ATR Ignition v.1

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.**

The strategy parameters were optimized using **The Grid Search technique.** Although **the strategy results on in-sample data are acceptable, the strategy failed the stability test in a wide range of optimized parameters.** This means that the strategy loses its profitability when tests are performed on suboptimal parameters. 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.

Contents

Step 1: Formulate an investment strategy

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.**

For the purposes of the test, the daily volatility of financial instruments was used, analysing the moments when **the price breaks above or below the last close by a value equal to a multiple of the ATR (e.g. 150%).**

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;
- **Mechanism of closing a position** when a signal of the opposite position appears.

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).
- **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.1 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.
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. **Set both pending orders (buy stop/sell stop).** If one order is activated, the other is canceled.
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:
    - The stop loss will be activated, or
    - There will be an opposite signal (e.g. a long position is opened and the price drops below the new sell stop level → a new short position is opened, the old one is closed).
5. **Daily Monitoring –** every day:
    - Calculate ATR and update order activation levels based on last close.
    - 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 is 1.0% of total capital.**

Step 3: Conduct a preliminary test of the investment strategy

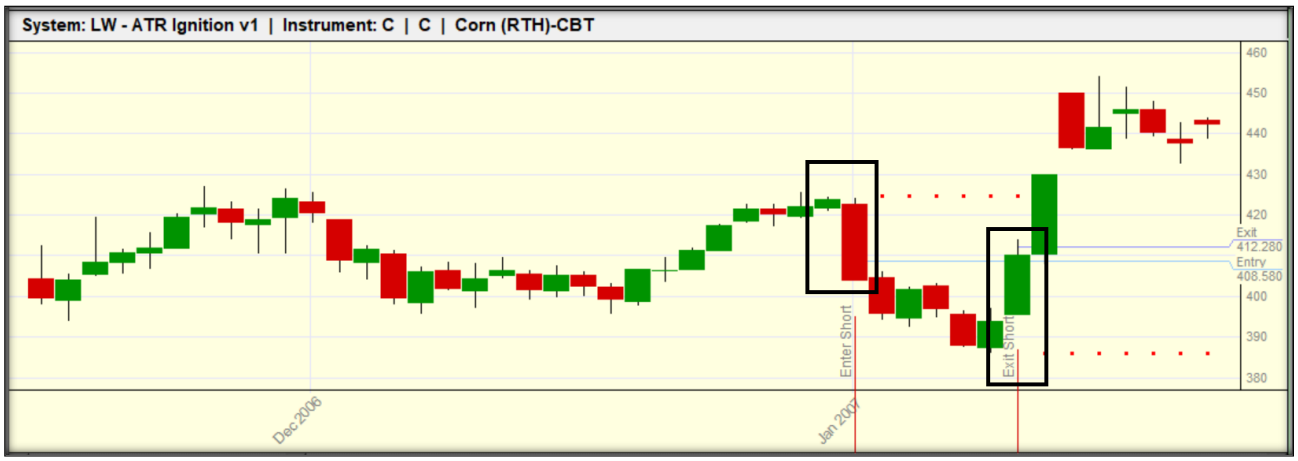
Below are some purchase and sale transactions that allow you to verify the following aspects:

- **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 corn futures contract. At the end of January 2007 (first candle in the rectangle on the left), **the ATR(20) volatility was $7.385, the closing price that day was $423.75, and we set the ATR multiplier at 200%.** So the next day we set a buy stop order **at $438.52** (423.75 + 200% x 7.385) and **a sell stop at $408.98** (423.75 + 200% x 7.385). **The sell stop order was executed** (second candle in the rectangle on the left), and a short position was opened (taking into account slippage, the execution price was $408.58). **The stop loss** (red steps) **was set a tick above the high candle from the day before the position was opened.**

It should be remembered that **when we have a short position, we set a buy stop order every day, 200% ATR away from the last closing price,** which is both a trailing defensive order/take profit (along with a standing stop loss order), as well as a signal to reverse the position. **Such an order was activated a few days after the position was opened** (candle in the rectangle on the right), not only closing the short position, but also **reversing it to a long position.** The stop loss for this position was set a tick below the low of the candle preceding the opening of the long position. **The system worked correctly.**



We can follow the further behavior of the long position, which gained value very quickly. It should be remembered that **with a long position, we set a sell stop order every day, 200% ATR away from the last closing price,** which is both a trailing defensive order/take profit (along with the permanent stop loss order), as well as a signal to reverse the position. **Such an order was activated at the end of March 2007** (candle in the rectangle on the right), not only closing the long position, but also **reversing it to a short position. 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 **the basic parameters,** which, on the one hand, should correspond to the assumed goals of the strategy, and on the other hand, be consistent with those **proposed by the creator of the strategy, i.e. Larry Connors.**

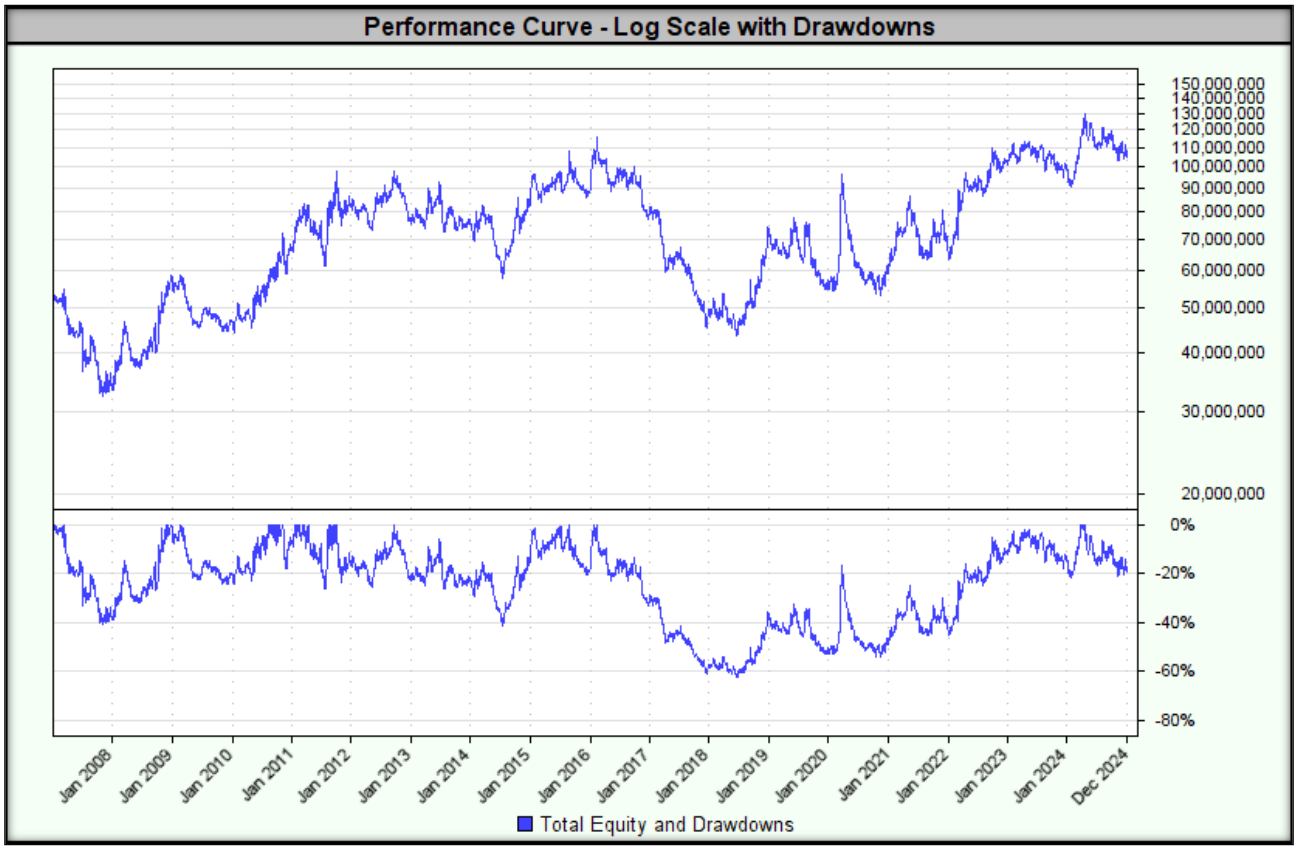
First of all, **we reject strategies that linearly lose capital.** If a strategy exhibits such a pattern, it is a clear signal that any parameter optimization does not make sense.

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:** 200% ATR;
- **ATR lengths:** 20 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;
- **How to open a position:** buy stop/sell stop order;
- **Position size:** corresponding to a risk of 1.0% of total capital;
- **Position direction:** long (buy) and short (sell) positions.

The test result is shown below.



Indicators/Measures	Concluding a transaction at the opening price
CAGR%	4.4%
MAR Ratio	0.07
RAR%	3.5%
R-Cubed	0.03
Robust Sharpe Ratio	0.13
Max Drawdown	62.4%
Wins	27.1%
Losses	72.9%
Average Win%	3.02%
Average Loss%	1.00%
Win/Loss Ratio	3.04
Average Trade Duration (days)	72
Percent Profit Factor	1.13
SQN	0.29
Number of transactions	1413

In summary, the system works properly and generates signals as expected. Additionally, tests on basic parameters have yielded satisfactory 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.1 strategy in this version assumes **the optimization of parameters proposed by the creator of the strategy - Larry Connors.** We will optimize using **The Grid Search method,** which consists in **full optimization of all indicated 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:

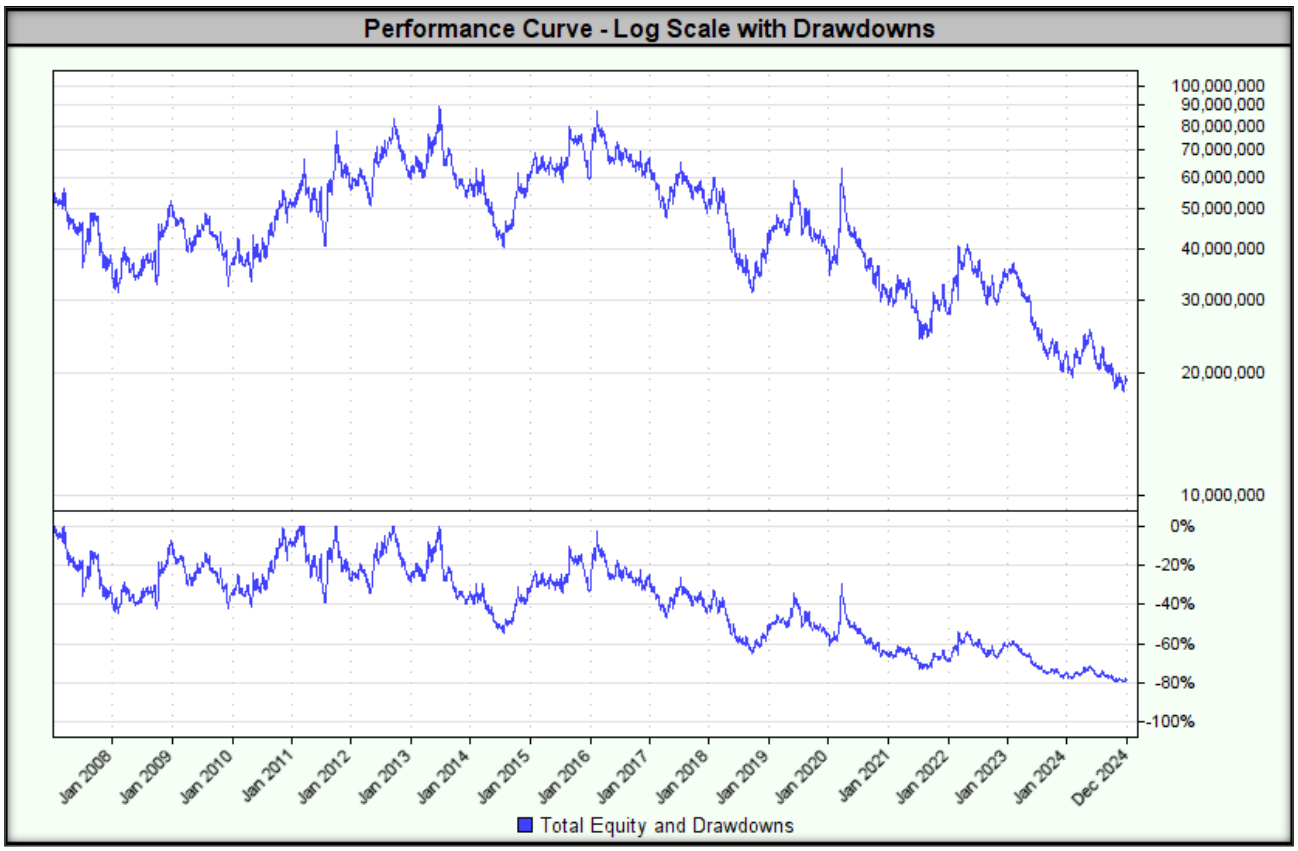
- **Distance of buy/sell order from last closing price:** range **150%-250% ATR (step: 5 pp);**
- **ATR lengths:** range **15-25 days (step: 1).**

The lowest MAR value of -0.07 was achieved for the following parameters:

- **Distance of buy/sell order from last closing price:** 160%;
- **ATR lengths:** 24 days.

Test	ATR Bars	ATR Multiplier (%)	End Balance	CAGR%	MAR	Sharpe	Ann. Sharpe	Max TE DD	Longest DD	Trades	R3	RAR [%]	%PF	Expectancy
192	24	160%	$19,164,656.09	-5.19%	-0.07	0.00	-0.24	79.8%	138.3	3520	-0.02	-3.15	0.99	-0.01
213	25	160%	$18,962,765.39	-5.24%	-0.06	-0.00	-0.25	80.9%	138.3	3515	-0.02	-3.00	0.99	-0.01
85	19	150%	$19,254,029.47	-5.16%	-0.06	0.02	-0.20	80.7%	158.9	4481	-0.02	-2.91	1.00	-0.00
64	18	150%	$19,889,082.92	-4.99%	-0.06	0.02	-0.18	81.5%	158.9	4487	-0.02	-2.80	1.00	-0.00
127	21	150%	$22,372,727.00	-4.37%	-0.06	0.04	-0.18	74.9%	158.9	4442	-0.02	-1.92	1.01	0.00
148	22	150%	$23,293,526.53	-4.16%	-0.06	0.05	-0.17	73.5%	158.9	4445	-0.01	-1.86	1.01	0.00
43	17	150%	$22,104,662.93	-4.43%	-0.06	0.03	-0.15	79.3%	158.9	4493	-0.02	-2.44	1.00	0.00
128	21	155%	$21,862,249.96	-4.49%	-0.06	0.03	-0.20	80.4%	158.9	3928	-0.03	-4.34	1.00	-0.00
149	22	155%	$21,988,096.90	-4.46%	-0.06	0.03	-0.20	80.1%	158.9	3926	-0.03	-4.45	1.00	-0.00
107	20	155%	$21,540,926.24	-4.57%	-0.06	0.03	-0.19	82.2%	158.9	3953	-0.03	-4.55	1.00	-0.00
231	25	250%	$24,050,441.94	-3.98%	-0.06	-0.13	-0.26	72.1%	158.9	538	-0.07	-5.60	0.88	-0.10

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



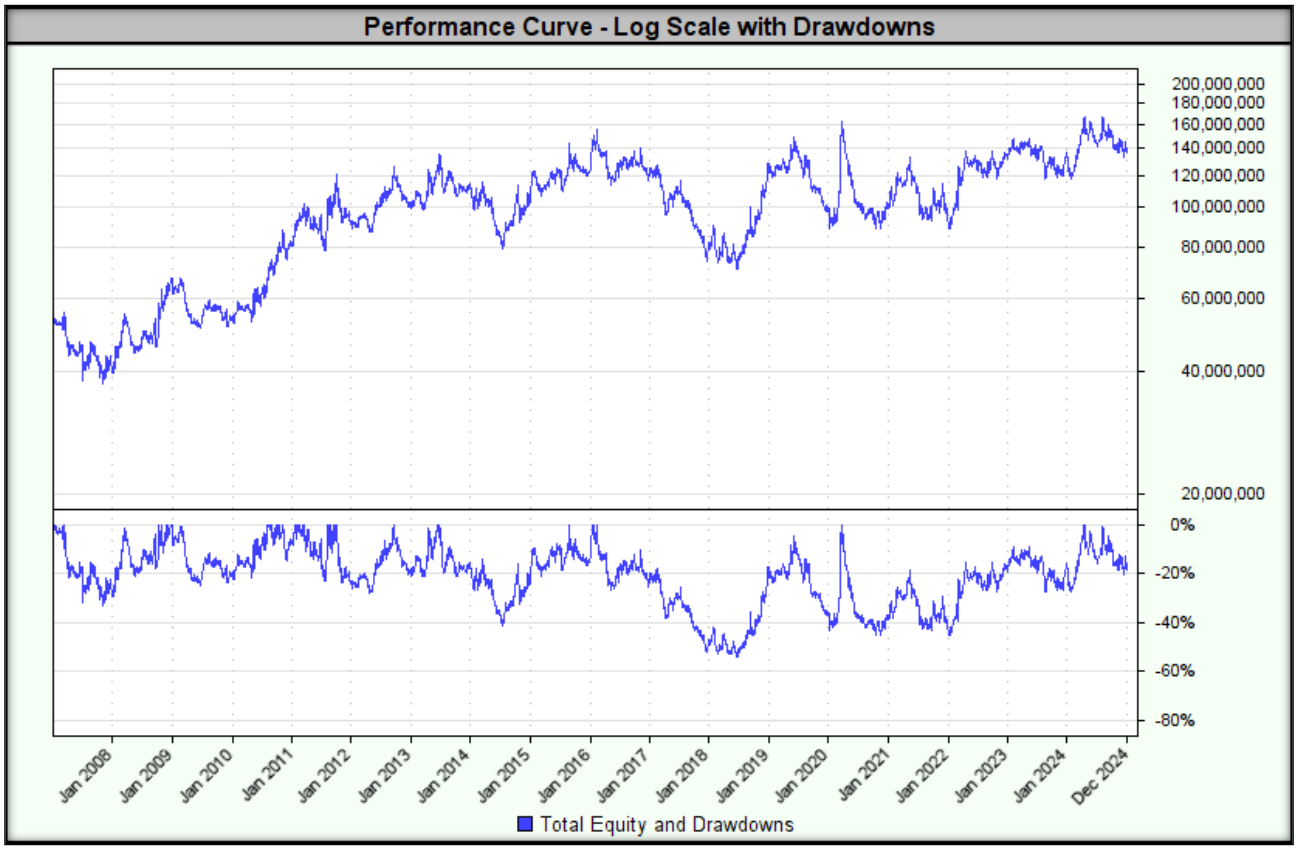
The highest MAR value of 0.11 was achieved for the following parameters:

- **Distance of buy/sell order from last closing price:** 190%;
- **ATR lengths:** 18 days.

The highest MAR value was accompanied by **a drawdown of 54.3%.**

Test	ATR Bars	ATR Multiplier (%)	End Balance	CAGR%	MAR	Sharpe	Ann. Sharpe	Max TE DD	Longest DD	Trades	R3	RAR [%]	%PF	Expectancy
72	18	190%	$139,783,101.30	5.88%	0.11	0.34	0.22	54.3%	49.1	1770	0.05	5.38	1.13	0.09
51	17	190%	$144,395,361.26	6.07%	0.11	0.35	0.23	56.9%	98.0	1772	0.06	6.03	1.13	0.09
93	19	190%	$121,365,975.66	5.05%	0.09	0.31	0.18	53.3%	57.3	1760	0.04	4.62	1.11	0.08
158	22	200%	$128,598,463.47	5.39%	0.09	0.32	0.18	59.1%	97.3	1421	0.04	4.56	1.15	0.11
115	20	195%	$121,953,648.35	5.08%	0.09	0.31	0.17	56.8%	49.1	1591	0.04	4.46	1.12	0.09
94	19	195%	$118,254,699.36	4.90%	0.09	0.31	0.16	57.1%	49.2	1586	0.04	4.48	1.13	0.09
137	21	200%	$121,880,014.59	5.08%	0.08	0.31	0.17	61.0%	98.0	1421	0.04	4.04	1.14	0.10
30	16	190%	$113,544,186.41	4.66%	0.08	0.30	0.17	56.2%	57.3	1775	0.04	4.99	1.11	0.08
179	23	200%	$117,371,638.72	4.86%	0.08	0.31	0.17	59.2%	106.6	1422	0.04	4.28	1.14	0.10
11	15	200%	$120,289,128.35	5.00%	0.08	0.31	0.16	61.5%	106.6	1441	0.04	3.90	1.14	0.10
32	16	200%	$110,482,068.81	4.50%	0.08	0.29	0.15	56.4%	97.9	1440	0.04	3.99	1.13	0.09

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 84.6%!**

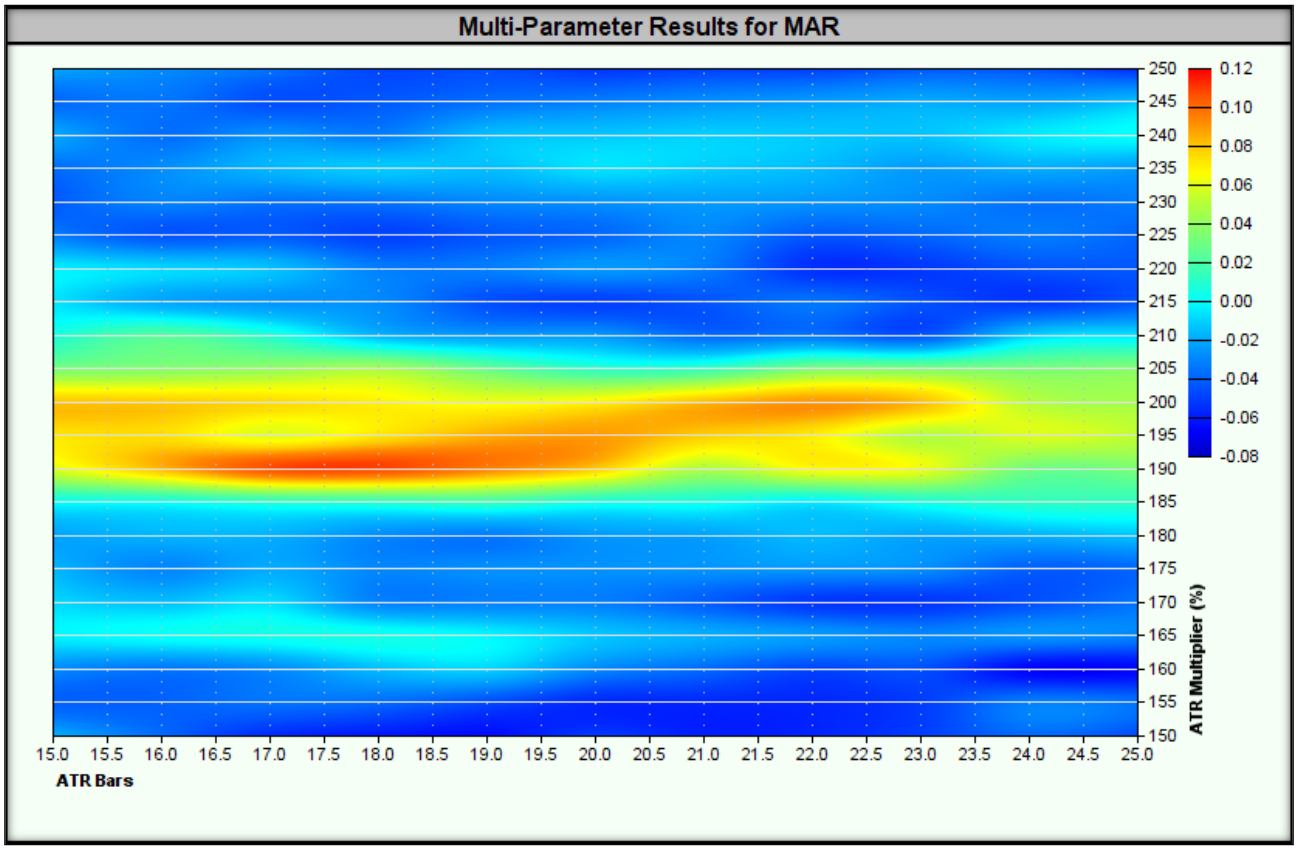
Test	ATR Bars	ATR Multiplier (%)	End Balance	CAGR%	MAR	Sharpe	Ann. Sharpe	Max TE DD	Longest DD	Trades	R3	RAR [%]	%PF	Expectancy
91	19	180%	$30,183,942.12	-2.77%	-0.03	0.04	-0.11	84.6%	106.6	2230	-0.01	-1.80	1.01	0.01
89	19	170%	$31,601,978.15	-2.52%	-0.03	0.07	-0.08	83.2%	106.6	2806	-0.01	-1.46	1.01	0.01
7	15	180%	$36,312,257.47	-1.76%	-0.02	0.08	-0.07	83.1%	106.6	2253	-0.01	-2.00	1.03	0.02
70	18	180%	$32,879,557.55	-2.30%	-0.03	0.06	-0.09	82.9%	106.6	2239	-0.01	-1.70	1.02	0.01
107	20	155%	$21,540,926.24	-4.57%	-0.06	0.03	-0.19	82.2%	158.9	3953	-0.03	-4.55	1.00	-0.00
112	20	180%	$34,937,126.20	-1.97%	-0.02	0.07	-0.08	82.0%	106.6	2215	-0.01	-0.84	1.02	0.01
69	18	175%	$32,485,010.62	-2.37%	-0.03	0.06	-0.08	81.8%	106.6	2503	-0.02	-2.32	1.02	0.01
64	18	150%	$19,889,082.92	-4.99%	-0.06	0.02	-0.18	81.5%	158.9	4487	-0.02	-2.80	1.00	-0.00
133	21	180%	$36,236,940.85	-1.77%	-0.02	0.07	-0.07	81.5%	106.6	2203	-0.01	-0.72	1.03	0.02
28	16	180%	$39,327,634.38	-1.33%	-0.02	0.10	-0.05	81.5%	106.6	2256	-0.01	-1.66	1.04	0.02
175	23	180%	$37,018,407.20	-1.66%	-0.02	0.07	-0.06	81.3%	106.6	2193	0.00	0.14	1.02	0.01

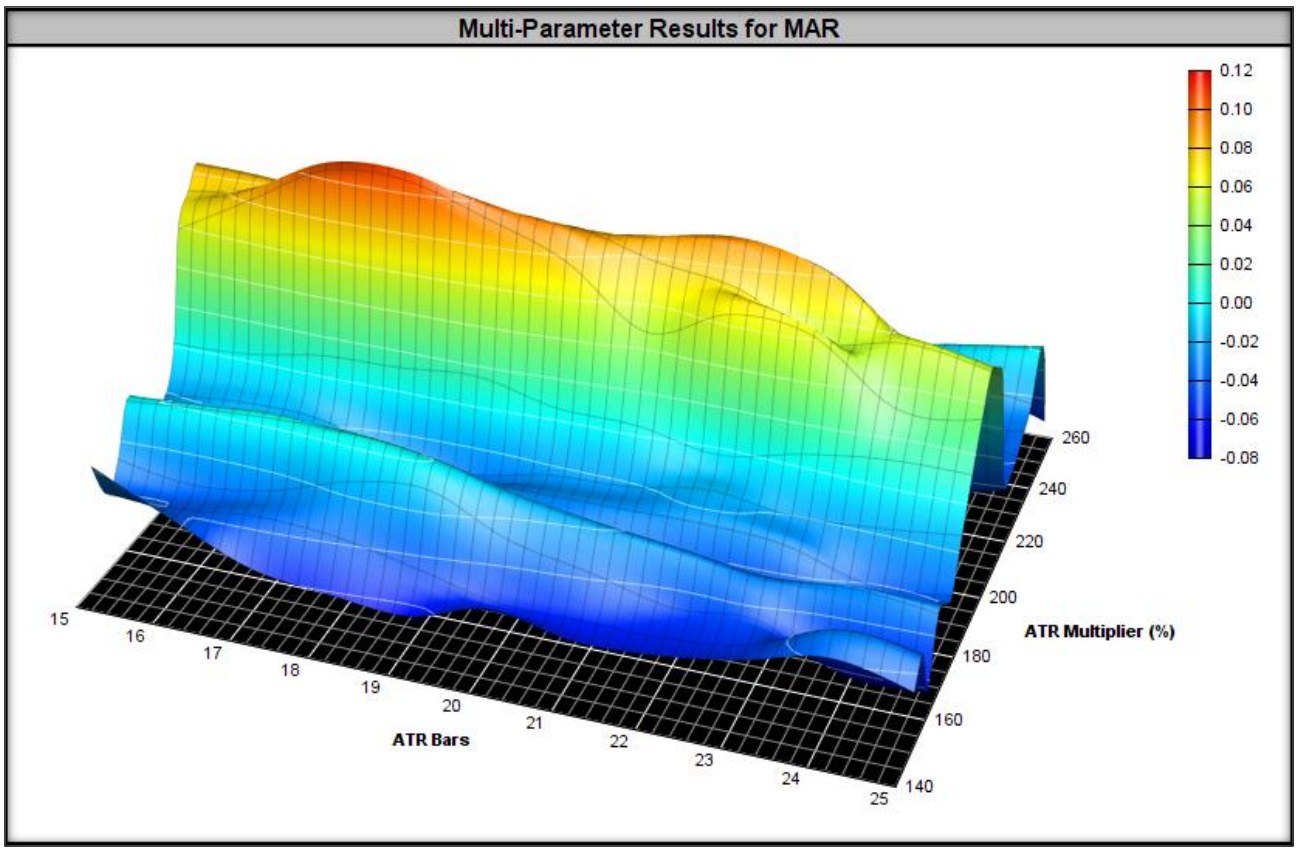
In summary, the strategy **failed the stability test** over a wide range of optimized parameters because:

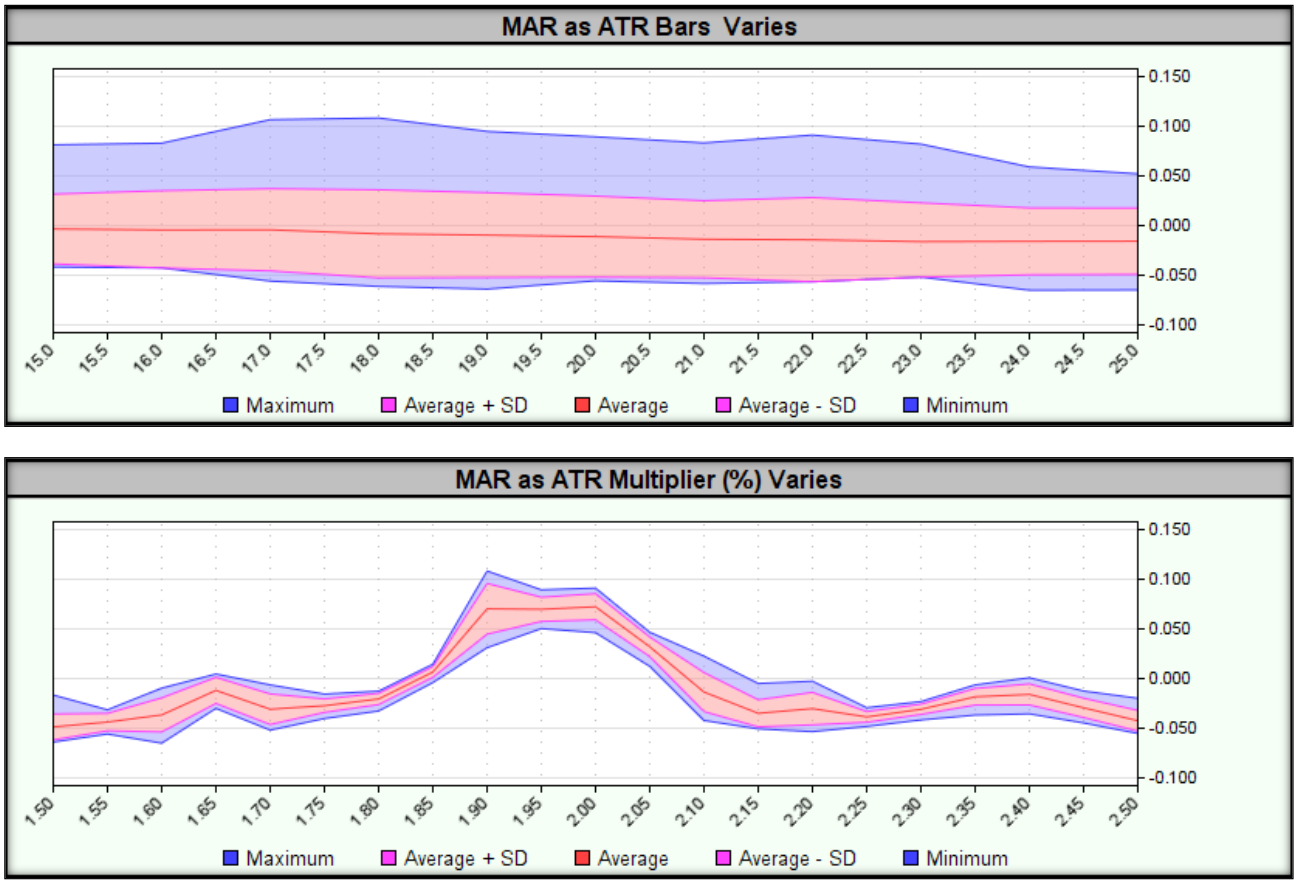
- **Not all test results showed a positive MAR value** – which indicates the instability of the strategy in different market conditions.

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

Heatmaps for the tested ranges are presented below.


Multi-Parameter Results for MAR
ATR Bars
ATR Multiplier (%)
15.0 15.5 16.0 16.5 17.0 17.5 18.0 18.5 19.0 19.5 20.0 20.5 21.0 21.5 22.0 22.5 23.0 23.5 24.0 24.5 25.0
150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250
0.12 0.10 0.08 0.06 0.04 0.02 0.00 -0.02 -0.04 -0.06 -0.08


Multi-Parameter Results for MAR
ATR Bars
ATR Multiplier (%)
15 16 17 18 19 20 21 22 23 24 25
140 160 180 200 220 240 260
0.12 0.10 0.08 0.06 0.04 0.02 0.00 -0.02 -0.04 -0.06 -0.08



2. **Monte Carlo simulation**

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

3. **Stability over a moving time window**

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

4. **Long/short stability**

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

5. **Stability in the portfolio of financial instruments**

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

6. **Money Management (Position Sizing)**

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

7. **Strategy Risk Management**

This step was skipped 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 under real market conditions.** It provides **reliable measures of reward and risk** after the optimization process and allows us 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 a more **reliable and realistic measure 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, which helps **minimize 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)**.
    - In this step, parameters are adjusted 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 whether a strategy has the potential to perform under real market conditions. WFE compares:

- **The rate of return achieved in the in-sample window** (where parameters were optimized)
- **The rate of return in the out-of-sample window** (where the strategy was operating 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 outside 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 skipped due to **failure of previous stability tests.**

Step 6: Using the strategy in real time

After **extensive testing, implementing a real-time** trading strategy becomes **relatively easy. Buy/sell signals and stop-loss orders are generated automatically** 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 is necessary to check **whether it really adds value** to the results of the entire portfolio. It does not make sense to implement a strategy that **generates similar signals** or **is characterized by a similar course of the equity curve.**

Key criteria for evaluating the strategy 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 of them are met** or **none of them are met.**

Once you decide to add a strategy to your portfolio, **the question arises:** *Should you implement your strategy right away 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 identify **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 a level of about half of the maximum drawdown** observed in historical data. **Only after reaching this threshold 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 to fully implement it 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.