Project Y: Technical Report & Validation

[Chart Description] Difference between Step Level H/L (Blue) and Close (Green).

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2. The Laboratory: Confirming the Theory

Before writing the execution code, we spent months in Pine Script and Excel testing hypotheses.

We started by formulating several hypotheses: Can our "Step Level" provide a significant advantage (Edge) on any of the steps over a long distance, giving us a trading advantage?

The Results:

Index	Total_48m	Expand_48m	Total_60m	Expand_60m
1	110768	52.3	138146	52.4
2	57912	50.3	72412	50.3
3	29109	49.1	36434	49.2
4	14282	48.7	17909	48.9
5	6962	48.0	8758	48.1
6	3343	47.5	4212	48.2
7	1588	49.9	2032	47.7
8	792	43.8	970	43.0
9	347	51.6	417	49.9
10	179	46.9	208	46.6

As seen, the advantage of trend continuation versus reversal is at parity for the last steps, but we cannot trust the latter due to a much smaller sample size and frequency compared to the main mass.

However, we keep this in mind. By changing the structure method from **Close** to **High/Low**, the result is as follows:

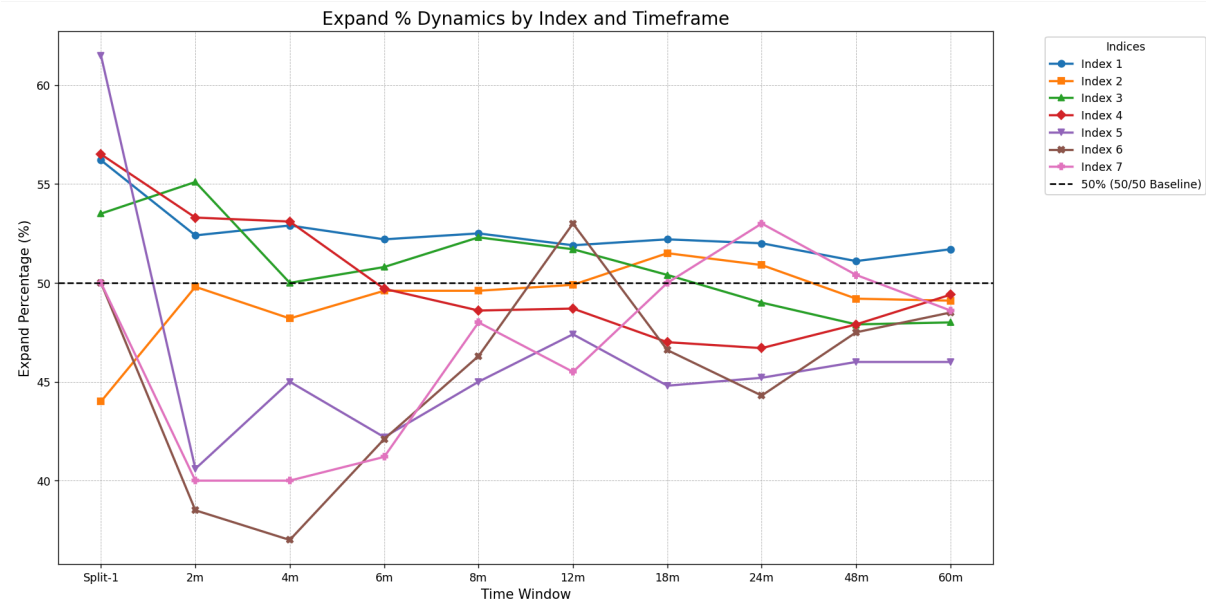
Total_48m	Expand_48m	Total_60m	Expand_60m
57751	50.2	71718	50.1
28963	49.2	35947	49.5
14259	48.6	17774	48.6
6927	48.8	8642	48.4
3383	48.3	4179	48.1
1633	46.2	2009	46.3
755	48.5	930	47.0
366	47.0	437	46.9
172	54.7	205	52.7

The deviation increases slightly, but globally, it remains the same. Therefore, we change `RESET_THRESHOLD = 3`, thereby smoothing out the "hysteria" (erratic nature) of trend changes:

Index	Total_24m	Expand_24m	Total_48m	Expand_48m	Total_60m	Expand_60m
1	2434	50.4	4849	50.1	5957	49.9
2	6621	50.2	13159	50.0	16262	50.1
3	12073	49.7	23867	49.5	29698	49.7
4	8943	50.4	17715	50.0	22111	50.0
5	6821	51.1	13257	50.0	16531	50.0
6	5261	50.8	10038	50.7	12584	51.1
7	3985	50.5	7722	50.6	9696	50.1
8	3094	52.1	5959	50.3	7412	50.3
9	2398	49.4	4469	49.0	5557	48.9
10	1804	50.3	3343	50.0	4160	50.1
11	1381	50.0	2533	49.4	3141	49.0
12	1028	48.5	1859	48.1	2271	47.6
13	738	50.4	1360	50.6	1657	50.5
14	552	51.8	1007	48.9	1229	48.5
15	434	51.8	751	51.1	890	49.6
16	333	51.4	590	50.7	680	51.6
17	256	52.7	456	49.6	533	49.9
18	198	52.0	320	46.2	379	46.4
19	150	55.3	219	53.4	262	52.7
20	125	55.2	173	53.2	206	52.4

These are general tables for an array of instruments. We can take individual assets, and the situation will be approximately the same. It does not matter if we separate individual steps or simply take a binary grid (we have experiments for this too), or if we look at Continuation vs. Reversal or Long vs. Short.

The results converge to one thing: A global balance, regardless of the angle or projection.



However... here we prove that in the end, we still reduce to a normal distribution. Moreover, the longer the timeframe, the tighter we fit into the 50% range.

Rolling Window Analysis: But if we look at it through the lens of a **rolling window**:

Index	Tot_M-1	Exp_M-1	Tot_M-2	Exp_M-2	Tot_M-3	Exp_M-3	Tot_M-4	Exp_M-4	Tot_M-5	Exp_M-5	Tot_M-6	Exp_M-6	Tot_M-7	Exp_M-7	Tot_M-8	Exp_M-8
1	6	66.7	2	50.0	8	50.0	8	37.5	8	62.5	5	80.0	10	70.0	9	33.3
2	20	45.0	17	64.7	19	52.6	22	54.5	26	53.8	18	55.6	29	51.7	17	35.3
3	40	52.5	33	48.5	27	37.0	30	33.3	41	43.9	32	53.1	42	47.6	36	52.8
4	29	48.3	23	52.2	18	66.7	17	64.7	24	33.3	21	52.4	23	43.5	25	36.0

For individual months, interesting deviations from the normal distribution begin to appear.

Next, we decided to focus exclusively on **Binary Classification**, with two types:

1. **Long / Short**
2. **Continuation / Reversal**

We assign them values of **1** or **0** respectively. This can be visualized on a chart:

- **Red-Green Line:** Long/Short
- **Orange-Purple Line:** Continuation/Reversal per period.

- **Blue Line:** The Step Level itself (Period = 10 in this example).

Out of curiosity, I built a small analyzer for patterns of various lengths to see if any regularity was hidden there. The results are as follows: In this updated file (48 months), the situation is much more interesting and statistically significant.

🏆 Top Patterns (>52% Edge)*:*

Type	Pattern	Edge (%)	Prediction	Count
Behavior	(1, 1, 1, 1, 1, 1)	**58.60%**	**CONTINUATION**	37,370
Direction	(1, 1, 1, 1, 1, 1)	**57.45%**	**LONG** 🚀	36,280
Behavior	(1, 1, 1, 1, 1)	**56.18%**	**CONTINUATION**	66,520
Direction	(1, 1, 1, 1, 1)	**55.86%**	**LONG** 🚀	64,953

Direction	(0, 0, 0, 0, 0, 0)	**54.64%**	**SHORT** 📉	30,225
Behavior	(1, 1, 1, 1)	**54.42%**	**CONTINUATION**	122,231
Direction	(1, 1, 1, 1)	**54.16%**	**LONG** 🚀	119,931
Direction	(0, 1, 1, 1, 1, 1)	**53.84%**	**LONG** 🚀	28,673
Behavior	(0, 1, 1, 1, 1, 1)	**53.08%**	**CONTINUATION**	29,150

TOP-10 Most Frequent Patterns These are the combinations that occur most often in the market. Note: the most popular are short patterns (4 steps), which is logical.

Патерн	**Тип**	**Опис**	**Edge**	**Частота**
(1, 1, 1, 1)	BEH	CONTINUATION	**54.42%**	**7.18%**
(1, 1, 1, 1)	DIR	LONG	**54.16%**	**7.05%**
(1, 0, 1, 1)	BEH	CONTINUATION	50.87%	6.56%
(1, 1, 0, 1)	BEH	CONTINUATION	50.73%	6.55%
(0, 0, 0, 0)	DIR	SHORT	51.54%	6.53%

TOP-10 Rarest Patterns These are long (6 steps) and specific combinations. They occur rarely (1.3% - 1.4%), but often possess a higher Edge.

Патерн	Тип	Опис	Edge	Частота
(0, 0, 0, 0, 0, 0)	BEH	CONTINUATION	51.95%	1.29%
(0, 1, 0, 1, 0, 1)	DIR	LONG	51.91%	1.34%
(1, 0, 1, 0, 1, 0)	DIR	SHORT	52.20%	1.36%
(0, 0, 0, 0, 0, 1)	BEH	CONTINUATION	50.69%	1.40%
(1, 0, 0, 0, 0, 0)	BEH	CONTINUATION	52.14%	1.40%

Machine Learning Validation (Status: Paused)

We tried adding many features and applying ML models, but so far without success. **Validation for BTCUSDT successfully completed!**

FINAL VALIDATION SUMMARY (Period: 2025-09-25 00:00:00 - 2025-10-25 00:00:00)

Model	Accuracy	Precision (UP)	Recall (UP)	F1-score (UP)	Precision (DOWN)	Recall (DOWN)
LightGBM	0.5000	0.5113	0.4892	0.5000	0.4892	0.5113
CatBoost	0.4978	0.5090	0.4892	0.4989	0.4870	0.5068
SVC	0.4956	0.5072	0.4589	0.4818	0.4856	0.5339
AdaBoost	0.4867	0.4985	0.7229	0.5901	0.4530	0.2398

RandomForest 0.4867 0.4982 0.6104 0.5486
0.4675 0.3575
Transformer 0.4823 0.4922 0.4113 0.4481 0.4749
0.5566
LogisticRegression 0.4779 0.4913 0.6104 0.5444
0.4545 0.3394
LDA 0.4779 0.4909 0.5844 0.5336 0.4576
0.3665
LSTM 0.4757 0.4891 0.5844 0.5325 0.4545
0.3620

F1-score (DOWN) Num_Predictions
Model
LightGBM 0.5000 452
CatBoost 0.4967 452
SVC 0.5086 452
AdaBoost 0.3136 452
RandomForest 0.4051 452
Transformer 0.5125 452
LogisticRegression 0.3886 452
LDA 0.4070 452
LSTM 0.4030 452
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The real results were:
Forecast accuracy report for ETHUSDT**
Model | Winrate |%

AdaBoost | 28/53 | 52.8
CatBoost | 25/53 | 47.2
LDA | 27/53 | 50.9
LightGBM | 24/53 | 45.3
LogisticRegression | 27/53 | 50.9
RandomForest | 27/53 | 50.9
SVC | 24/53 | 45.3

General | 25/49 | 51.0
```

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Forecast accuracy report for BNBUSDT**
Model | Winrate |%

AdaBoost | 23/48 | 47.9
CatBoost | 25/48 | 52.1
LDA | 24/48 | 50.0
LightGBM | 27/48 | 56.2
LogisticRegression | 25/48 | 52.1
RandomForest | 24/48 | 50.0
SVC | 26/48 | 54.2

General | 24/45 | 53.3

Conclusion on ML: Since the results were hovering around parity, the decision was made to temporarily set aside ML to prepare the data more thoroughly and classify it more strictly

The Pivot: Statistical Deviation Strategy

What we derived from our experiments: If the market is balanced in all planes over a long distance, trading it in one direction always results in a net 0 (excluding commissions).

However, this balance is smoothed by time and the number of step changes. Therefore, in certain intervals, there may be deviations from 0 to 100% in certain directions.

The Next Step: Building a model that works on the principle of a **Trigger**. We wait for a strong deviation from the norm (e.g., 0-30% or 70-100%). Then, we engage trading exclusively **counter-trend** until we reach a statistical advantage!

We expect a series that should end with 1 or 2 positive trades. If we accept that 1 is a (+) trade and 0 is a (-) trade, the series looks like: `0/1/0/1/1/1` or `1/0/1/1/0/1/0/1/1`, etc..

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LAST 100 STEPS SEQUENCE

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DIRECTION (1=UP, 0=DOWN):

1100100100100011001010011100110011111000110000101110100010010001001111000011011100001110100001111001

BEHAVIOR (1=CONT, 0=REV):

0101001001001101010000101101010101111011010111000110001100100110010111011010011011101100011101110 10

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STATISTICS COMPARISON

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METRIC | GLOBAL (All Time) | LOCAL (Last 100)

LONG % | 50.0 % | 47.0 %

CONTINUATION % | 49.4 % | 53.0 %

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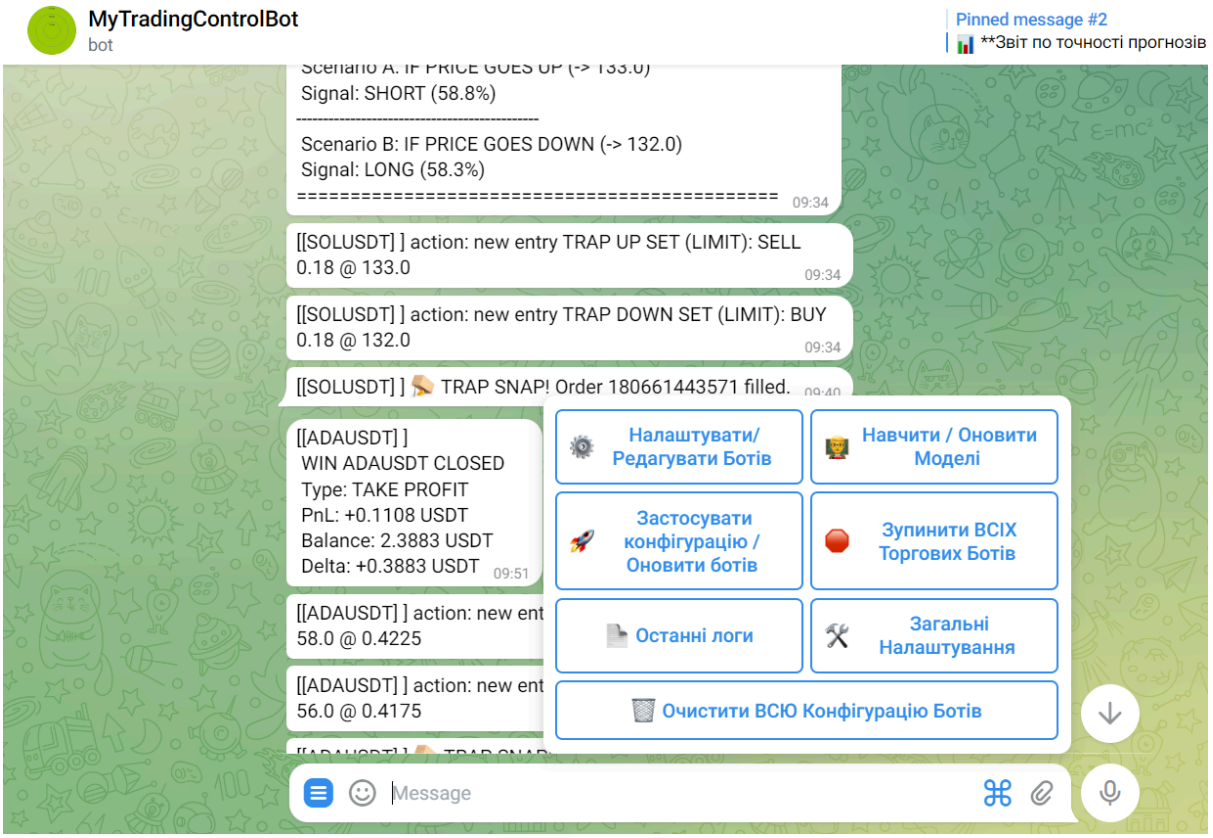
We then turn it off until a new series appears. What does this give us? A version of "doubling" from Game Theory.

Note on Multi-Asset Correlation: Currently, we are looking at step changes in several planes, but we are not yet touching the topic of multi-asset correlation. This is intentional—firstly, it is a colossal amount of work and data. (Although I have an idea to create an analyzer that takes a stack of assets, determines the most correlated ones, identifies leaders and laggards, calculates relative strength, and waits for a signal from the leaders to enter on the laggards. I just haven't gotten around to it due to lack of time). Secondly, the goal was to find a minimal advantage in a **single asset** first, and then scale.

Telegram Management & Streak Analysis



We decided to verify the theory on **Streaks** (series of identical patterns) for **REVERSAL** and behavior respectively.

Probability of closing a series in PLUS (+1) when betting on REVERSAL (0):

Series 1 (Trigger)	Number of signals	1 step (instant)	<= 3 steps	<= 5 steps	<= 10 steps(TOTAL)
Streak 1	4994	49.7%	62.4%	69.1%	**76.1%**
Streak 2	2512	48.9%	62.0%	69.3%	**76.3%**
Streak 3	1283	47.8%	61.7%	68.7%	**75.8%**
Streak 4	670	47.3%	61.9%	69.3%	**75.7%**
Streak 5	353	47.9%	60.9%	66.9%	**73.7%**
Streak 6	184	44.6%	57.1%	63.0%	**70.1%**
Streak 7	102	**42.2%**	**54.9%**	**59.8%**	**68.6%**
Streak 8	59	45.8%	59.3%	62.7%	**71.2%**

behavior (Bet on TREND after CHOP)

Series 1 (Trigger)	Number of signals	1 step (instant)	<= 3 steps	<= 5 steps	<= 10 steps(TOTAL)
Streak 1 (0)	4993	49.7%	62.4%	69.2%	**76.5%**
Streak 2 (00)	2510	**51.1%**	63.9%	70.8%	**78.1%**
Streak 3 (000)	1228	**52.4%**	65.3%	72.1%	**79.9%**
Streak 4 (0000)	584	**55.0%**	65.4%	72.3%	**80.7%**
Streak 5 (00000)	263	49.4%	61.6%	70.0%	**79.5%**
Streak 6 (000000)	133	**51.1%**	63.1%	72.9%	**85.7%**
Streak 7 (0000000)	65	**56.9%**	69.2%	78.5%	**92.3%**
Streak 8 (00000000)	28	**57.1%**	75.0%	85.7%	**96.4%**

Laboratory: Rolling Window Optimization

We built a "Laboratory"—a rolling window analyzer with the following parameters:

- `OPT_WIN_RANGE`: Range (3, 31)

- `OPT_LOOK_RANGE`: Range (1, 11)
- `OPT_MIN_TRADES`: 500

We fed it 60 months of history. Here are the results:

```
================================================================================
🏆 BEST INDIVIDUAL PARAMETERS (PER COIN)
================================================================================
  Symbol  Window  Lookahead Thresholds Net Edge  Trades
 BTCUSDT      10          3       8/2    16.2%     582
 ETHUSDT      22         10      14/8    20.7%     540
 SOLUSDT      27          7      18/9    10.5%     583
 XRPUSDT      18          9      12/6    11.3%     778
 BNBUSDT       8          3       7/1     8.5%     516
DOGEUSDT      10          7       8/2     4.9%     690
 ADAUSDT       7          7       6/1     8.7%     835
 TRXUSDT       5         10       4/1     2.4%    1625
AVAXUSDT      21          9      14/7    12.7%     653
LINKUSDT      22          7      15/7    17.2%     565
 DOTUSDT      28          5     18/10    13.4%     640
 LTCUSDT      14          3      11/3    12.5%     530
 BCHUSDT       4          7       4/0     5.3%     965
ATOMUSDT       5          3       5/0     9.6%     664
 UNIUSDT      24          9      16/8     6.0%     619
 XLMUSDT       6          5       5/1     2.5%    1542
 ETCUSDT      10          7       8/2     7.2%     746
 FILUSDT       8          3       7/1    12.4%     566
NEARUSDT      16          7      11/5    12.0%     914
 ARBUSDT       6          7       5/1    12.0%     732
  OPUSDT      23          9      15/8    13.9%     567
 SUIUSDT       7          7       4/3    11.6%    1384
 APTUSDT      15          9       9/6    11.4%    1169
 INJUSDT       9          9       7/2    13.7%     554
RNDRUSDT       3          7       3/0     9.6%     606
 WIFUSDT       4          1       4/0     8.1%     903
 FETUSDT      20          3      14/6     5.1%     567

================================================================================
🌍 UNIVERSAL BEST CONFIGURATION (PORTFOLIO WIDE)
```

```
================================================================================
 Window  Lookahead  Up_T  Dn_T  Total Trades  Avg Win%  Avg Loss%  Portfolio Edge
   16.0        7.0  11.0   5.0       20184.0      52.2       47.8          4.4

👇 BREAKDOWN FOR UNIVERSAL BEST: Window=16, Look=7, Thresh=11/5
--------------------------------------------------------------------------------
  Symbol  Trades  Win%  Edge
 BTCUSDT     598 55.5% 11.0%
 ETHUSDT     551 56.1% 12.2%
 SOLUSDT    1145 54.4%  8.8%
 XRPUSDT     846 55.3% 10.6%
 BNBUSDT     776 50.5%  1.0%
DOGEUSDT    1030 50.4%  0.8%
 ADAUSDT     954 50.4%  0.8%
 TRXUSDT    1081 46.6% -6.8%
AVAXUSDT     921 54.4%  8.8%
LINKUSDT     981 56.5% 12.9%
 DOTUSDT     681 55.7% 11.3%
 LTCUSDT     981 54.0%  8.1%
 BCHUSDT     853 48.4% -3.2%
ATOMUSDT     918 49.2% -1.5%
 UNIUSDT    1091 51.1%  2.3%
 XLMUSDT     978 46.7% -6.5%
 ETCUSDT    1124 52.4%  4.8%
 FILUSDT     798 54.3%  8.5%
NEARUSDT     914 56.0% 12.0%
 ARBUSDT     513 52.0%  4.1%
  OPUSDT     730 51.8%  3.6%
 APTUSDT     576 50.0%  0.0%
 INJUSDT     570 52.5%  4.9%
 FETUSDT     574 51.7%  3.5%

================================================================================

✅ Analysis Complete. Check GLOBAL_REPORT.txt
```

Refining the Portfolio: However, a certain number of assets fell out that almost negated our advantage—so we removed them and repeated the analysis

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🏆 BEST INDIVIDUAL PARAMETERS (PER COIN)
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Symbol	Window	Lookahead	Thresholds	Net Edge	Trades
BTCUSDT	16	7	11/5	20.8%	538
ETHUSDT	18	9	12/6	14.5%	524
SOLUSDT	19	7	13/6	14.0%	858
XRPUSDT	14	7	10/4	8.9%	771
AVAXUSDT	13	5	10/3	11.9%	520
LINKUSDT	18	3	13/5	13.0%	784
DOTUSDT	21	5	14/7	14.7%	696
LTCUSDT	14	3	11/3	10.5%	563
ATOMUSDT	4	9	4/0	12.4%	1000
FILUSDT	10	7	8/2	13.1%	525
NEARUSDT	5	7	5/0	10.1%	596
ARBUSDT	6	7	5/1	12.0%	732
OPUSDT	23	9	15/8	13.9%	567
SUIUSDT	7	7	4/3	11.5%	1387
APTUSDT	15	9	9/6	11.4%	1169
INJUSDT	9	9	7/2	13.7%	554
RNDRUSDT	3	7	3/0	9.6%	606

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🌍 UNIVERSAL BEST CONFIGURATION (PORTFOLIO WIDE)
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Window	Lookahead	Up_T	Dn_T	Total Trades	Avg Win%	Avg Loss%	Portfolio Edge
20.0	7.0	13.0	7.0	14022.0	53.8	46.2	7.6

👇 BREAKDOWN FOR UNIVERSAL BEST: Window=20, Look=7, Thresh=13/7

Symbol	Trades	Win%	Edge
BTCUSDT	654	58.9%	17.7%
ETHUSDT	643	56.6%	13.2%
SOLUSDT	1285	56.0%	12.1%
XRPUSDT	970	52.1%	4.1%
AVAXUSDT	1104	53.2%	6.3%
LINKUSDT	1122	52.3%	4.6%
DOTUSDT	773	56.0%	12.0%
LTCUSDT	1155	53.4%	6.8%

ATOMUSDT 1080 51.7% 3.3%
FILUSDT 910 55.4% 10.8%
NEARUSDT 1065 53.1% 6.1%
ARBUSDT 571 51.1% 2.3%
OPUSDT 834 53.8% 7.7%
SUIUSDT 522 52.1% 4.2%
APTUSDT 665 52.6% 5.3%
INJUSDT 669 52.9% 5.8%

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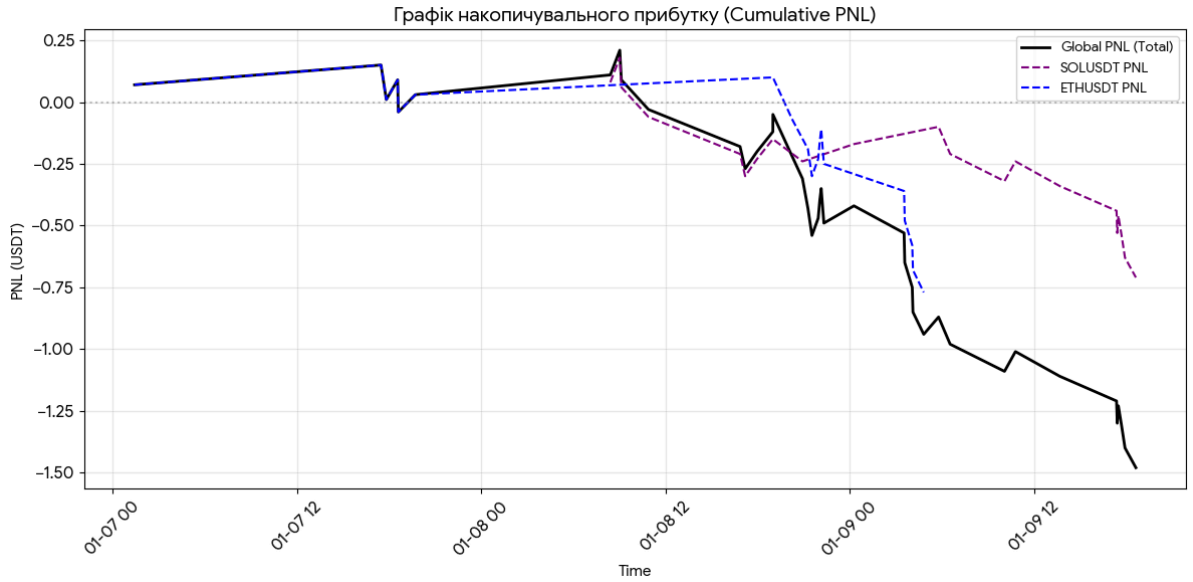
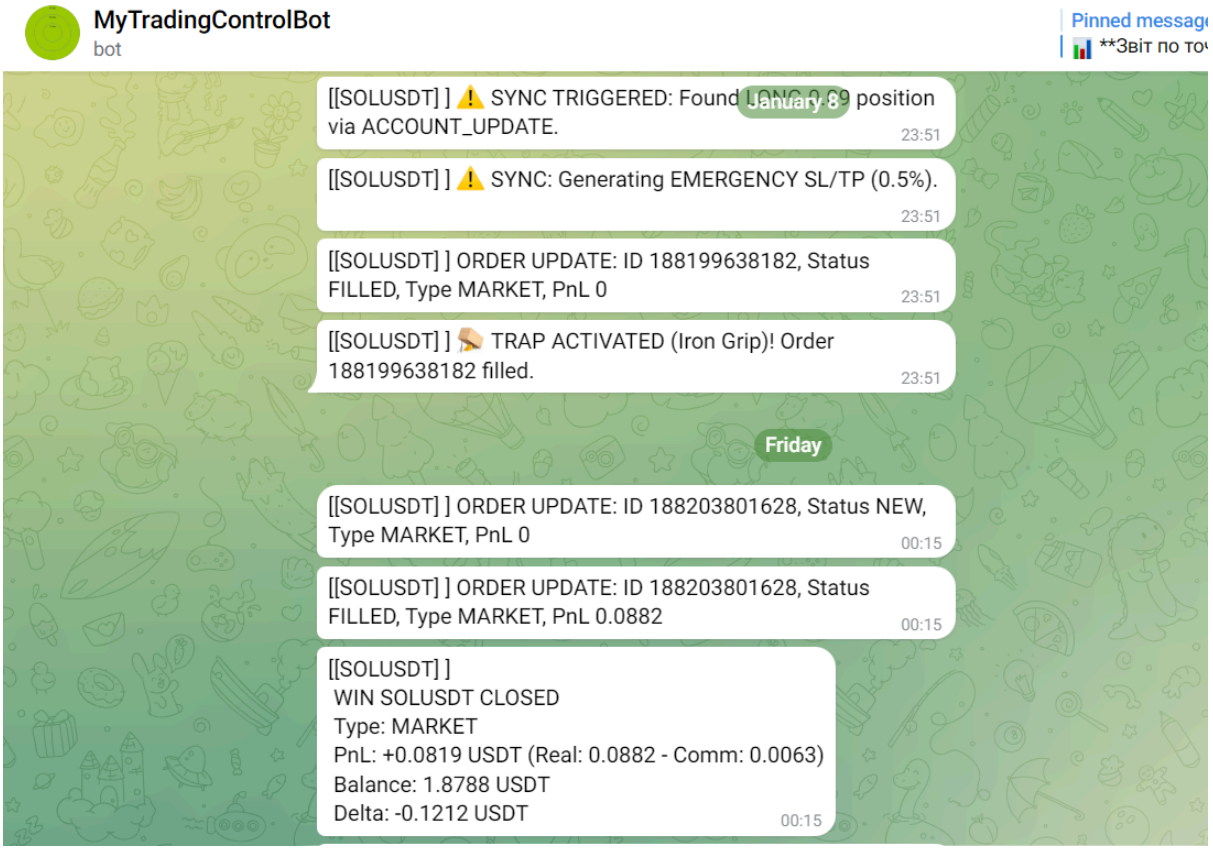
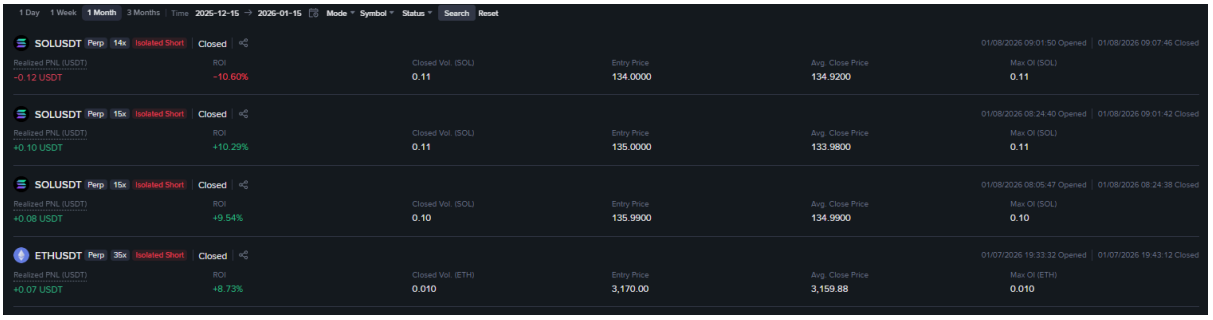
✅ Analysis Complete. Check GLOBAL_REPORT.txt

The live testing phase was of limited duration.



The operation was automatically suspended by the bot’s circuit breaker mechanism, triggered to prevent capital drawdown beyond acceptable limits.





The results are inconclusive. The experiment was conducted with a strict 1:1 PnL (Risk/Reward) ratio to ensure data integrity, and the Win Rate proved to be highly path-dependent based on the series sequence. Furthermore, utilizing a High/Low-based step level introduced several critical challenges:

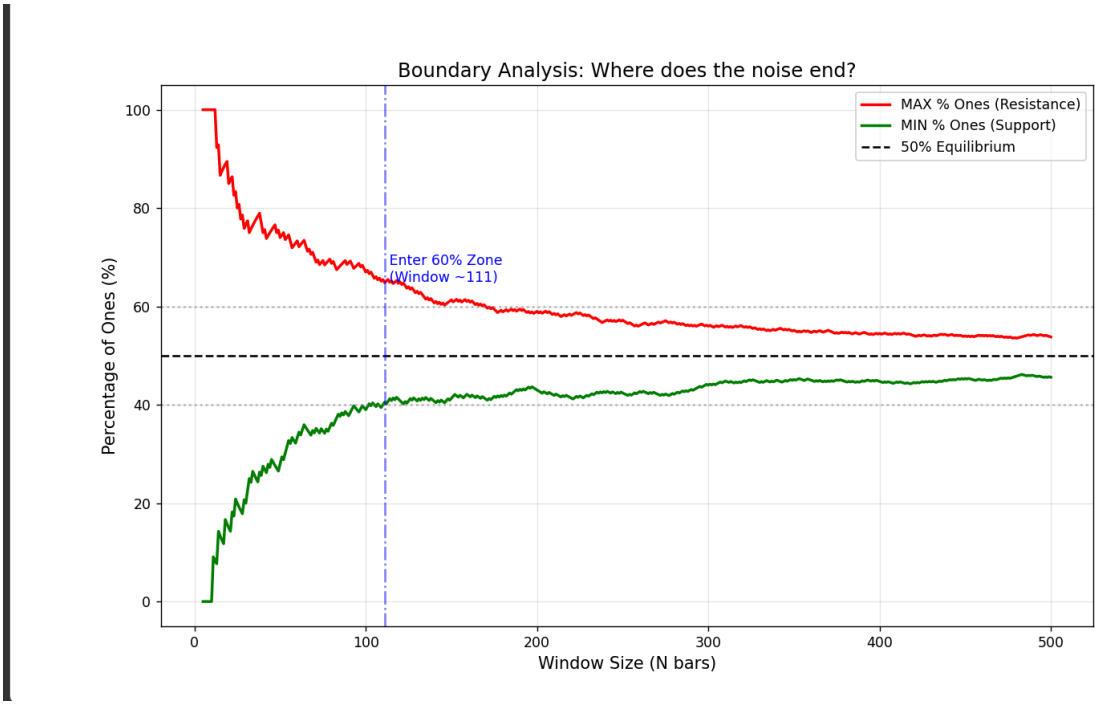
- **Liquidity & Execution:** We encountered a lack of liquidity, even with minimal position sizes. Price wicks caused significant execution issues—orders were frequently skipped. Instead of the target sequence of 7 steps, the system consistently achieved only 3 to 6 steps.
- **Fee Structure:** Operating on a standard exchange tier creates a mathematical disadvantage. For every 7–10 trades, an additional winning trade is required solely to cover the commission costs (breakeven friction).

- **Time Horizon:** The testing window was insufficient (spanning only a few days) with a fine-grained step grid. Validating these results requires a longer timeframe, which is contingent upon refining the Step Level calculation logic.

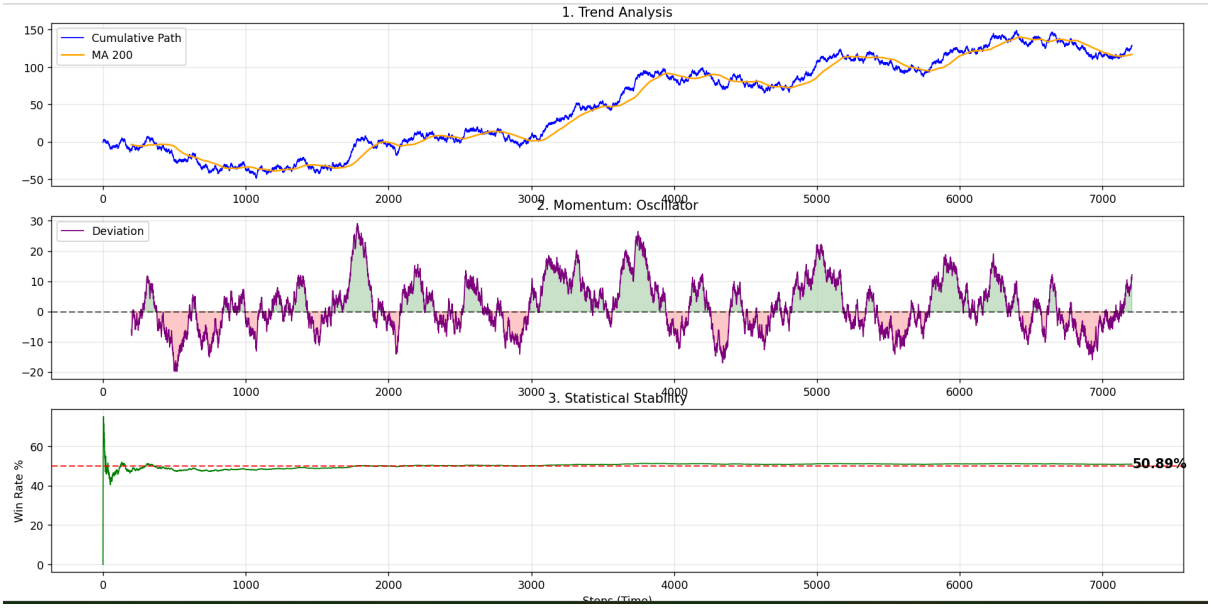
Using Close prices proved ineffective due to market noise and wick volatility, even at lower timeframes. High-Frequency Trading (HFT) is currently technically unfeasible.

More importantly, I maintain a deep skepticism regarding historical parameter optimization—I consider curve-fitting to be a dead end. Consequently, I have paused operations to re-evaluate the core approach, specifically focusing on implementing a dynamic window or an alternative decision-making governance model.

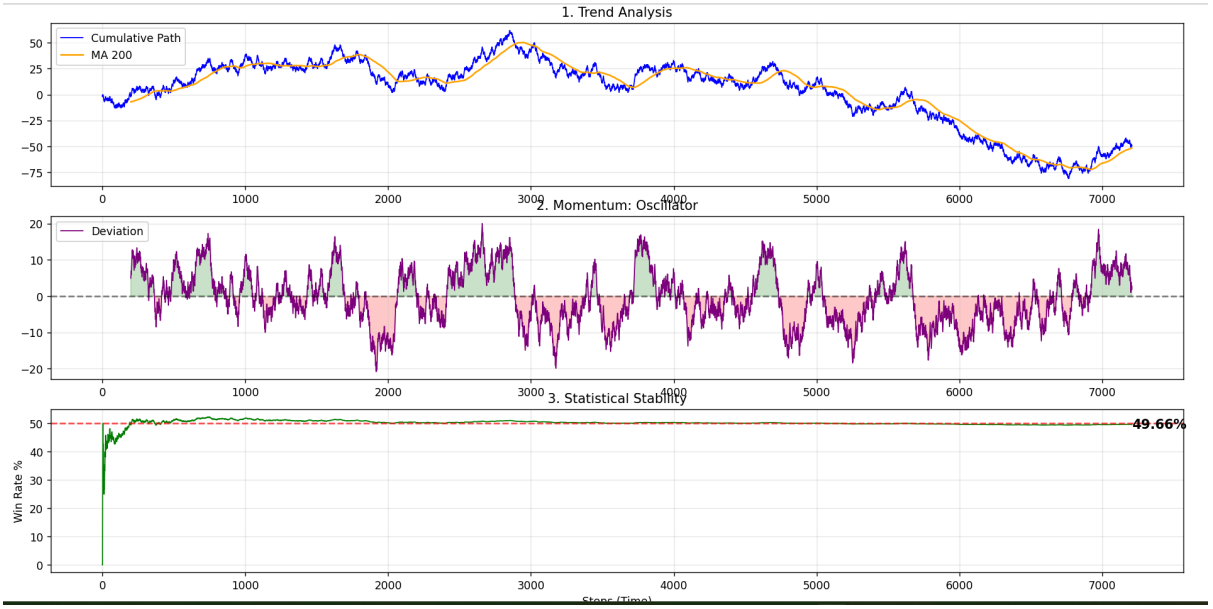
We attempted to calibrate the optimal window size—seeking a range that eliminates binary noise (extreme jumps between 0 and 100 series) while preserving a dominant directional advantage.



If we construct a pure Directional Graph and analyze its deviation (essentially, an adapted form of Renko charting)



Transitioning the dataset from 'Trend' to 'Behavior' fundamentally alters the analysis. Extensive testing indicates that the **Behavior Series** is statistically much cleaner than the Trend Series, suggesting that a tangible Edge (Alpha) can be extracted from this data structure.



We conducted brief experiments feeding isolated series into Machine Learning models (specifically Random Forest). The result was consistent with expectations: performance was inferior to random chance, confirming the limitations of standard ML on this market microstructure.

At this stage, the project has been paused for strategic reassessment.

Current Status

The primary motivation behind releasing this documentation is the critical necessity to determine a definitive path forward. Currently, the geopolitical and military landscape severely restricts local opportunities for further development.

The statement that 'any day could be the last' is neither a figure of speech nor an attempt to solicit emotion—it is a literal operational reality. Ballistic missile strikes have impacted the immediate 0.5 km radius of my workspace on more than six occasions, including a direct hit on a residential property just three streets away. This is in addition to the incessant threat of drone activity.

Therefore, my objective is twofold:

1. **Preservation:** To formally archive and document the R&D results achieved to date.
2. **External Catalyst:** I am seeking a 'boost' from the professional community. Whether in the form of rigorous critique, strategic guidance, or technical advice—I would be profoundly grateful for any feedback, regardless of how negative or critical it may be.