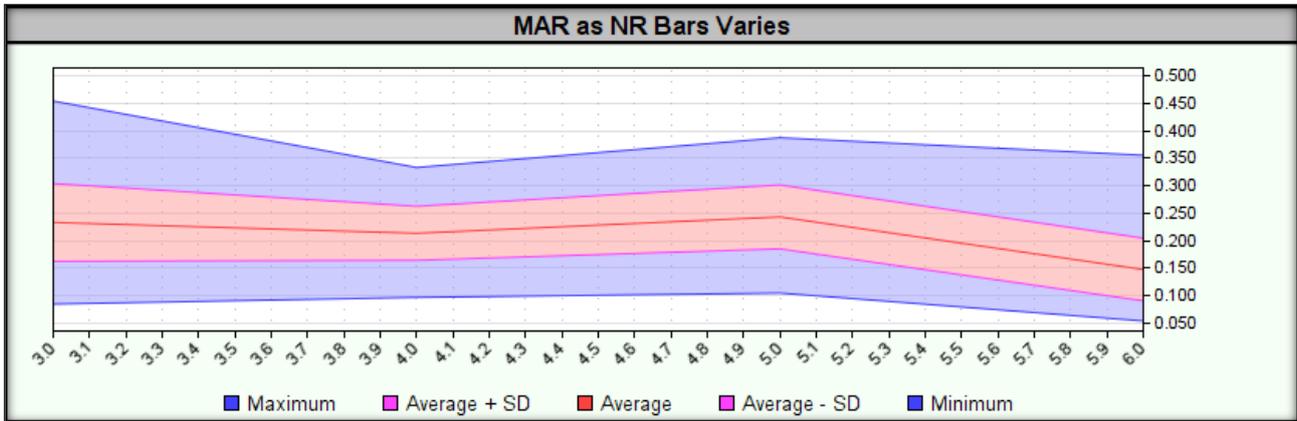












After passing the stability tests on **in-sample data**, it is time perform the same on **out-of-sample data**. For this purpose, we use **the same range of parameters** as on in-sample data:

- **ATR lengths:** range 6-16 days (step: 1);
- **Narrow Range:** range 3-6 days (step: 1);
- **Distance of buy/sell order from last closing price:** range 100%-160% ATR (step: 10 pp);
- **Moving average:** range 170-270 days (step: 10).

The lowest MAR value of 0.10 was achieved for the following parameters:



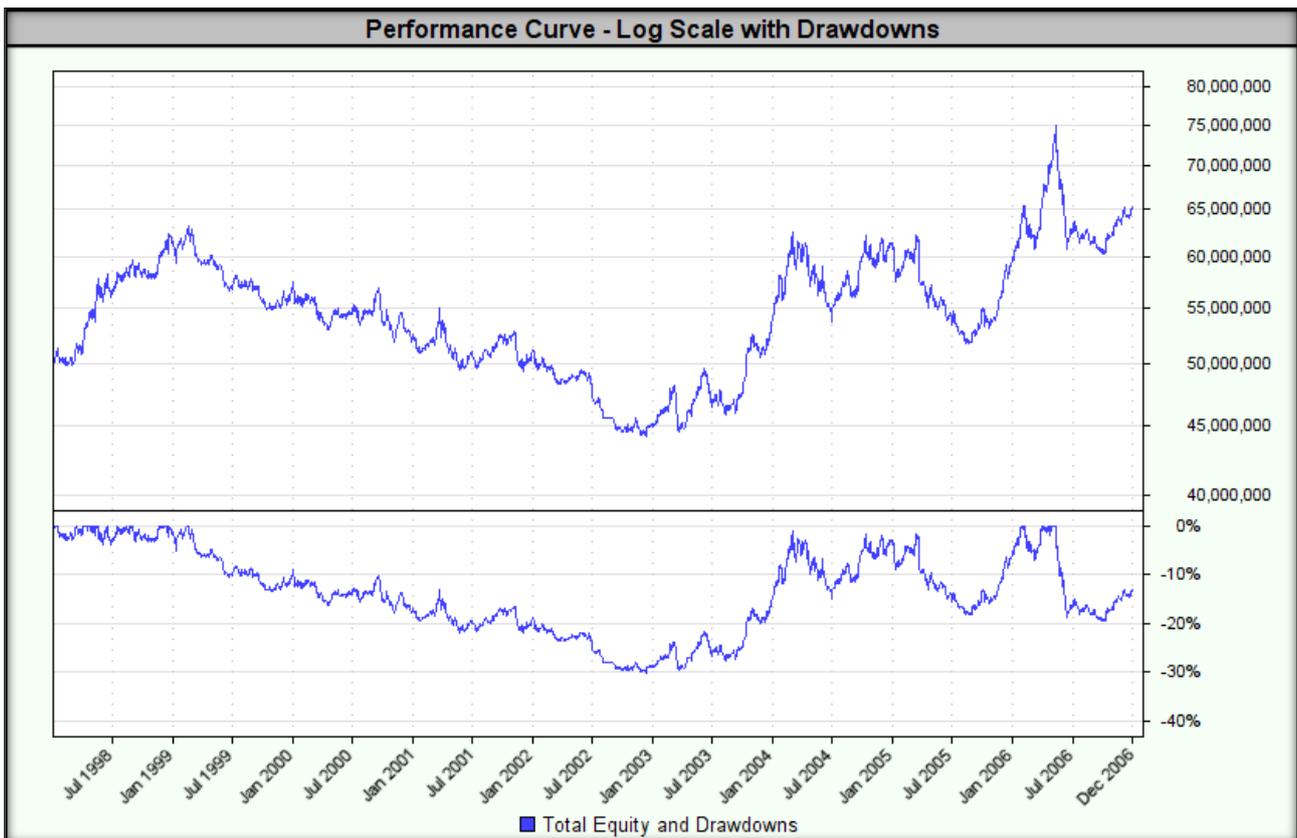
- **ATR lengths:** 13 days;
- **Narrow Range:** 6 days;
- **Distance of buy/sell order from last closing price:** 160% ATR;
- **Moving average:** 190 days.

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

Test	ATR Bars	NR Bars	ATR Multiplier (%)	Moving Average (bars)	End Balance	CAGR%	MAR	Sharpe	Ann. Sharpe	Max TE DD	Longest DD	Trades	R3
2456	13	6	160%	190	\$64,981,976.65	2.96%	0.10	0.30	0.24	30.1%	83.3	228	0.04
2764	14	6	160%	190	\$64,520,735.02	2.88%	0.10	0.30	0.25	28.8%	60.4	225	0.05
3380	16	6	160%	190	\$64,464,315.40	2.87%	0.10	0.30	0.25	28.5%	72.7	218	0.05
3072	15	6	160%	190	\$64,647,220.99	2.90%	0.10	0.30	0.25	28.6%	60.4	221	0.06
1224	9	6	160%	190	\$65,944,987.33	3.13%	0.11	0.31	0.26	29.3%	60.4	250	0.06
1532	10	6	160%	190	\$66,529,023.03	3.23%	0.11	0.32	0.26	30.1%	60.4	242	0.05
1840	11	6	160%	190	\$66,887,669.53	3.29%	0.11	0.33	0.26	29.3%	60.4	235	0.05
2148	12	6	160%	190	\$68,669,612.95	3.59%	0.13	0.35	0.29	28.5%	60.3	227	0.06
2455	13	6	160%	180	\$67,995,029.02	3.48%	0.13	0.35	0.31	26.8%	60.0	228	0.06
2454	13	6	160%	170	\$68,064,824.45	3.49%	0.13	0.35	0.31	26.5%	60.0	232	0.06
2457	13	6	160%	200	\$70,179,356.69	3.84%	0.14	0.37	0.29	28.4%	60.4	227	0.09
2763	14	6	160%	180	\$68,250,497.53	3.52%	0.14	0.36	0.31	26.0%	59.9	225	0.07

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 0.91 was achieved for the following parameters:

- **ATR lengths:** 8 days;
- **Narrow Range:** 3 days;
- **Distance of buy/sell order from last closing price:** 100% ATR;



- **Moving average: 220 days.**

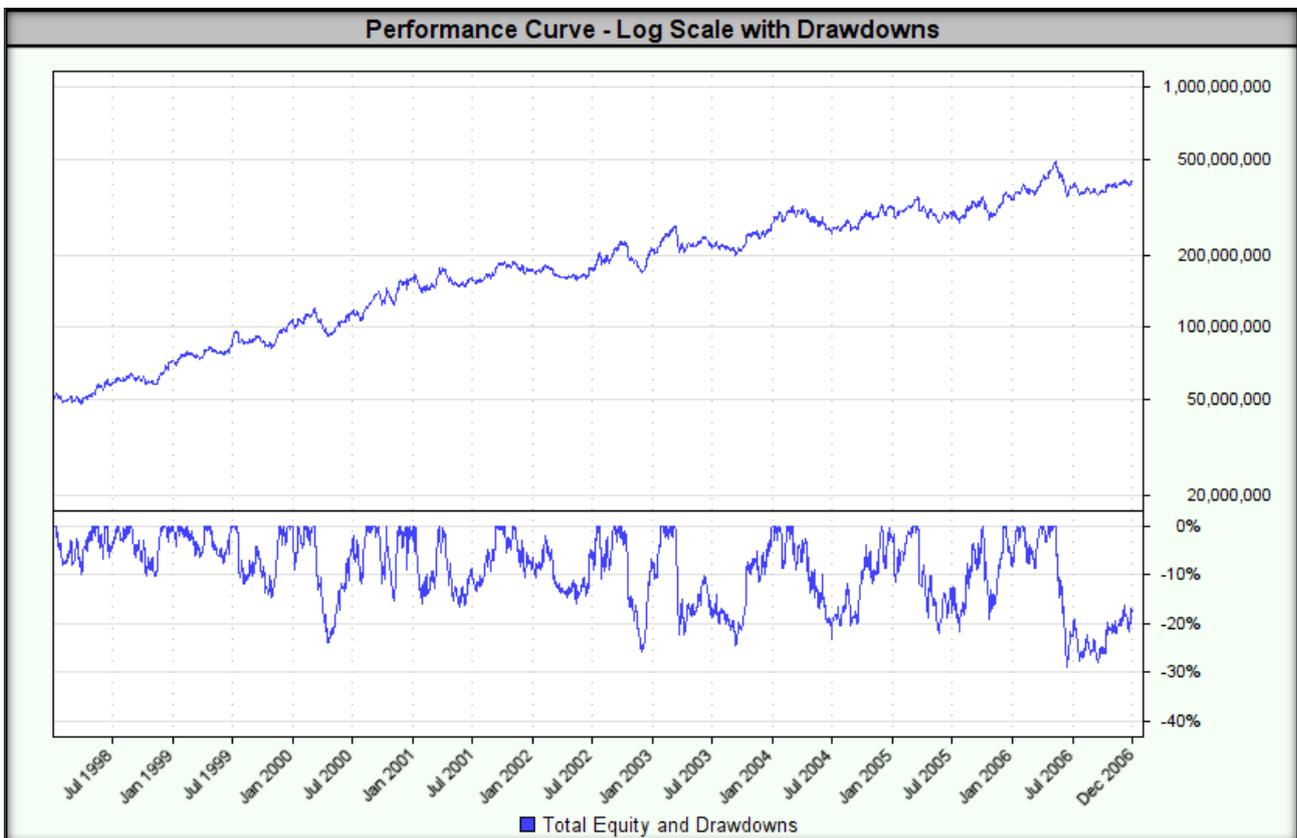
The highest MAR value was accompanied by a drawdown of 28.9%.

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

Test	ATR Bars	NR Bars	ATR Multiplier (%)	Moving Average (bars)	End Balance	CAGR%	MAR	Sharpe	Ann. Sharpe	Max TE DD	Longest DD	Trades	R3
622	8	3	100%	220	\$406,330,016.82	26.24%	0.91	0.97	1.63	28.9%	9.7	704	1.72
314	7	3	100%	220	\$421,373,021.61	26.75%	0.91	0.98	1.65	29.5%	9.7	704	1.72
6	6	3	100%	220	\$423,176,462.72	26.81%	0.90	0.98	1.73	29.7%	9.6	715	1.73
391	7	4	100%	220	\$429,033,633.46	27.01%	0.90	1.01	1.47	30.2%	9.3	646	1.72
83	6	4	100%	220	\$419,844,437.83	26.70%	0.88	0.99	1.47	30.3%	9.3	659	1.60
699	8	4	100%	220	\$385,682,243.62	25.51%	0.88	0.97	1.31	29.0%	10.5	648	1.59
317	7	3	100%	250	\$411,200,759.39	26.41%	0.87	0.98	1.64	30.3%	9.6	655	1.38
930	9	3	100%	220	\$393,011,631.45	25.77%	0.87	0.96	1.59	29.7%	9.6	700	1.70
9	6	3	100%	250	\$408,081,755.62	26.30%	0.86	0.97	1.66	30.5%	9.5	668	1.33
1238	10	3	100%	220	\$384,903,321.88	25.48%	0.86	0.96	1.60	29.7%	9.6	696	1.69
392	7	4	100%	230	\$418,884,871.19	26.67%	0.86	0.99	1.59	31.1%	9.6	630	1.78
7	6	3	100%	230	\$405,771,221.47	26.22%	0.86	0.96	1.70	30.6%	9.6	695	1.73

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

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



For all combinations of tested parameter ranges, the highest drawdown was 35.6%.

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

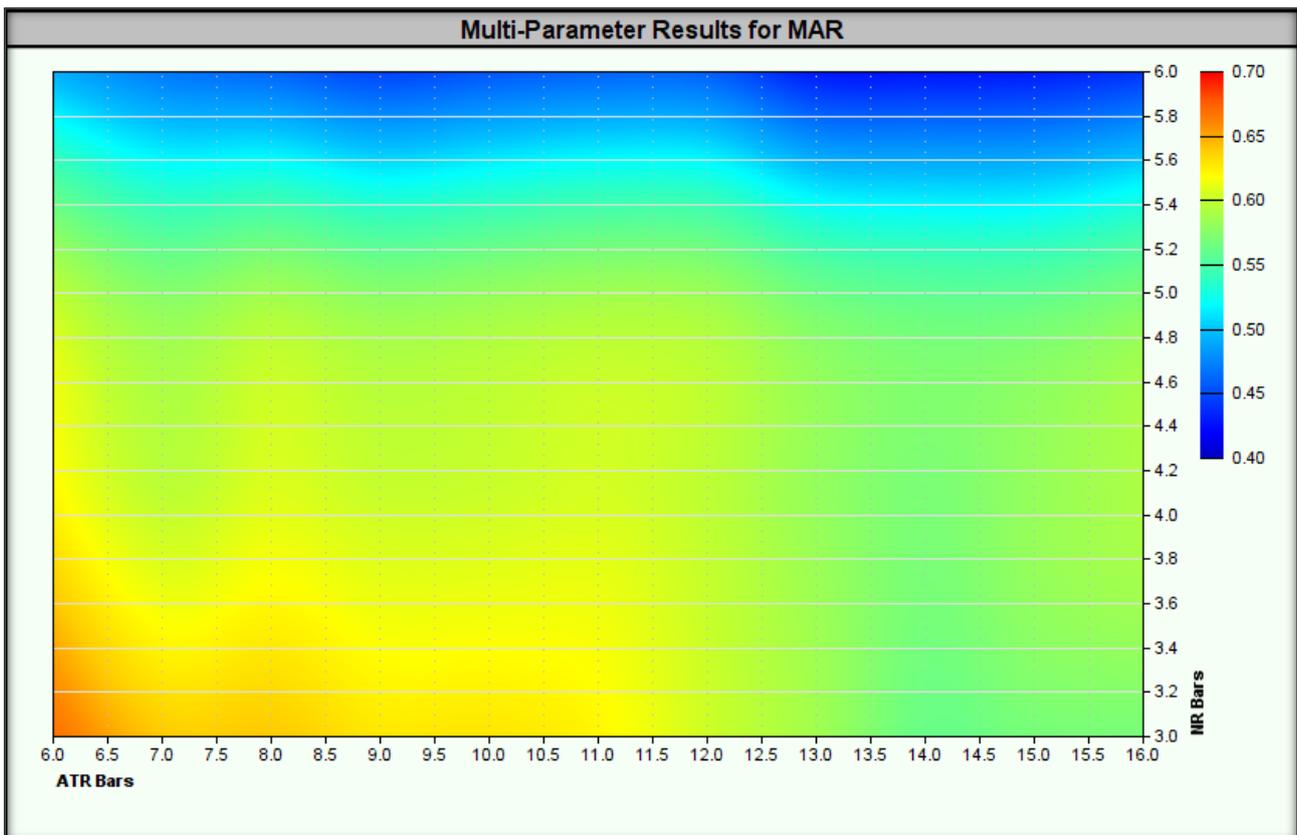


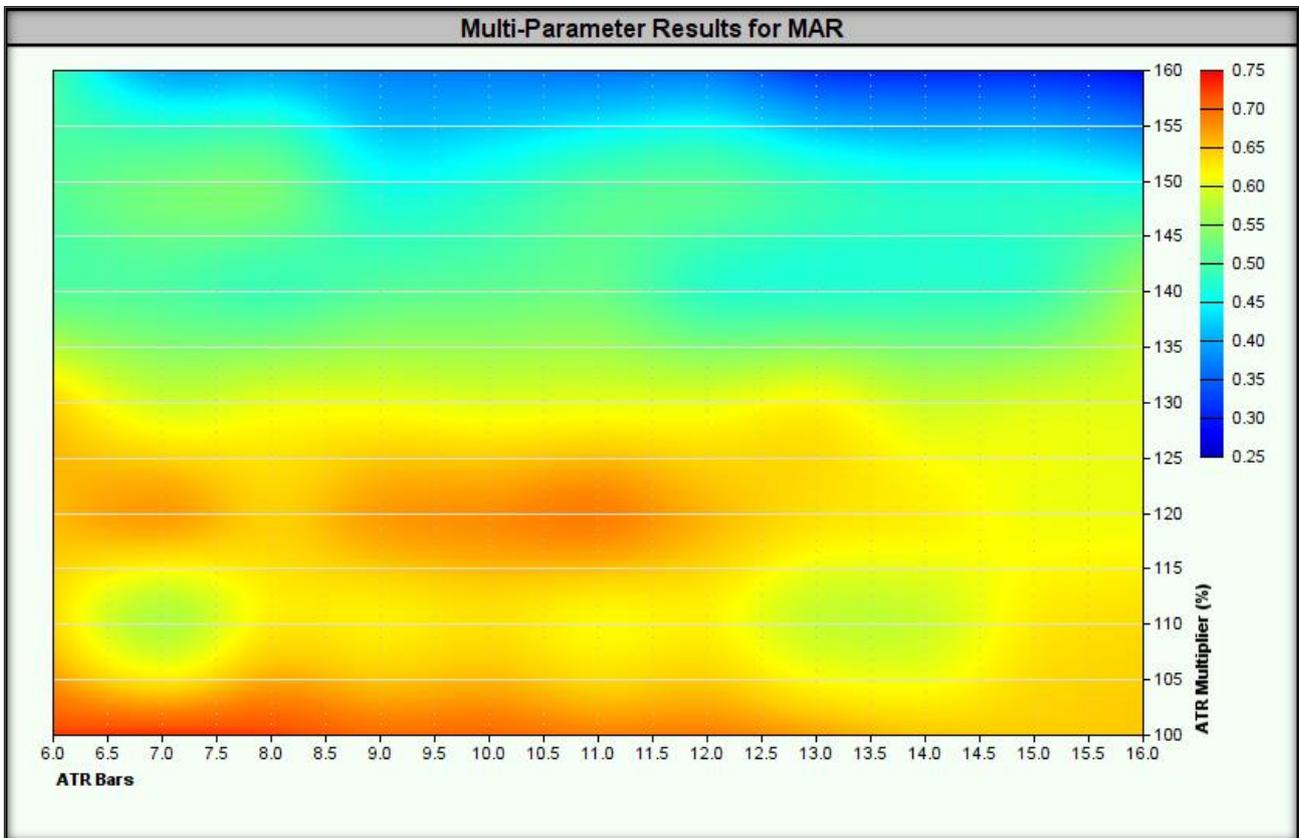
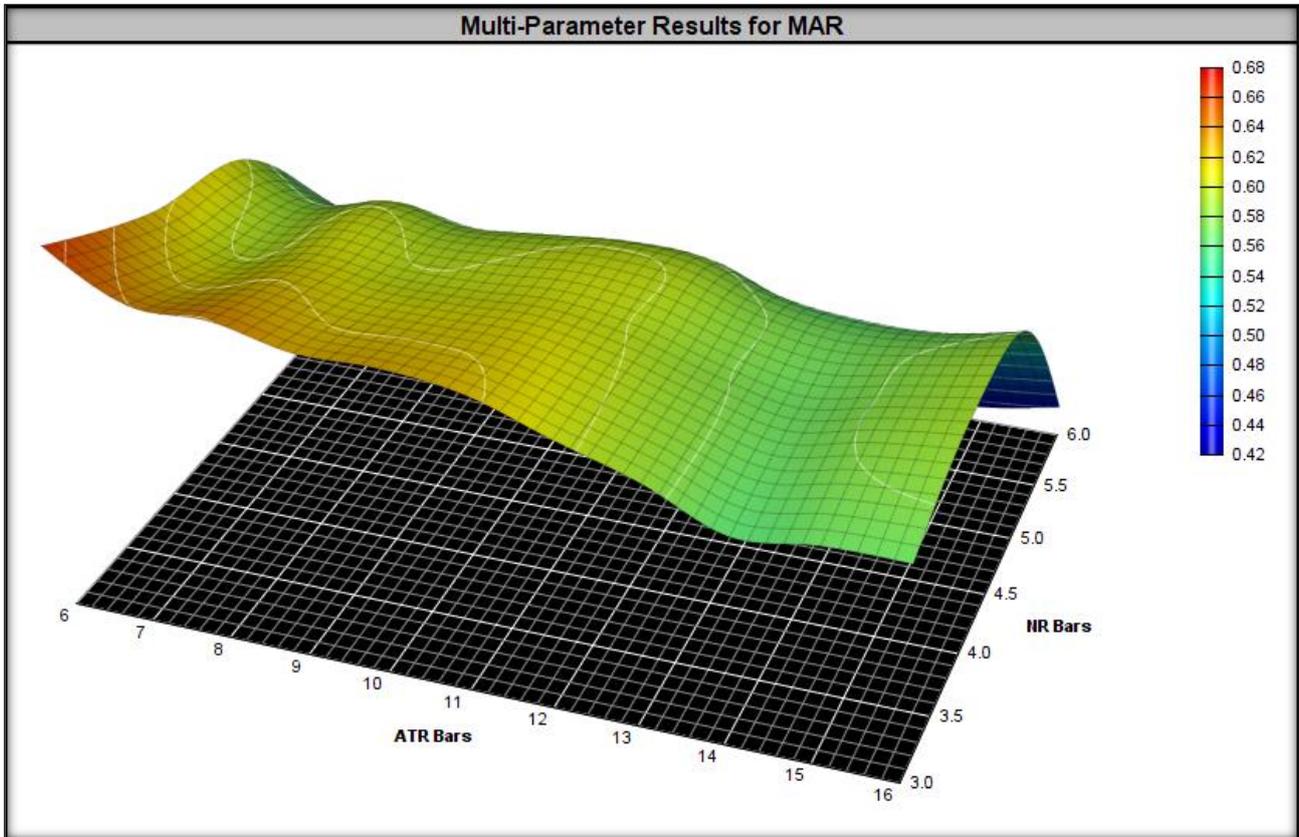
Test	ATR Bars	NR Bars	ATR Multiplier (%)	Moving Average (bars)	End Balance	CAGR%	MAR	Sharpe	Ann. Sharpe	Max TE ...	Longest DD	Trades	R3
240	6	6	100%	250	\$274,763,182.30	20.87%	0.59	0.80	1.47	35.6%	14.7	574	1.13
239	6	6	100%	240	\$285,364,051.70	21.38%	0.60	0.82	1.57	35.3%	14.7	581	1.17
548	7	6	100%	250	\$279,389,743.40	21.09%	0.60	0.82	1.44	35.3%	14.6	560	1.18
547	7	6	100%	240	\$288,516,246.46	21.52%	0.61	0.83	1.52	35.0%	14.6	568	1.20
252	6	6	110%	260	\$195,980,703.00	16.41%	0.47	0.71	0.96	34.8%	10.7	522	0.97
1164	9	6	100%	250	\$245,680,664.54	19.37%	0.56	0.78	1.11	34.7%	14.5	550	1.07
251	6	6	110%	250	\$225,698,258.64	18.25%	0.53	0.75	1.12	34.7%	14.7	526	1.10
238	6	6	100%	230	\$276,324,118.16	20.94%	0.60	0.81	1.41	34.7%	14.6	596	1.20
253	6	6	110%	270	\$190,546,627.97	16.04%	0.46	0.70	0.98	34.6%	10.5	519	0.98
1472	10	6	100%	250	\$243,206,751.20	19.24%	0.56	0.78	1.15	34.6%	14.5	542	1.08
1163	9	6	100%	240	\$252,567,797.55	19.74%	0.57	0.79	1.16	34.5%	14.5	558	1.13
250	6	6	110%	240	\$240,086,875.52	19.07%	0.55	0.78	1.21	34.5%	14.7	527	1.12

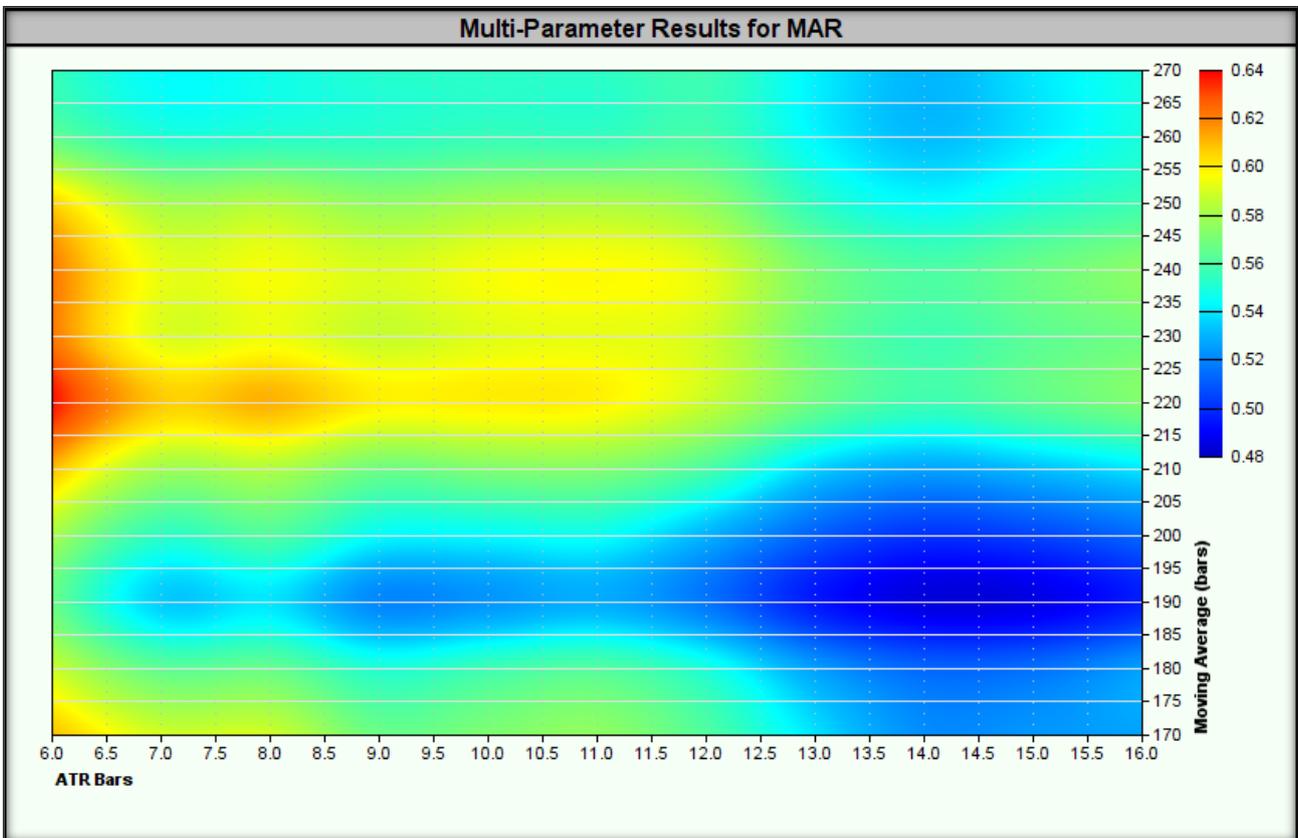
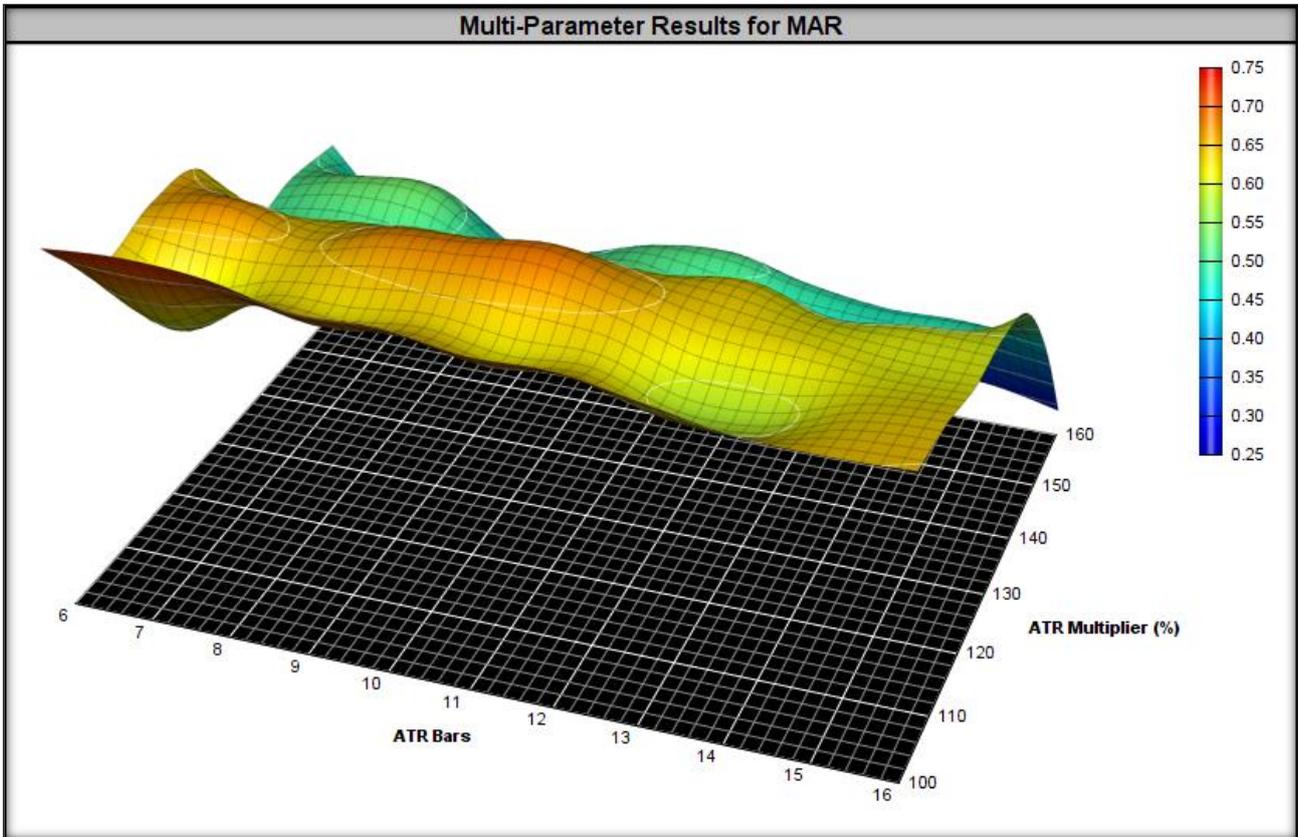
In summary, the strategy passed the stability test over a wide range of optimized parameters on out-of-sample data because:

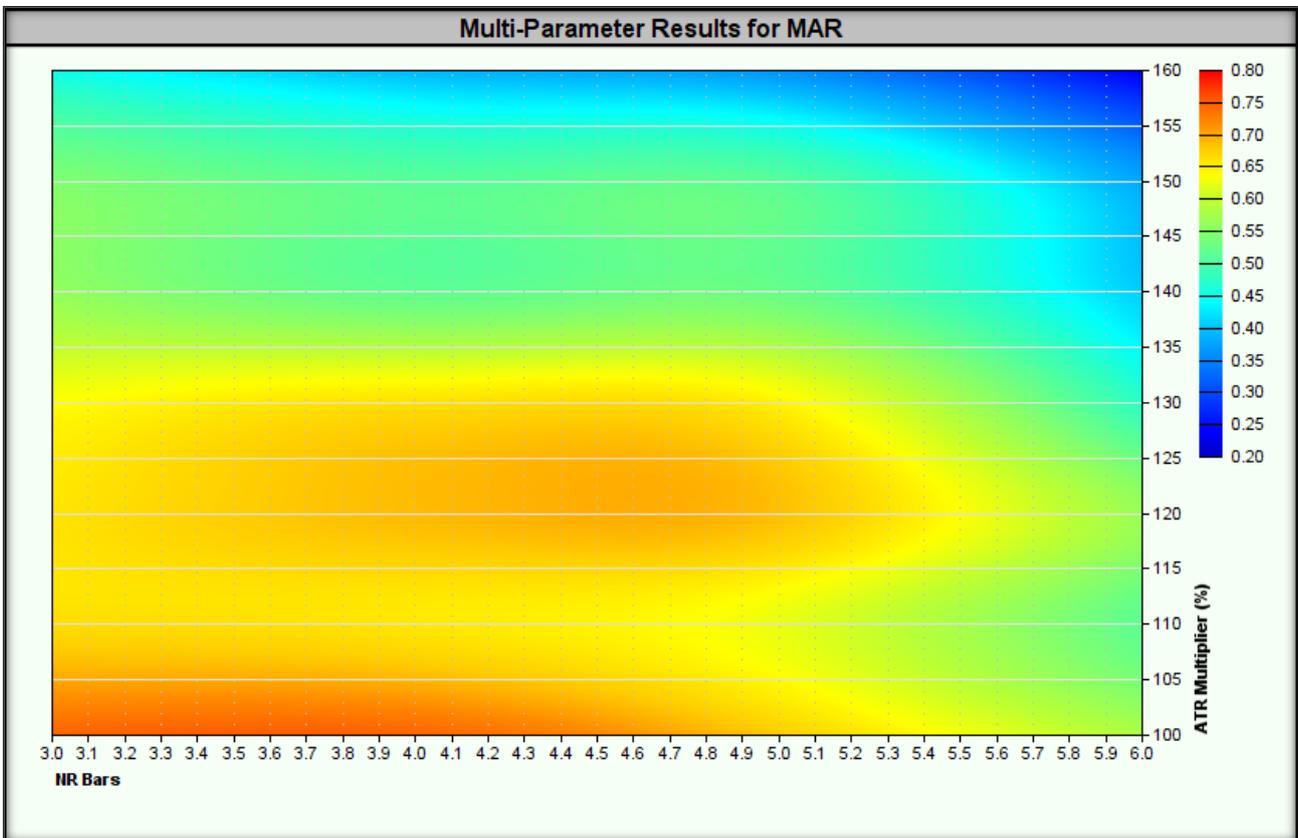
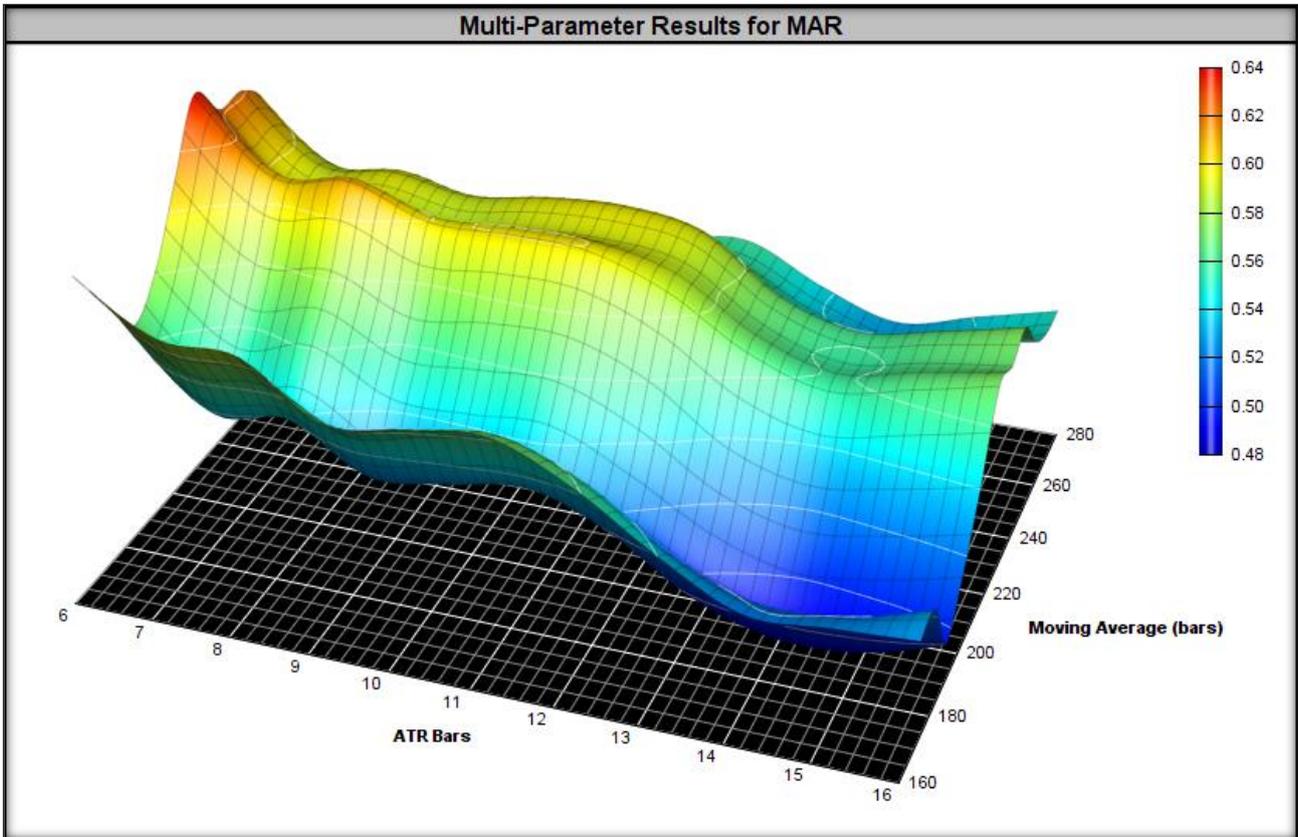
- All test results showed a positive MAR value – which indicates the stability of the strategy in various market conditions.
- The maximum drawdown on out-of-sample data did not exceed 150% of the maximum drawdown value on in-sample data (35.6 % vs. 67.3 %) – which means an acceptable risk of capital drawdown.
- The decrease in the maximum MAR value on out-of-sample data was less than 50% relative to the in-sample test results (0.91 vs. 0.45) – indicating that the strategy can perform well in a variety of market conditions.

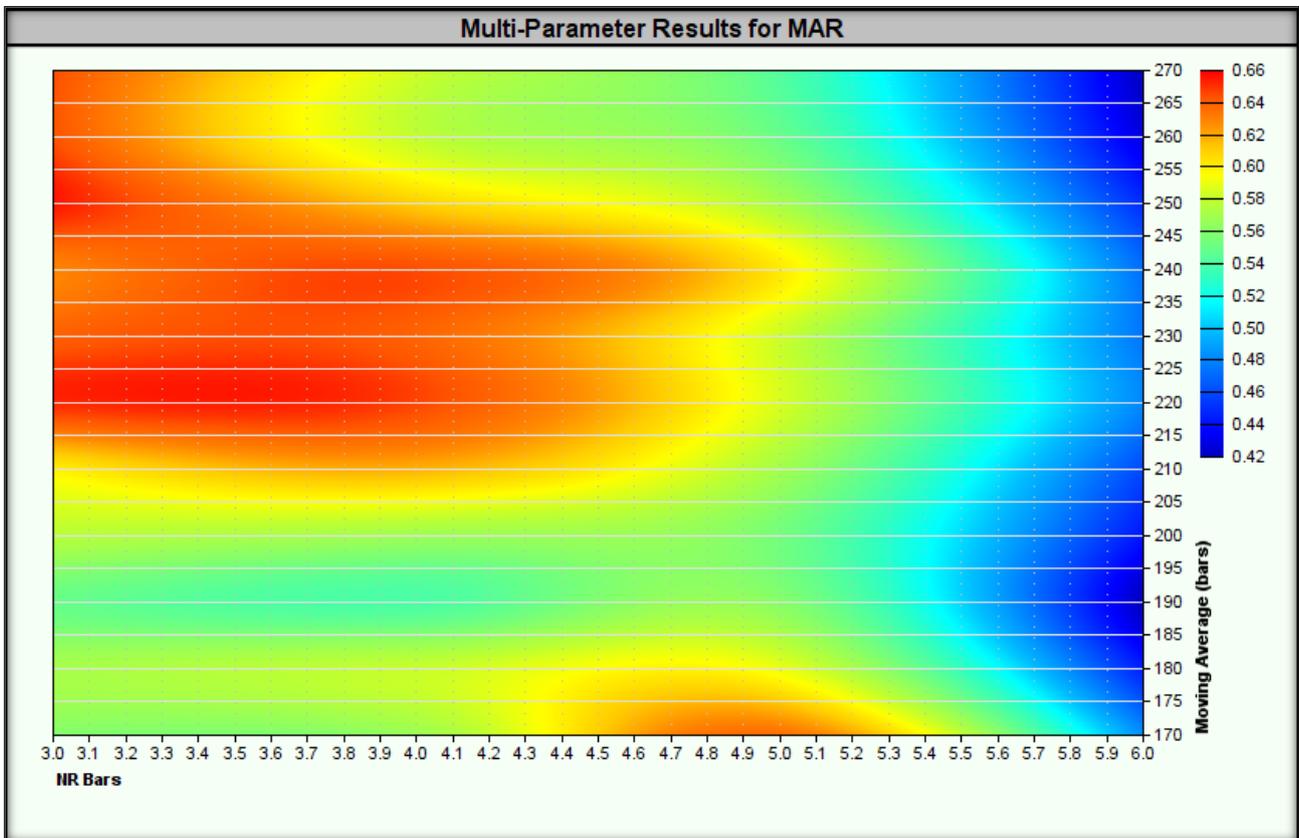
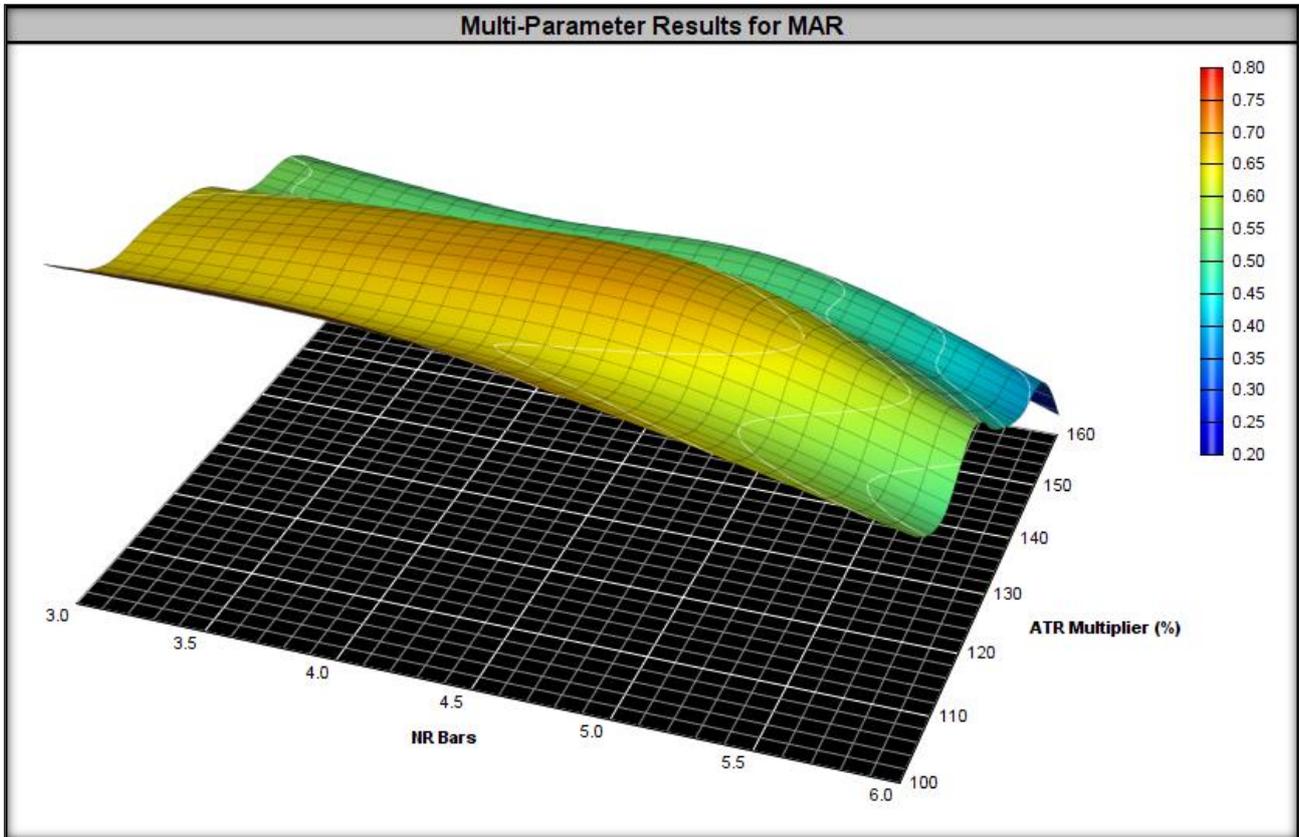
Heatmaps for the tested ranges are presented below.

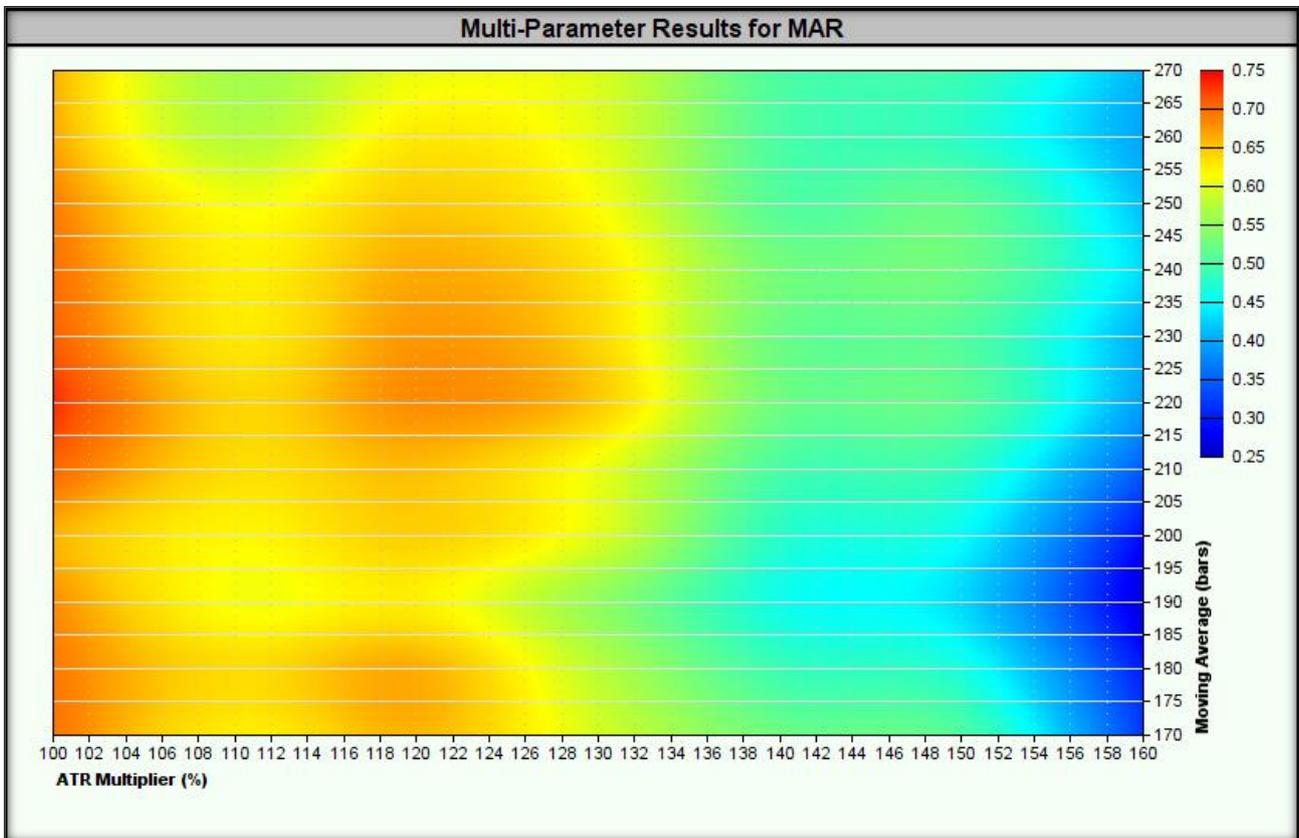
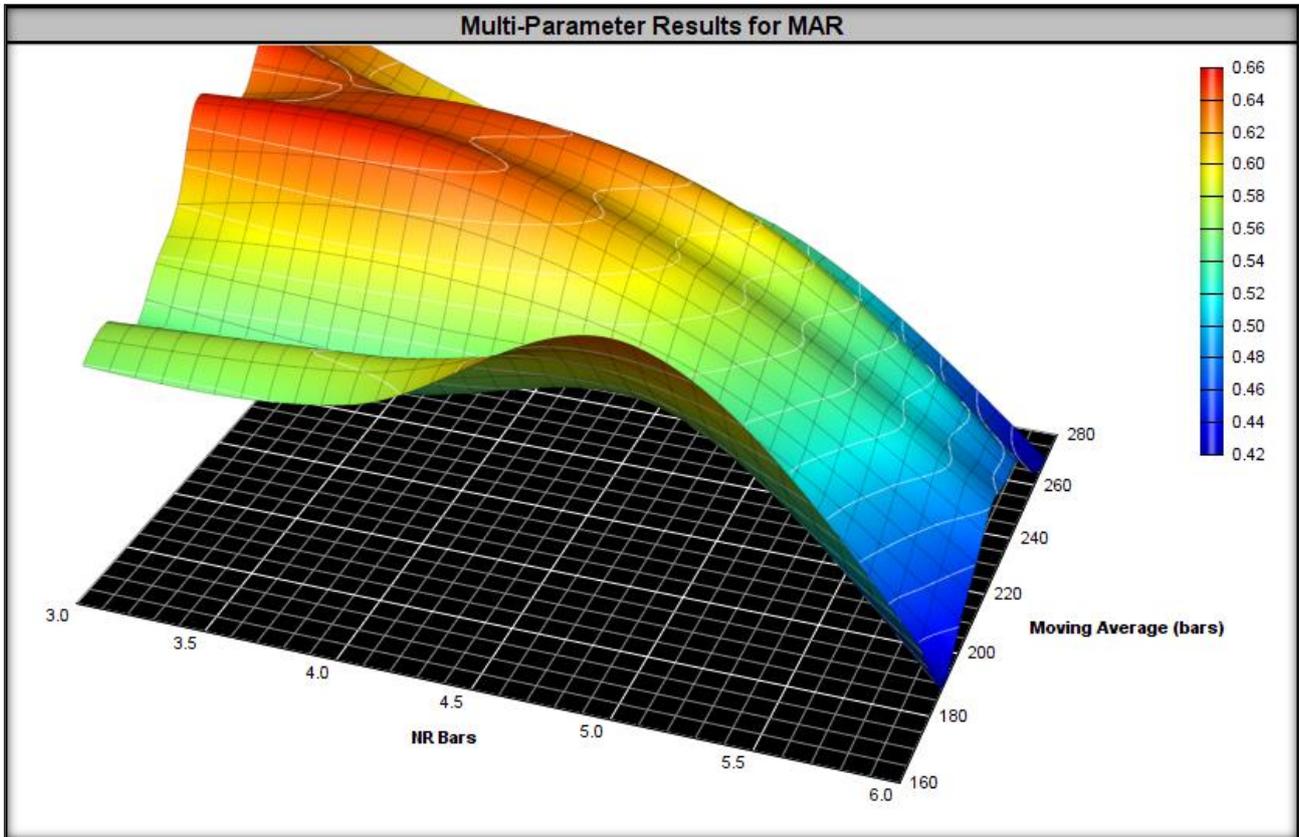


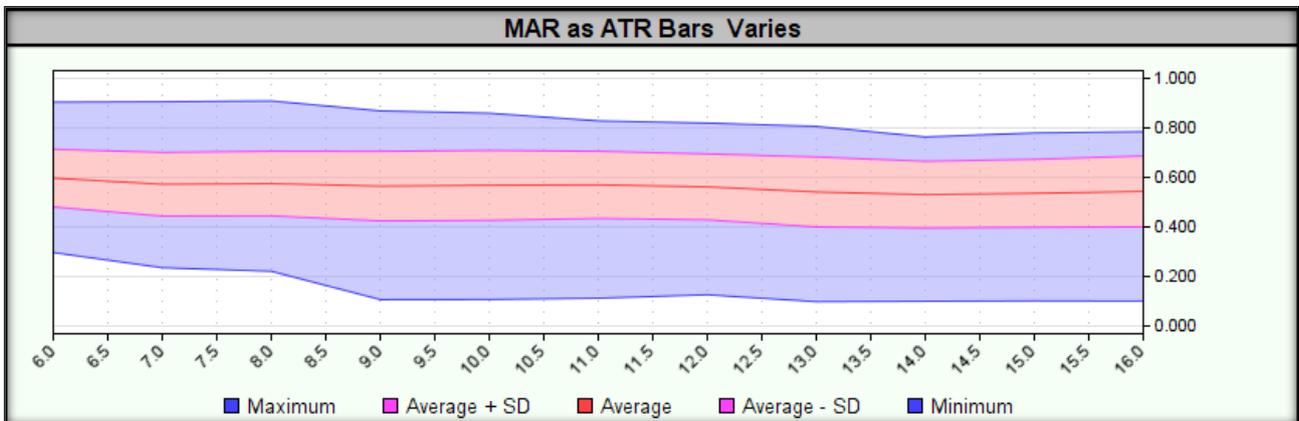
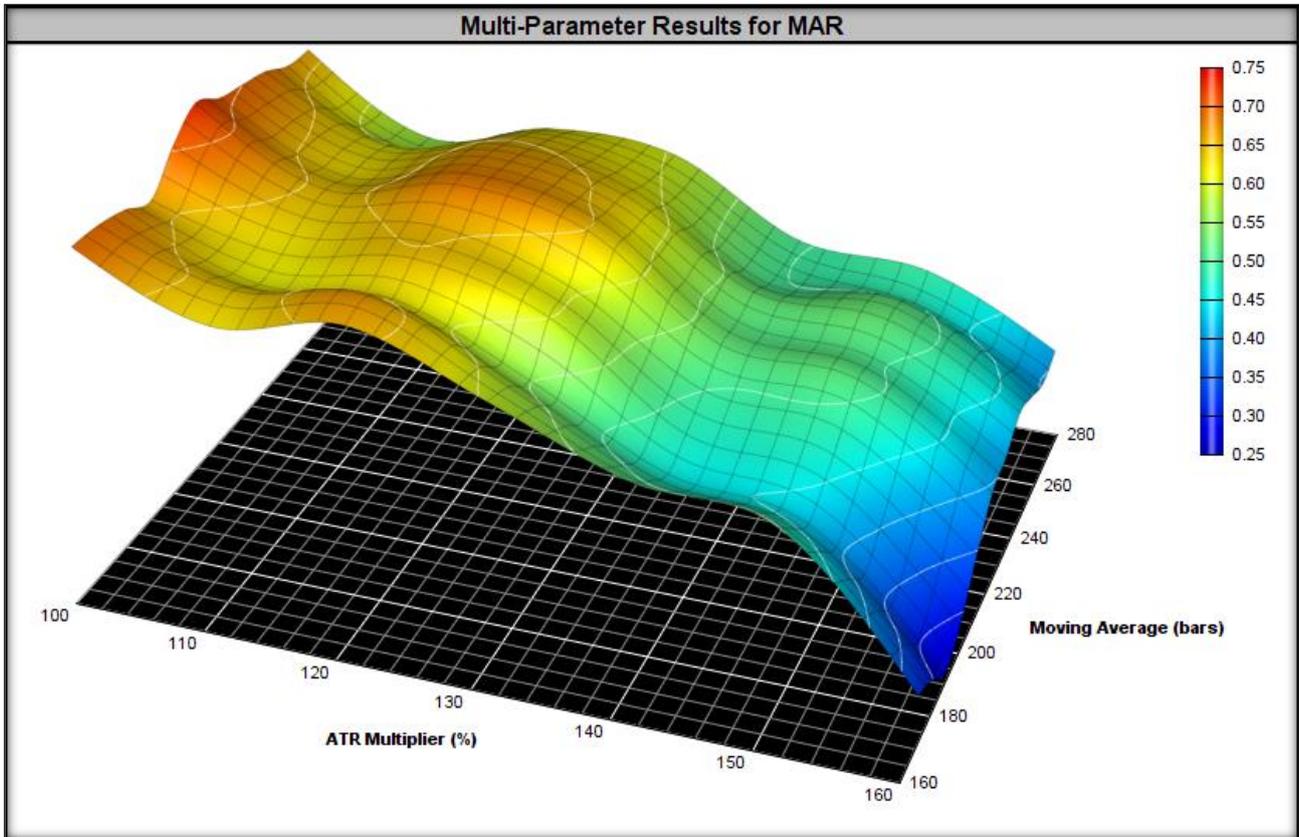


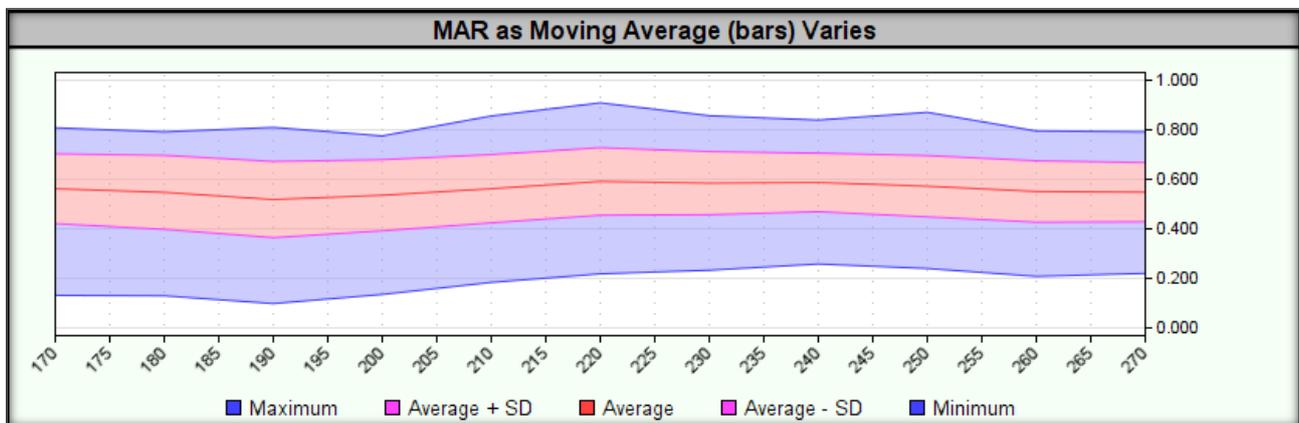
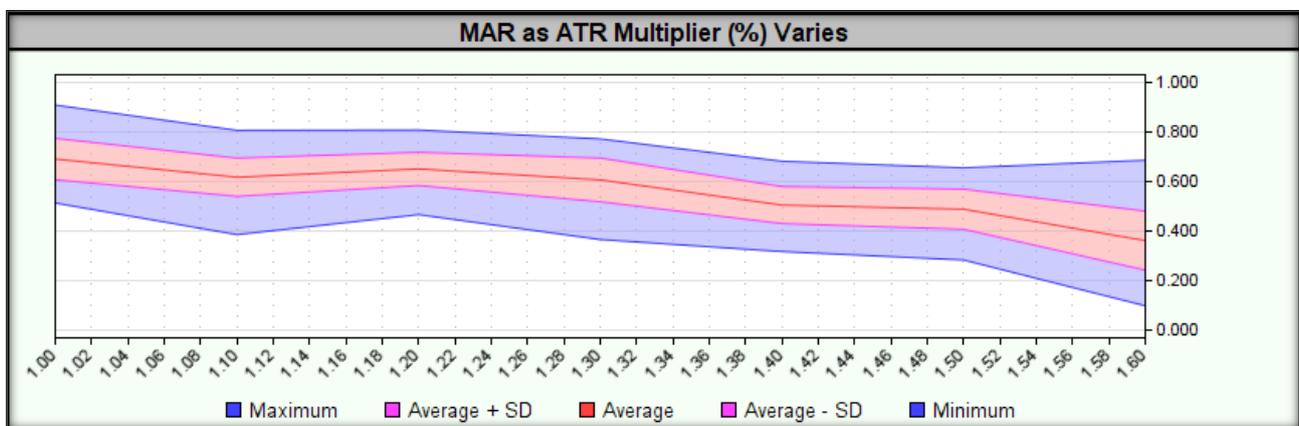
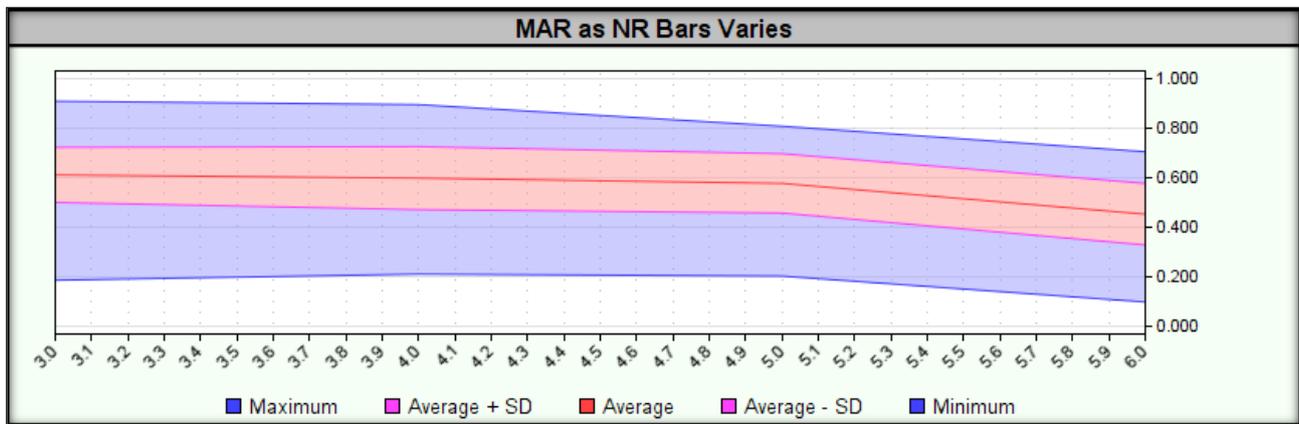












After passing the **stability test in a wide range of optimized parameters**, we can proceed to **stability testing using Monte Carlo simulation**. The conditions for passing this test are similar to those required in the above step.

2. Monte Carlo simulation

Monte Carlo simulation involves running multiple simulations to examine how a strategy might perform in different market scenarios. The key objective of this method is to assess the potential **drawdown** of an optimized strategy. **Monte Carlo simulation** better reflects the possible swings of the equity curve and the depth of the potential **drawdown**, allowing for a more realistic risk assessment. It is also an ideal opportunity



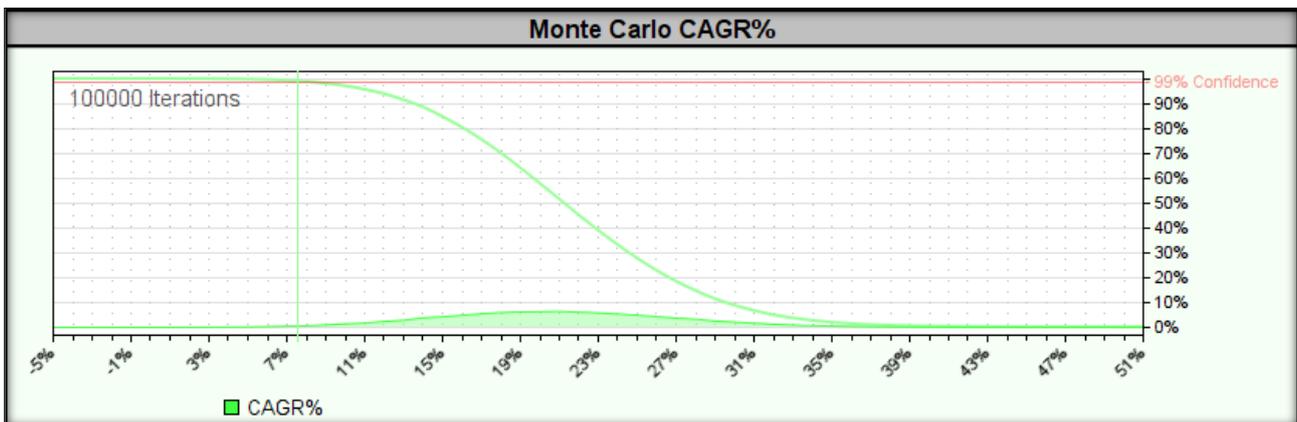
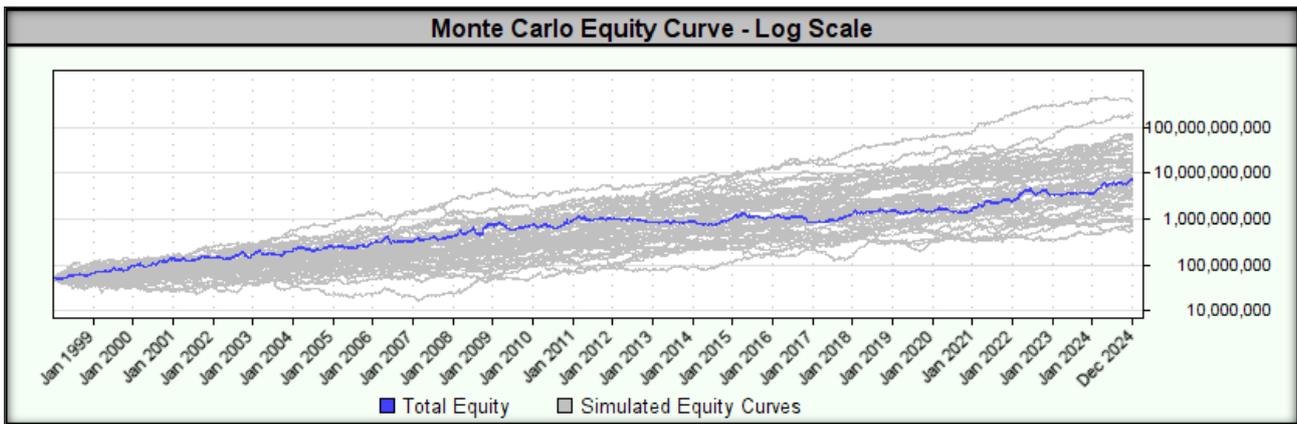
to compare **the drawdown** obtained in tests on optimized parameter ranges with the results of **the Monte Carlo simulation**, using a **99% confidence interval**.

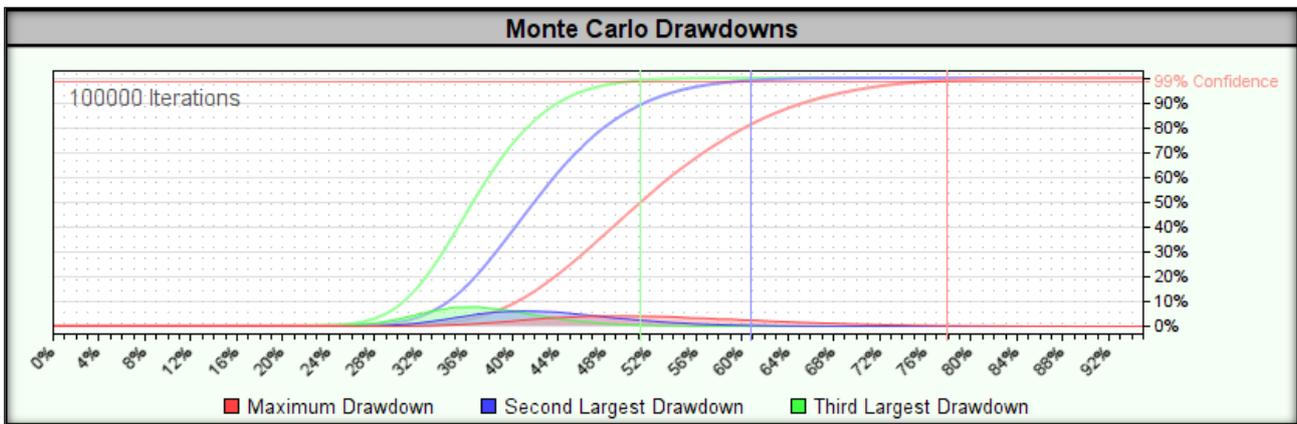
A strategy considered to be **stable (robust)** should achieve a **drawdown in a Monte Carlo simulation** that does not exceed **250% of the drawdown size from total tests in-sample and out-of-sample** (for parameters optimized on IS data). Furthermore, the **MAR indicator** should remain positive within the chosen confidence interval.

For data covering the period from **01.01.1998 to 31.12.2024**, a **Monte Carlo simulation** was performed on **optimal strategy parameters**. The Monte Carlo simulation was performed **100,000 times**, testing **the variant with replacement (more conservative)**, and the **confidence interval was set to 99%**.

The simulation with sample replacement are presented below.

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





- **CAGR%** – In 99% of simulations achieved a **rate of return equal to or higher than 7.5%**.
- **Drawdown** – in 99% of simulations, **drawdown equal to or lower than 78%** was achieved. For parameters optimized on in-sample data, drawdown was 38.9%.

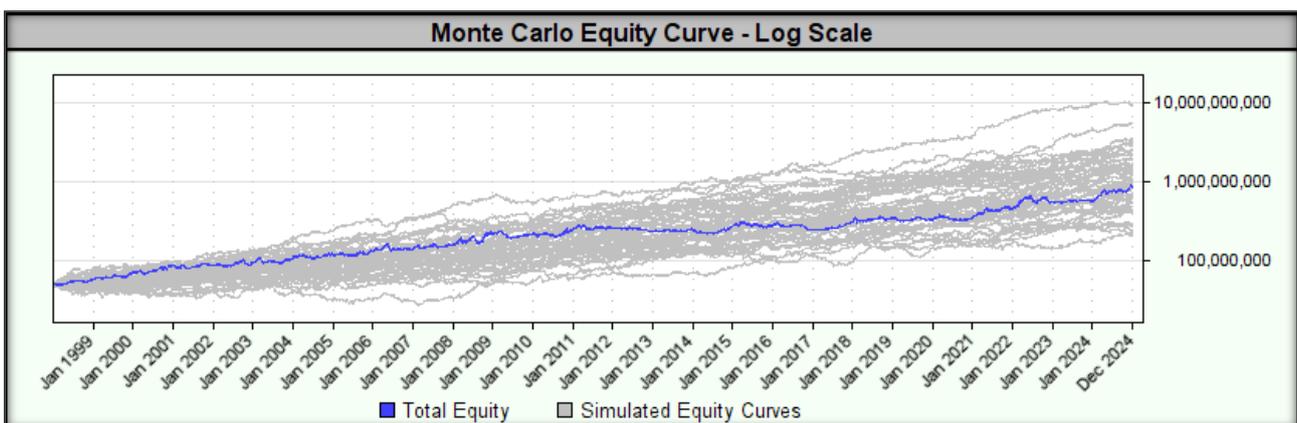
The strategy stability criteria were met, as **the drawdown in the Monte Carlo simulation** did not exceed **250% of the drawdown** value from tests on **optimized parameters**. In addition, the **MAR indicator** remained positive in **99%** of tests, which was also a condition for the strategy stability.

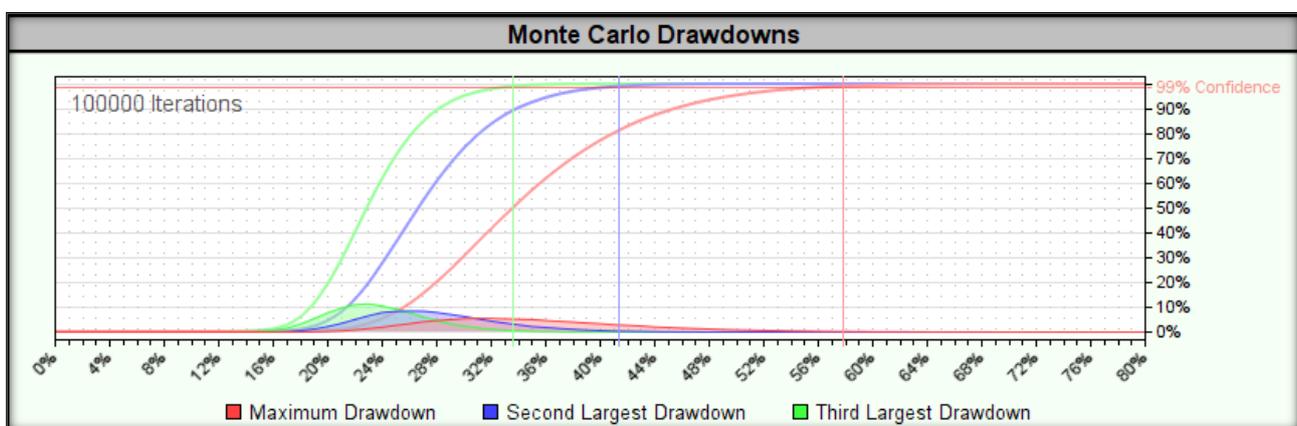
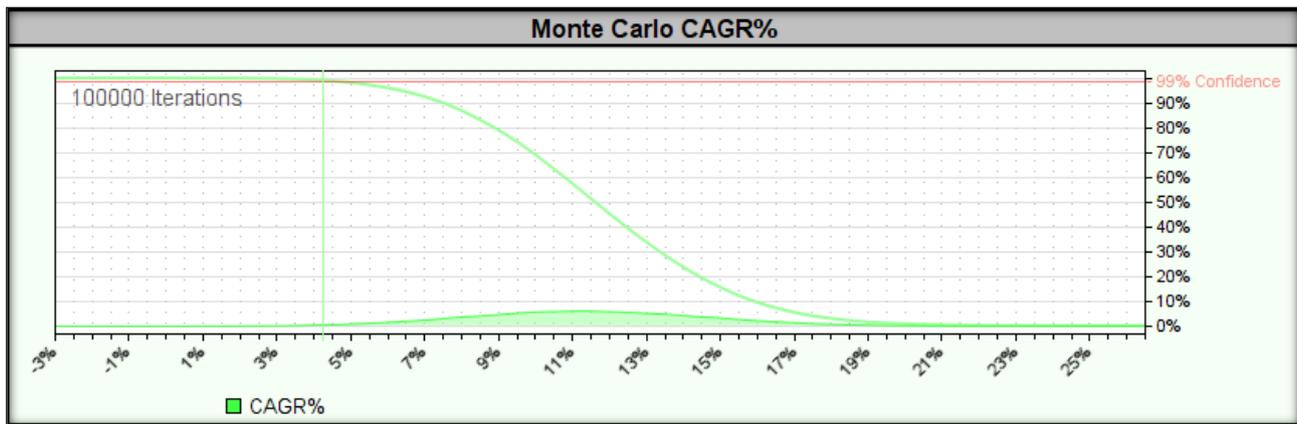
The problem with these tests, however, is the fact that **the drawdown on the optimized parameters is 38.9%**, which means that **even with a 100% loss of capital in the Monte Carlo tests we will only slightly exceed the stability criterion (250% drawdown)**. Therefore, it is necessary to reduce the position size so that the simulation results make sense.

For the purpose of **the repeated Monte Carlo test we are reducing the position size to 0.25% of capital per position** (from 0.5%).

The results of repeated tests for the simulation with sample replacement are presented below.

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





- **CAGR%** – In 99% of simulations achieved a rate of return equal to or higher than 4.5%.
- **Drawdown** – in 99% of simulations, drawdown equal to or lower than 58% was achieved. For parameters optimized on in-sample data, drawdown was 23.8%.

The strategy stability criteria were met, as **the drawdown in the Monte Carlo simulation** did not exceed **250% of the drawdown** value from tests on **optimized parameters**. In addition, the **MAR indicator** remained positive in **99%** of tests, which was also a condition for the strategy stability.

Now that we know the strategy is **stable** across **wide data ranges** and a **changing environment**, it's time to test its **stability** over **different time periods**.

3. Stability over a moving time window

Rolling window stability testing involves **evaluating one-year and three-year returns in time windows that move by one year** (for both in-sample and out-of-sample data). This process involves **applying strategy parameters optimized on the in-sample data**, setting a one-year or three-year trading window, and moving it by one year.

We then analyze what portion of these one- and three-year periods showed positive returns. **A strategy considered stable (robust) should achieve profitable results in at least 70% of the one- and three-year periods.**



For data covering the period from **01/01/1998 to 31/12/2024**, testing of optimized parameters was performed on a **moving data window**.

Two variants of test windows were tested:

- **Annual testing window (365 days)**, tested every 365 days – this means that we measure the annual rate of return every year.
- **Three-year testing window (1095 days)**, tested every 365 days – this means we measure a three-year rate of return every year.

A one-year (365/365) testing window are shown below.

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

Test Start Date	End Balance	CAGR%	MAR	Sharpe	Ann. Sharpe	Max TE DD	Longest DD	Trades	R3	RAR (%)	%PF	Expectancy
19980101	\$68,257,631.10	36.54%	3.44	1.97	2.00	10.6%	3.4	87	33.77	27.13	2.02	0.81
19990101	\$68,063,711.71	36.27%	2.10	1.60	NA	17.3%	4.8	87	15.33	12.83	2.01	0.82
20000101	\$73,609,069.51	47.89%	3.32	1.47	NA	14.4%	3.3	86	41.84	37.36	2.33	1.07
20010101	\$63,286,902.02	26.59%	1.79	1.21	2.00	14.8%	5.5	79	29.92	24.40	1.79	0.62
20020101	\$59,018,912.06	18.05%	0.80	0.67	2.00	22.4%	5.5	96	9.85	8.98	1.50	0.41
20030101	\$59,248,012.88	18.51%	0.68	0.68	2.00	27.0%	9.7	97	-6.39	-7.56	1.50	0.42
20040101	\$60,855,855.58	21.73%	1.06	0.95	NA	20.4%	6.5	96	1.99	2.20	1.53	0.43
20050101	\$56,781,020.43	13.73%	0.70	0.66	NA	19.5%	8.5	92	-0.31	-0.24	1.42	0.34
20060101	\$53,642,793.03	7.31%	0.28	0.47	2.00	26.4%	7.7	99	2.08	2.47	1.17	0.14
20070101	\$52,959,768.00	5.92%	0.27	0.43	1.99	21.7%	4.4	110	-3.07	-2.97	1.17	0.14
20080101	\$81,400,204.58	62.85%	2.01	1.29	NA	31.3%	3.3	92	25.88	31.20	2.77	1.27
20090101	\$50,396,894.23	0.79%	0.02	0.15	1.94	35.0%	10.0	104	-11.47	-16.79	1.14	0.11
20100101	\$60,106,351.78	20.29%	0.94	0.75	NA	21.6%	5.2	108	5.93	6.77	1.56	0.45
20110101	\$50,210,495.14	0.43%	0.02	0.14	NA	21.5%	8.7	106	-11.34	-10.50	1.04	0.04
20120101	\$41,286,279.63	-17.48%	-0.76	-1.14	NA	23.0%	7.0	101	-20.76	-16.41	0.57	-0.35
20130101	\$52,929,304.76	5.86%	0.48	0.46	1.99	12.3%	10.7	107	-3.74	-2.33	1.12	0.11
20140101	\$62,560,526.30	25.14%	1.47	1.27	2.00	17.1%	6.4	107	5.57	5.47	1.76	0.62
20150101	\$52,157,903.78	4.32%	0.18	0.29	1.99	23.7%	8.6	85	-4.32	-4.83	1.14	0.11
20160101	\$39,102,949.74	-21.86%	-0.62	-0.99	NA	35.2%	10.6	114	-15.54	-22.22	0.52	-0.39
20170101	\$70,421,887.44	41.01%	5.12	2.25	2.01	8.0%	4.0	92	24.67	22.40	2.25	0.92
20180101	\$58,114,709.48	16.24%	0.86	0.81	2.00	19.0%	6.9	107	-11.56	-12.65	1.34	0.28
20190101	\$46,575,815.05	-8.85%	-0.35	-0.25	-2.01	19.5%	3.9	109	3.01	3.93	0.87	-0.11
20200101	\$58,987,235.93	17.99%	0.90	0.86	NA	19.9%	8.3	101	-1.51	-2.09	1.50	0.37
20210101	\$66,733,693.18	33.60%	2.03	1.20	NA	16.5%	4.4	80	25.84	28.45	2.12	0.85
20220101	\$60,421,321.57	21.11%	0.78	0.76	NA	27.2%	6.6	86	14.13	16.57	1.67	0.52
20230101	\$57,099,072.68	14.25%	1.20	0.87	2.00	11.8%	1.9	94	24.20	25.31	1.38	0.31
20240101	\$79,547,773.81	59.15%	3.30	2.73	NA	17.9%	4.2	84	23.01	24.19	2.87	1.36

A three-year testing window (1095/365) are shown below.

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

Test Start Date	End Balance	CAGR%	MAR	Sharpe	Ann. Sharpe	Max TE DD	Longest DD	Trades	R3	RAR (%)	%PF	Expectancy
19980101	\$141,932,132.83	41.72%	1.98	1.52	11.01	21.1%	4.4	207	14.38	38.57	2.45	1.18
19990101	\$103,885,802.90	27.62%	1.31	1.01	1.50	21.0%	8.0	211	7.79	32.08	1.90	0.76
20000101	\$89,147,175.11	21.32%	0.86	0.80	1.19	24.9%	9.1	224	3.86	17.25	1.67	0.54
20010101	\$92,490,423.71	22.77%	0.86	0.85	2.10	26.5%	9.7	226	2.41	15.12	1.74	0.60
20020101	\$87,111,642.50	20.34%	0.76	0.79	5.81	26.9%	9.7	235	2.77	21.49	1.69	0.58
20030101	\$79,511,220.71	16.75%	0.62	0.71	8.33	27.0%	9.7	236	2.06	16.17	1.62	0.53
20040101	\$77,994,636.52	16.02%	0.51	0.72	3.95	31.1%	7.6	243	3.10	19.24	1.49	0.41
20050101	\$81,564,036.80	17.77%	0.59	0.85	1.77	30.1%	13.8	245	2.49	15.30	1.55	0.46
20060101	\$120,852,554.56	34.27%	1.01	1.02	1.17	34.1%	9.4	244	4.38	26.01	2.05	0.87
20070101	\$94,729,738.51	23.76%	0.69	0.77	0.70	34.5%	9.8	239	3.94	34.67	1.81	0.64
20080101	\$108,168,672.13	28.55%	0.91	0.88	1.14	31.3%	19.6	227	2.36	15.60	2.07	0.80
20090101	\$70,775,335.70	12.31%	0.35	0.55	0.92	35.0%	19.9	246	2.60	18.82	1.45	0.37
20100101	\$53,453,770.73	2.25%	0.07	0.21	0.15	30.2%	21.9	253	1.56	10.49	1.10	0.08
20110101	\$46,241,051.98	-2.58%	-0.09	-0.06	-0.22	28.0%	32.8	283	-1.96	-8.39	0.94	-0.05
20120101	\$51,169,288.45	0.77%	0.02	0.14	0.06	33.1%	31.0	284	-2.15	-9.18	1.10	0.09
20130101	\$62,365,785.30	7.65%	0.27	0.43	1.14	28.0%	10.7	252	2.16	13.48	1.34	0.29
20140101	\$49,670,640.09	-0.22%	-0.01	0.11	-0.01	37.8%	20.6	261	1.42	10.46	1.14	0.11
20150101	\$62,126,211.71	7.53%	0.20	0.45	0.24	36.8%	22.6	251	-0.93	-7.20	1.33	0.27
20160101	\$73,944,660.30	13.94%	0.39	0.71	0.46	36.1%	22.4	256	1.11	8.43	1.62	0.51
20170101	\$78,558,097.31	16.28%	0.75	0.82	0.79	21.8%	11.7	237	3.27	21.11	1.62	0.51
20180101	\$60,141,184.40	6.35%	0.22	0.40	0.49	28.6%	11.7	269	0.73	6.53	1.17	0.14
20190101	\$77,951,936.48	15.97%	0.55	0.72	0.75	28.9%	11.0	252	2.22	17.15	1.63	0.53
20200101	\$127,269,314.20	36.61%	1.34	1.18	2.66	27.3%	8.5	226	8.73	49.24	2.44	1.14
20210101	\$96,682,870.46	24.60%	0.89	0.91	1.17	27.8%	18.6	231	4.77	28.82	1.94	0.76
20220101	\$126,954,567.07	36.53%	1.28	1.29	0.78	28.5%	20.1	232	3.99	21.90	2.44	1.17

In both cases, success is completing at least 70% of the periods (both 365-day and 1095-day) with positive returns.



- For the one-year test window (365/365): 24 out of 27 periods ended with a positive rate of return (89%).
- For the three-year test window (1095/365): 2-3 out of 25 periods ended with a positive rate of return (92%).

Thus, the test of the strategy's stability on a moving data window was passed.

4. Long/short stability

In the case of many instruments, markets have a natural tendency to move in an upward direction (so-called **Long Bias**), which makes investing in upside scenarios often easier than betting on downside. **Optimizing a strategy** for a downside scenario, which is usually implied by the data used for optimization, can lead to **problems** when markets enter a **long-term downward trend**. In such conditions, the strategy can generate **significant losses**.

To check if a **strategy** is prone to **Long Bias** or (less often) **Short Bias**, you need to look at **the distribution of historical** buys and sells. Ideally, this distribution should be around **50%/50%**. However, if one side is significantly favored (e.g. **70%/30%**), the strategy may be **unstable** in a real market environment.

A **strategy considered stable (robust)** should show a maximum of **60% tendency (bias)** in one direction.

Results for ATR Ignition strategy (1998-2024):

- **Total number of transactions: 1968**
- **Long trades: 1012 (51.4%)**
- **Short trades: 956 (48.6%)**

The trade distribution is **51.4%/48.6%**, which is **within the acceptable range**, meaning that the strategy **does not exhibit excessive bias** and can be considered stable under various market conditions.

5. Stability in the portfolio of financial instruments

In this step, we want to examine **how the strategy's performance is distributed across different instruments in the portfolio**. Our goal is to **avoid a situation where the strategy's positive performance comes only from a small group of exceptionally well-performing instruments**.

To check this, for **both in-sample and out-of-sample data**, we analyze **what percentage of instruments achieved a profit factor value above 1** (which means a positive contribution to the strategy's result).

We expect that:

- **For the portfolio with the highest MAR** (obtained on IS data), the percentage of instruments with **profit factor > 1 will be at least 80%**.
- **For the portfolio with the lowest MAR** (obtained on IS data), the percentage of instruments with **profit factor > 1 will be at least 70%**.

If the above conditions are met, **we can consider that the strategy is stable on a wide basket of financial instruments**.

The **profit factor** for the instruments included in the portfolio using the highest MAR is presented below.



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

Instrument Performance Summary													
Symbol	Wins	%	Losses	%	Trades	Win Months	%	Loss Months	%	Avg. Win %	Avg. Loss %	Avg. Trade %	% Profit Factor
C	18	23.7%	58	76.3%	76	189	58.3%	135	41.7%	1.37%	0.26%	0.12%	1.62
CC	11	11.3%	86	88.7%	97	175	54.0%	149	46.0%	5.50%	0.27%	0.39%	2.62
CFI	11	23.4%	36	76.6%	47	239	73.8%	85	26.2%	3.30%	0.26%	0.57%	3.91
CL	13	14.3%	78	85.7%	91	181	55.9%	143	44.1%	2.06%	0.26%	0.07%	1.31
CT	15	18.5%	66	81.5%	81	172	53.1%	152	46.9%	2.25%	0.27%	0.19%	1.87
DX	15	18.1%	68	81.9%	83	179	55.2%	145	44.8%	2.95%	0.26%	0.32%	2.49
EBL	13	18.8%	56	81.2%	69	197	60.8%	127	39.2%	2.19%	0.25%	0.21%	2.00
ES	15	22.7%	51	77.3%	66	199	61.4%	125	38.6%	2.08%	0.25%	0.28%	2.43
FDX	12	15.8%	64	84.2%	76	191	59.0%	133	41.0%	1.86%	0.26%	0.08%	1.35
FLG	21	25.9%	60	74.1%	81	177	54.6%	147	45.4%	0.95%	0.26%	0.05%	1.26
GC	14	13.9%	87	86.1%	101	165	50.9%	159	49.1%	1.79%	0.27%	0.02%	1.08
HG	15	16.7%	75	83.3%	90	169	52.2%	155	47.8%	1.90%	0.25%	0.11%	1.53
HSI	17	20.7%	65	79.3%	82	180	55.6%	144	44.4%	1.93%	0.28%	0.18%	1.83
KC	11	11.8%	82	88.2%	93	186	57.4%	138	42.6%	1.83%	0.27%	-0.02%	0.92
LCO	14	15.4%	77	84.6%	91	181	55.9%	143	44.1%	2.78%	0.26%	0.21%	1.93
LGO	12	14.3%	72	85.7%	84	178	54.9%	146	45.1%	3.95%	0.27%	0.33%	2.40
NG	12	17.1%	58	82.9%	70	185	57.1%	139	42.9%	2.18%	0.26%	0.16%	1.74
NIY	8	9.9%	73	90.1%	81	212	65.4%	112	34.6%	3.02%	0.28%	0.05%	1.20
NQ	15	22.1%	53	77.9%	68	196	60.5%	128	39.5%	1.59%	0.26%	0.15%	1.73
OJ	13	19.4%	54	80.6%	67	199	61.4%	125	38.6%	2.94%	0.27%	0.36%	2.67
PA	13	24.1%	41	75.9%	54	221	68.2%	103	31.8%	2.06%	0.27%	0.29%	2.43
S	17	21.2%	63	78.8%	80	183	56.5%	141	43.5%	1.64%	0.26%	0.15%	1.73
SB	17	21.0%	64	79.0%	81	186	57.4%	138	42.6%	1.73%	0.26%	0.16%	1.75
TY	14	20.6%	54	79.4%	68	182	56.2%	142	43.8%	2.16%	0.25%	0.24%	2.22
W	13	14.3%	78	85.7%	91	181	55.9%	143	44.1%	1.16%	0.26%	-0.06%	0.75

The profit factor for the instruments included in the portfolio **using the lowest MAR** is presented below.

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



Instrument Performance Summary													
Symbol	Wins	%	Losses	%	Trades	Win Months	%	Loss Months	%	Avg. Win %	Avg. Loss %	Avg. Trade %	% Profit Factor
C	5	16.1%	26	83.9%	31	268	82.7%	56	17.3%	0.62%	0.25%	-0.11%	0.47
CC	6	16.7%	30	83.3%	36	261	80.6%	63	19.4%	3.80%	0.27%	0.41%	2.80
CFI	6	27.3%	16	72.7%	22	286	88.3%	38	11.7%	1.83%	0.26%	0.31%	2.67
CL	4	20.0%	16	80.0%	20	288	88.9%	36	11.1%	1.70%	0.25%	0.14%	1.67
CT	6	20.7%	23	79.3%	29	275	84.9%	49	15.1%	2.39%	0.27%	0.28%	2.28
DX	9	31.0%	20	69.0%	29	262	80.9%	62	19.1%	1.37%	0.25%	0.26%	2.51
EBL	3	13.0%	20	87.0%	23	286	88.3%	38	11.7%	0.36%	0.25%	-0.17%	0.22
ES	3	17.6%	14	82.4%	17	290	89.5%	34	10.5%	1.58%	0.25%	0.08%	1.37
FDX	6	30.0%	14	70.0%	20	288	88.9%	36	11.1%	0.66%	0.25%	0.02%	1.13
FLG	4	11.1%	32	88.9%	36	268	82.7%	56	17.3%	0.35%	0.24%	-0.17%	0.18
GC	5	17.9%	23	82.1%	28	278	85.8%	46	14.2%	1.81%	0.25%	0.12%	1.56
HG	5	17.9%	23	82.1%	28	279	86.1%	45	13.9%	1.38%	0.25%	0.04%	1.18
HSI	12	32.4%	25	67.6%	37	255	78.7%	69	21.3%	0.90%	0.26%	0.11%	1.64
KC	7	15.6%	38	84.4%	45	246	75.9%	78	24.1%	1.24%	0.27%	-0.03%	0.86
LCO	7	26.9%	19	73.1%	26	274	84.6%	50	15.4%	1.90%	0.25%	0.33%	2.76
LGO	7	21.9%	25	78.1%	32	265	81.8%	59	18.2%	0.92%	0.26%	-0.00%	0.98
NG	3	13.6%	19	86.4%	22	290	89.5%	34	10.5%	1.04%	0.27%	-0.09%	0.62
NIY	6	23.1%	20	76.9%	26	275	84.9%	49	15.1%	1.51%	0.26%	0.15%	1.76
NQ	2	25.0%	6	75.0%	8	310	95.7%	14	4.3%	0.72%	0.26%	-0.01%	0.93
OJ	5	13.5%	32	86.5%	37	261	80.6%	63	19.4%	1.68%	0.26%	0.01%	1.03
PA	3	13.6%	19	86.4%	22	283	87.3%	41	12.7%	1.59%	0.27%	-0.02%	0.93
S	7	17.5%	33	82.5%	40	255	78.7%	69	21.3%	1.67%	0.25%	0.08%	1.40
SB	7	21.9%	25	78.1%	32	268	82.7%	56	17.3%	1.20%	0.26%	0.06%	1.27
TY	8	27.6%	21	72.4%	29	273	84.3%	51	15.7%	0.77%	0.25%	0.03%	1.18
W	4	16.7%	20	83.3%	24	283	87.3%	41	12.7%	0.64%	0.25%	-0.10%	0.51

For our tested strategy:

- the portfolio with the highest MAR (obtained on IS data) has a percentage of instruments with profit factor > 1 at the level of 92%.
- the portfolio with the lowest MAR (obtained on IS data) has a percentage of instruments with profit factor > 1 at the level of 64%.

Thus, the test of the stability of the strategy on the portfolio of financial instruments was not passed, because the portfolio with the lowest MAR (obtained on IS data) has the percentage of instruments with profit factor > 1 below the acceptable level of 70%.

6. Money Management (Position Sizing)

The step was skipped due to failure of previous tests.

7. Strategy Risk Management

The step was skipped due to failure of previous tests.



Step 5: Walk-Forward Analysis

The step was skipped due to failure of previous tests.



Step 6: Using the strategy in real time

The step was skipped due to failure of previous tests.