

Quantitative Winning

An Algorithmic Trading Approach Towards The Markets For Superior Risk
Adjusted Returns.

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Quantitative Analyst and Algorithmic Trader

Algorithmic Trading

Algorithmic trading is any form of trading where all decision making for placing trades, risk management and position sizing is executed by a computer. The logic for the decision making can either be programmed by a quantitative analyst or learned by the computer by training it over a large dataset. It is also called rule-based trading as the logic has repeatability and no subjectivity of conventional technical/fundamental analysis.

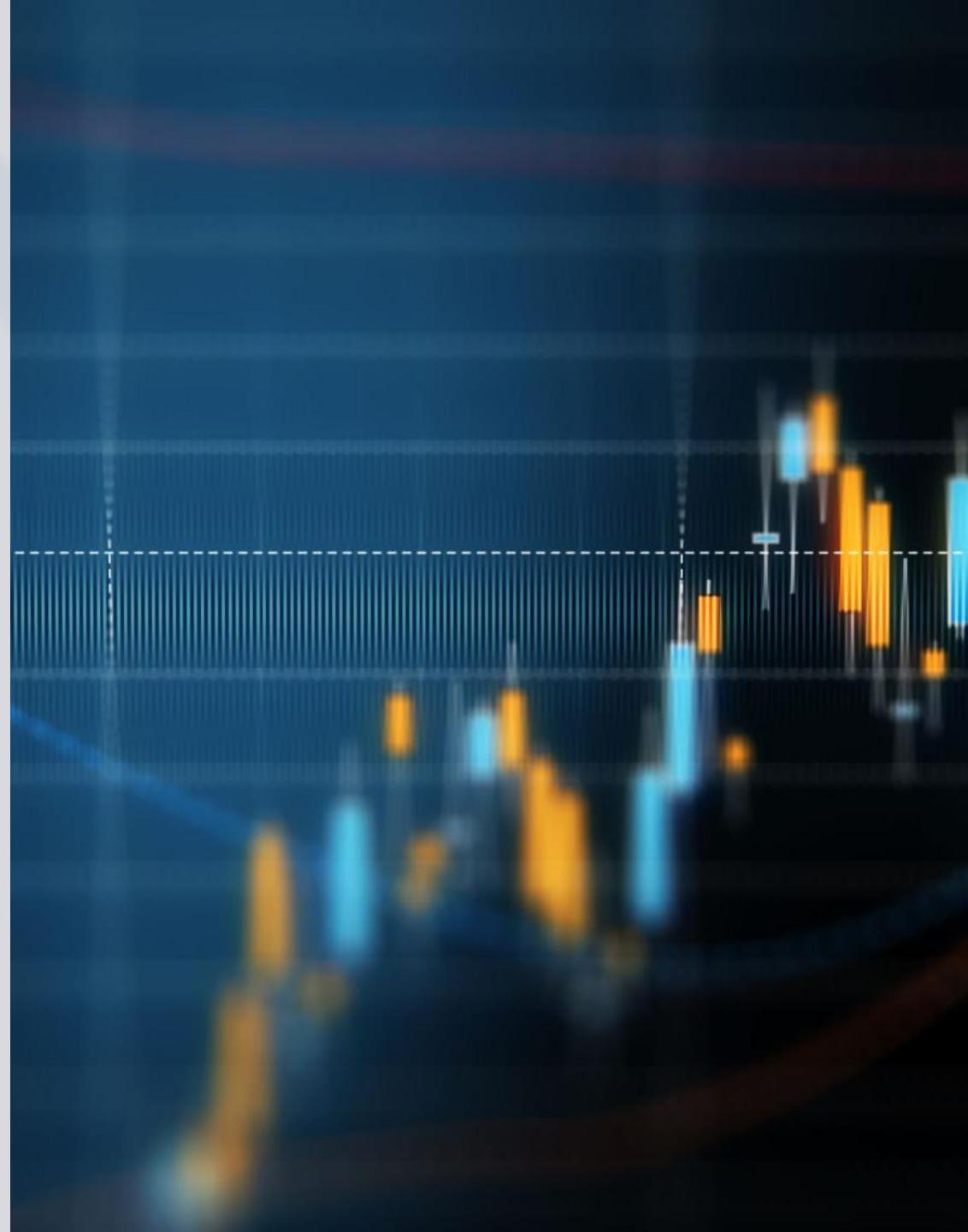
Advantages Of Algorithmic Trading

- The biggest advantage that algo-trading possesses over conventional trading is that there is zero involvement of human emotions such as fear and greed that makes trading so difficult
- Since the rules are fixed, the logic can be tested over a large time horizon to see how the algorithm would have performed in the past. Based on this test, a quantitative analyst can assess the effectiveness of the decision making process to see if money would have been made historically and get key metrics. This process is called "Back-Testing"



Advantages Of Algorithmic Trading

- If the back-test satisfies the requirements of the analyst, the algo can be tested with live market data to check against deviations between past and expected results. This is called "Forward Testing"
- The superior computing power of modern computers give algo-traders instant order executions, minimal delay and error free order placement
- 80% of all trading activity in US Markets is algorithmically driven



The Trading Edge And Why It Is Important

- Making money in the markets consistently is a two-dimensional game of win-rate and risk-reward
- A coin toss (probability 50%) if accompanied by a profit of Rs.1000 when right and a loss of Rs 1000 when wrong would yield a near zero gain after a 1000-coin tosses
- The same coin if accompanied by a profit of Rs. 1500 when right and a loss of Rs. 1000 when wrong would be very profitable after a 1000-coin tosses. Here the Risk Reward = $1.5:1 = 1.5$
- Thus, a Trading Edge can be mathematically represented as -
- $(\text{Probability of being right} * \text{Avg. profit}) - (\text{Probability of being wrong} * \text{Avg. loss})$
- Algorithmic Trading is all about finding an edge in the markets which has occurred historically for a long period of time and is taken forward to live markets on the assumption that the edge will exist in the future as well



Key Metrics Of An Algorithmic Trading Strategy

- Cumulative PNL - Sum of all profits and losses
- ROI - Return On Investment (Cumulative PNL/Initial Investment)
- Drawdown - The maximum dip in account value after a bad run relative to the highest value the account reached (valley to peak) or initial starting capital (valley to base). Lower numbers signify a smooth happy growth in account value with minimal bumps and superior risk adjusted returns.
- Win Rate - Probability of being profitable in a trade



Key Metrics Of An Algorithmic Trading Strategy

- Average Loss
- Max Profit
- Max Loss
- Skew Of Returns – Tendency of the returns to cluster on either side of 0. A higher positive value is preferred as it illustrates the asymmetrical nature of returns which gives the algorithm its edge



Key Metrics Of An Algorithmic Trading Strategy

- Profit Factor - Sum of all profits generated by the strategy / Sum of all losses incurred by the strategy. Higher values are preferred
- Average PNL - Average Profit or Loss of A Trade
- Average Profit

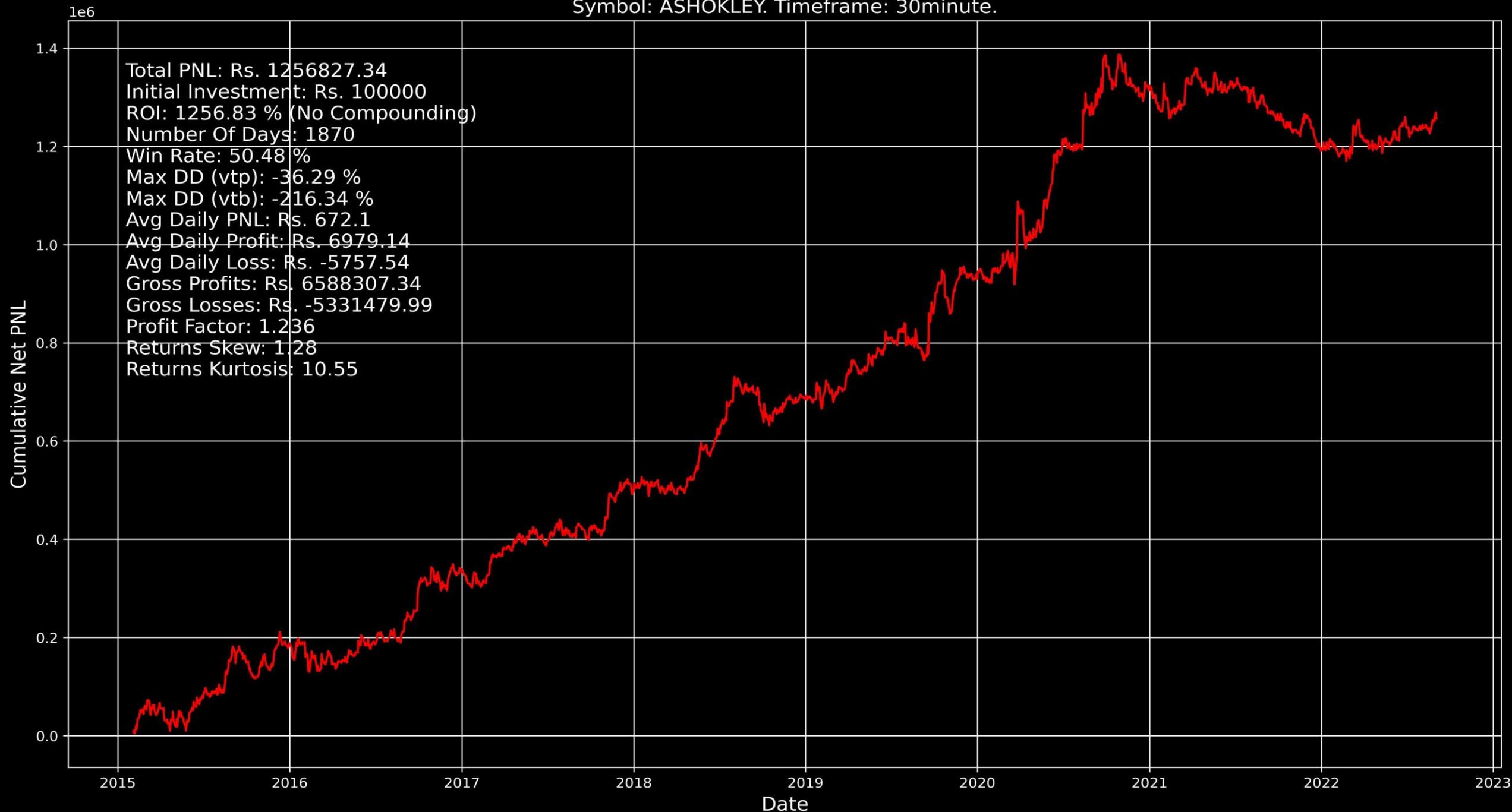


Core Block 1

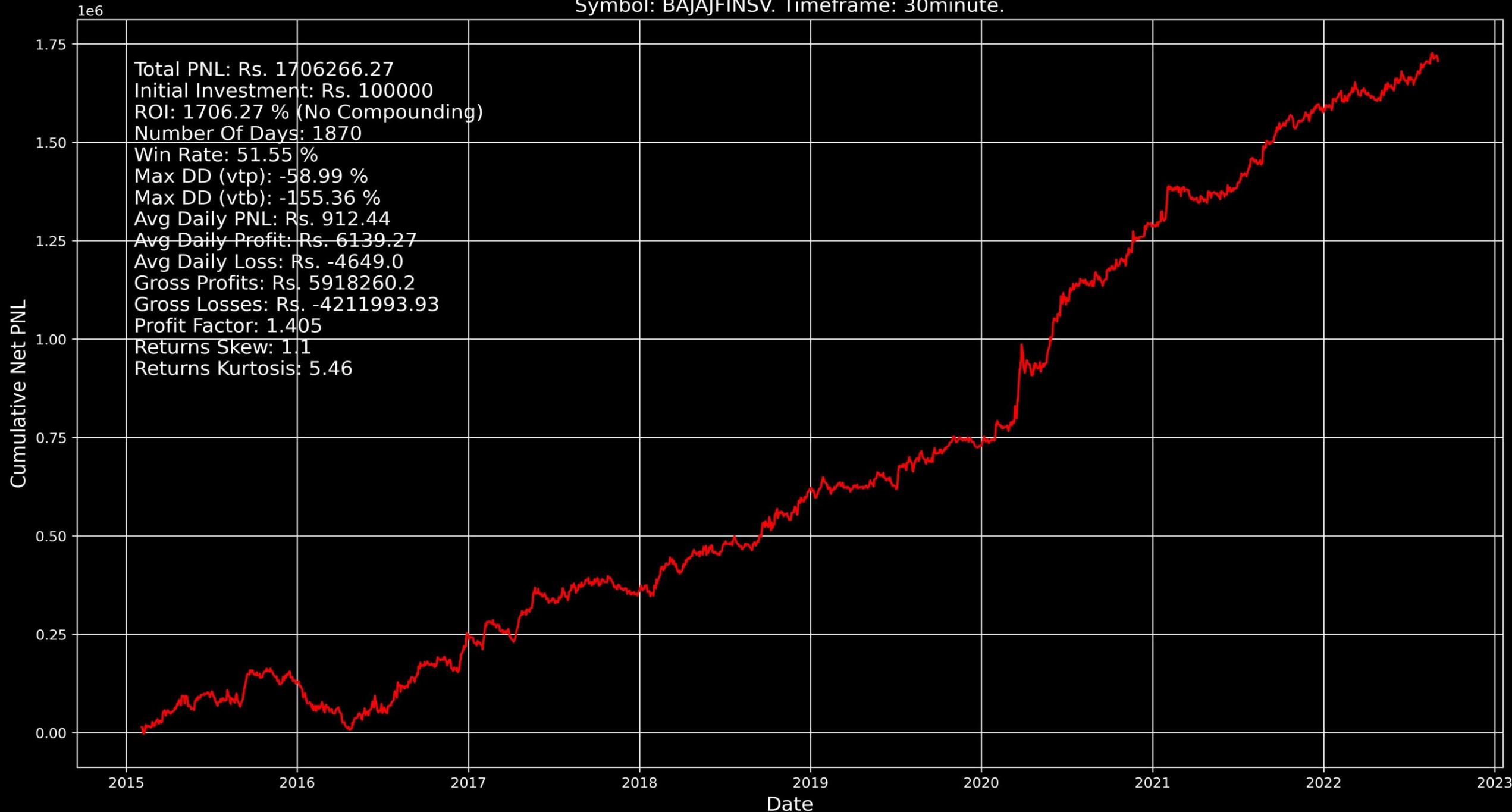
VWAP Based Intraday Trend Following System

Individual Symbol-wise Performance

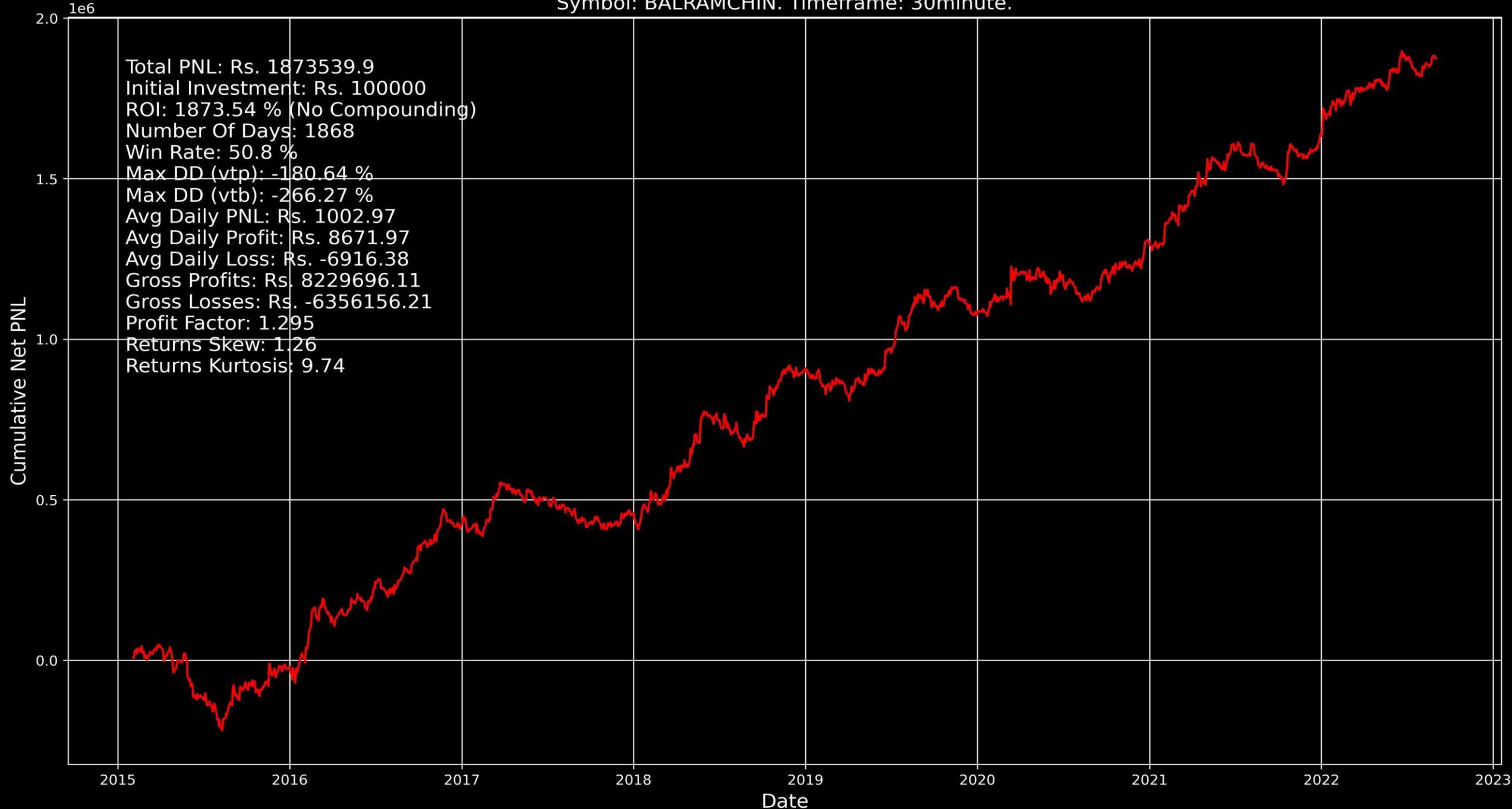
VWAP System Performance (Day-wise)
Symbol: ASHOKLEY. Timeframe: 30minute.



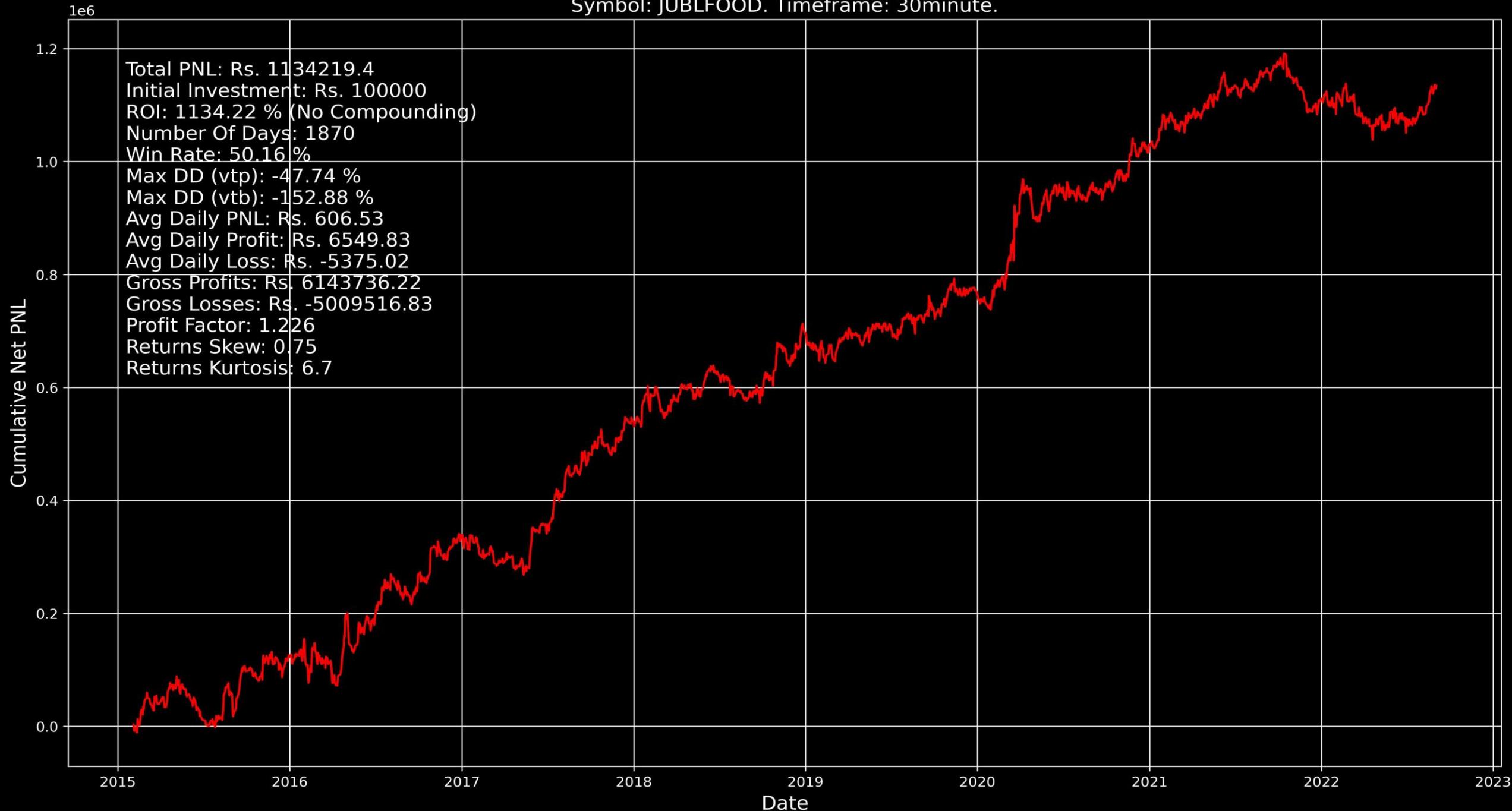
VWAP System Performance (Day-wise)
Symbol: BAJAJFINSV. Timeframe: 30minute.



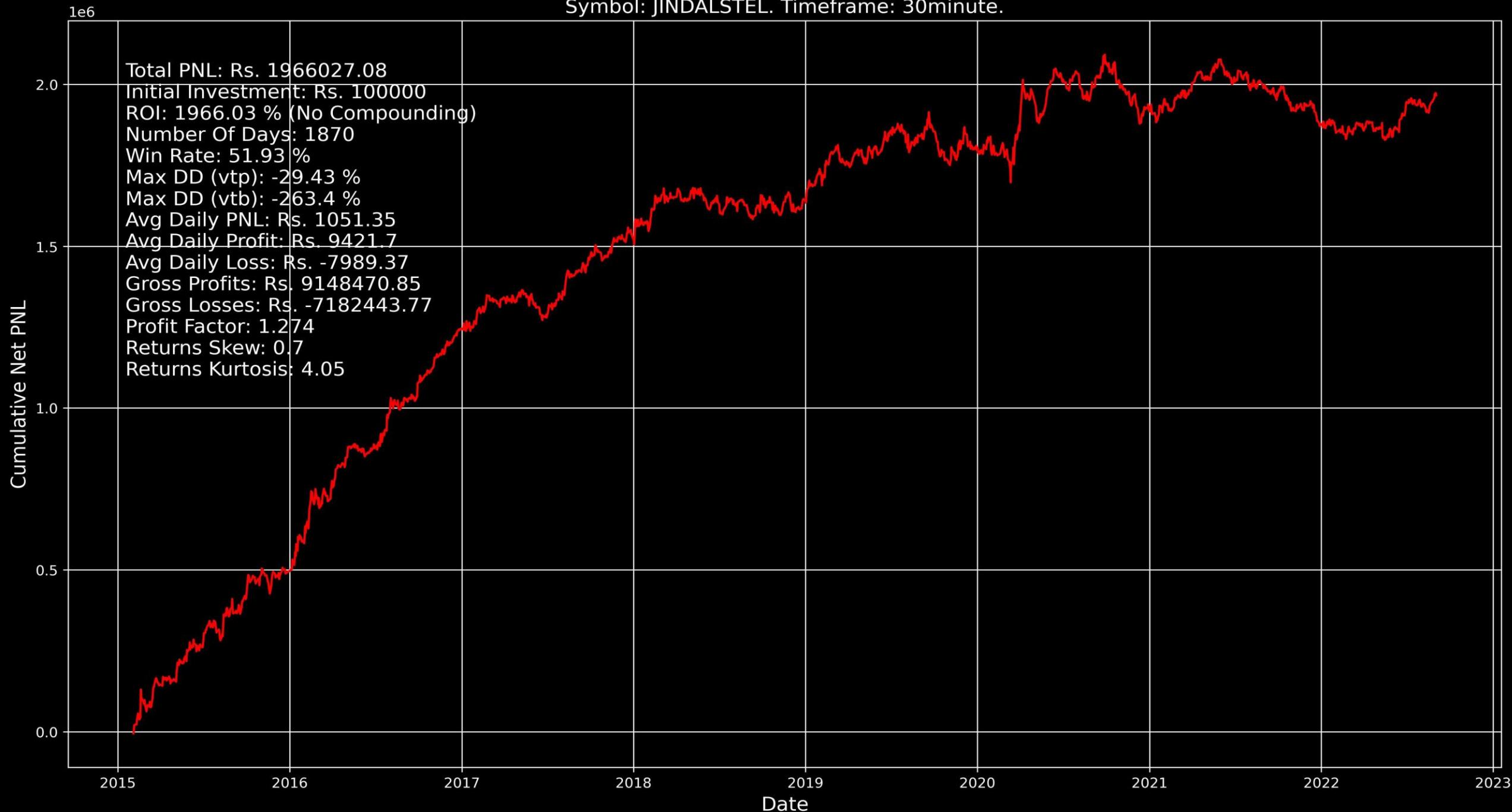
VWAP System Performance (Day-wise)
Symbol: BALRAMCHIN. Timeframe: 30minute.



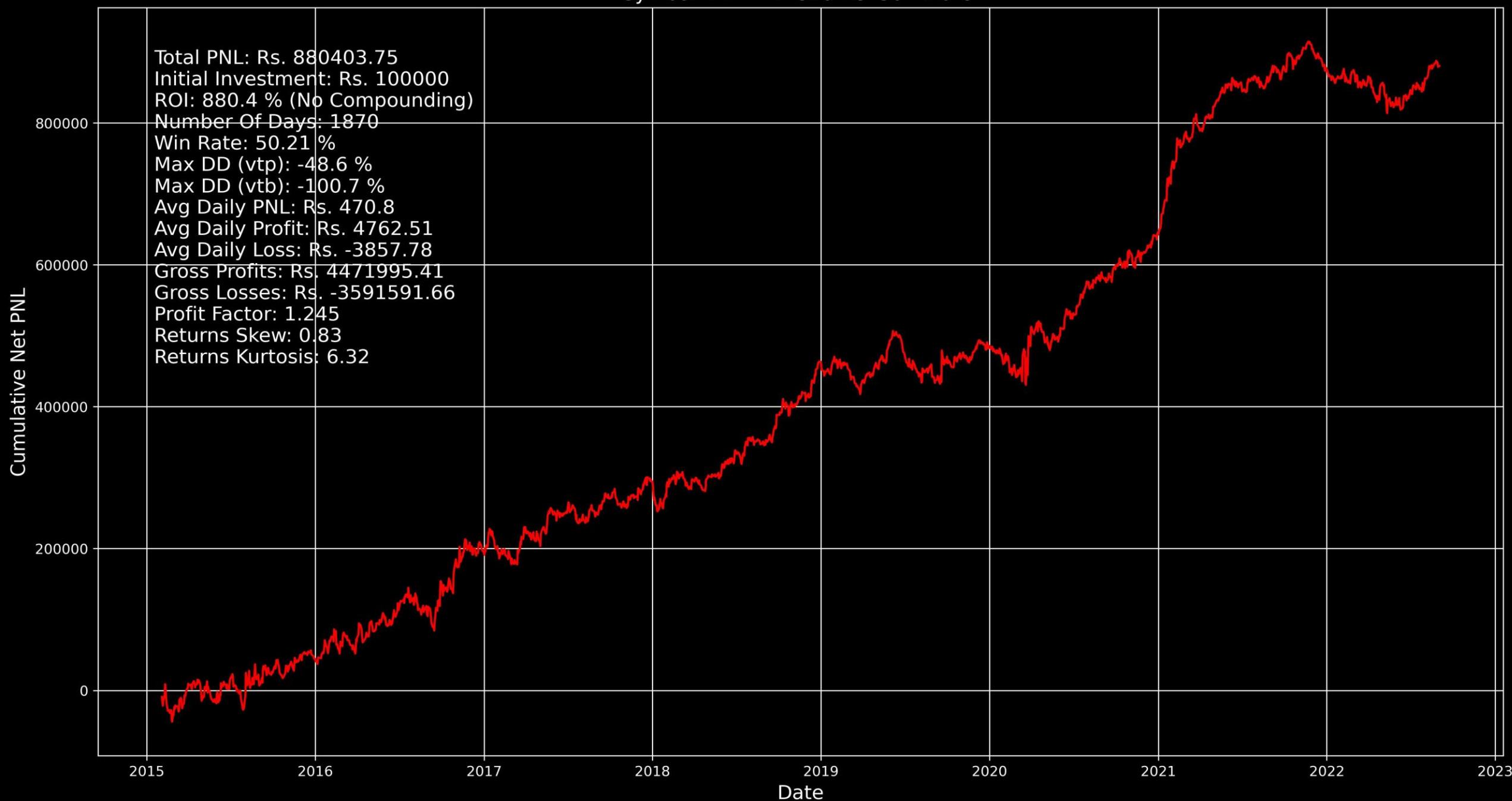
VWAP System Performance (Day-wise)
Symbol: JUBLFOOD. Timeframe: 30minute.



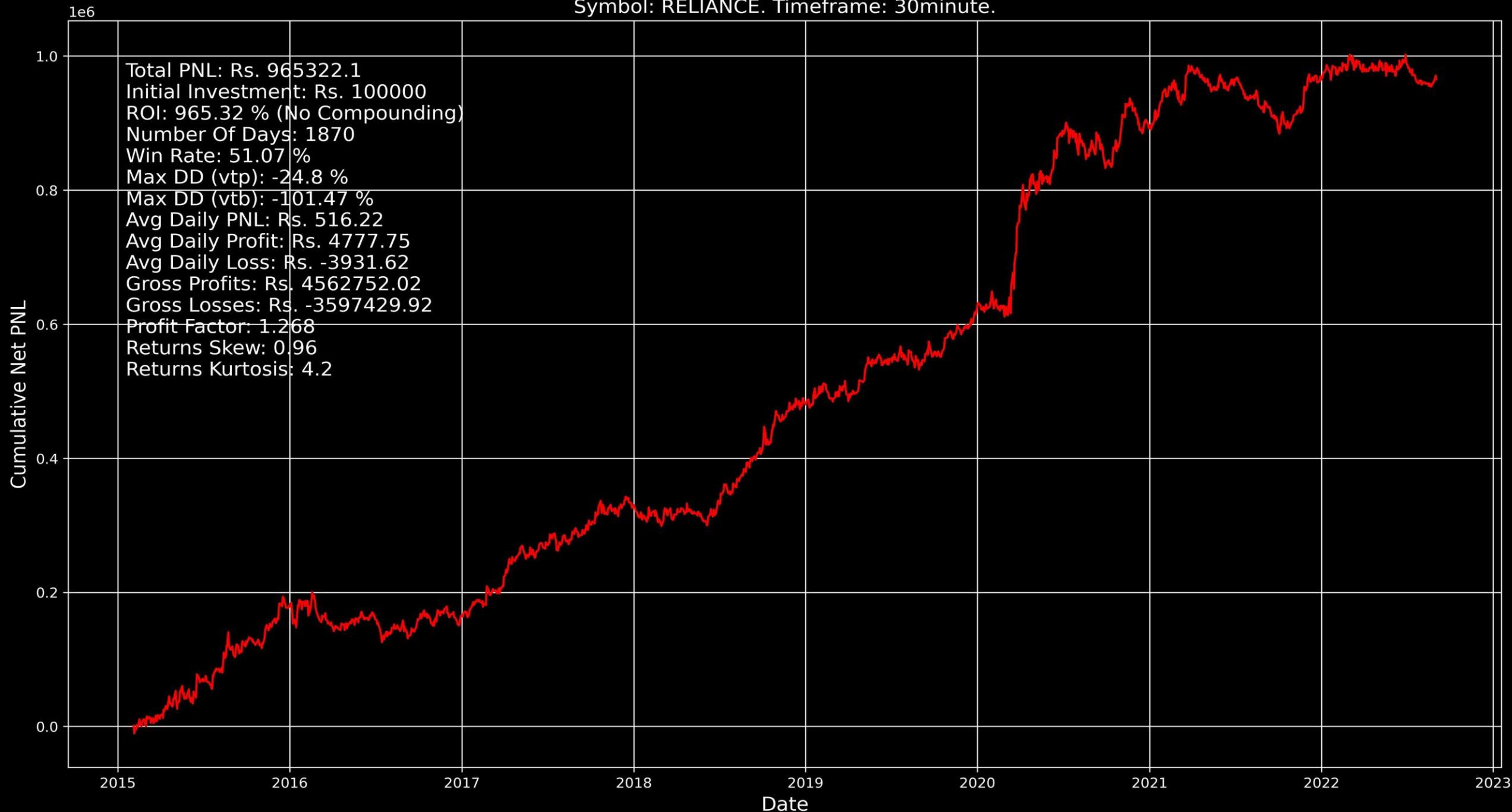
VWAP System Performance (Day-wise)
Symbol: JINDALSTEL. Timeframe: 30minute.



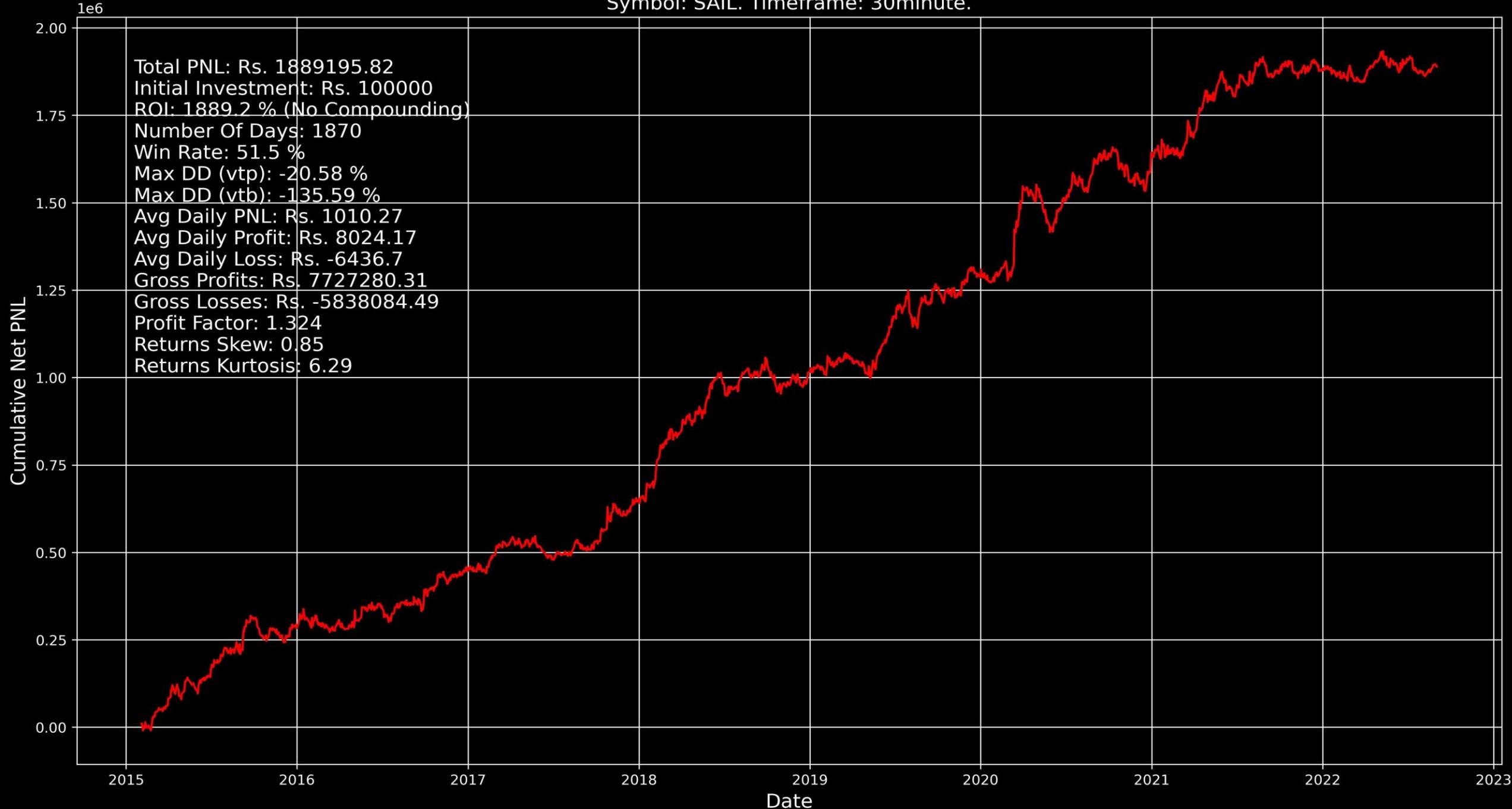
VWAP System Performance (Day-wise)
Symbol: MRF. Timeframe: 30minute.



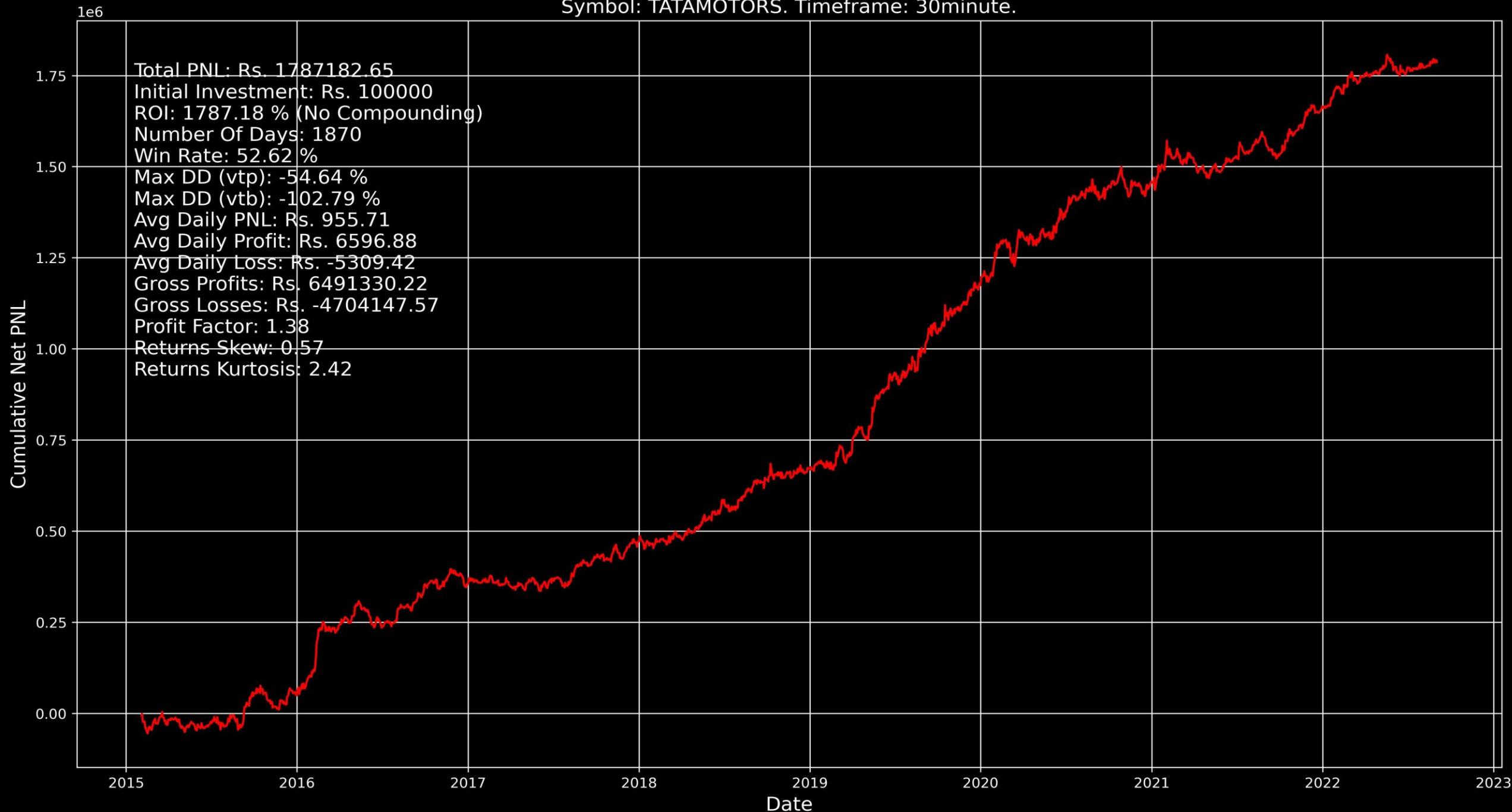
VWAP System Performance (Day-wise)
Symbol: RELIANCE. Timeframe: 30minute.



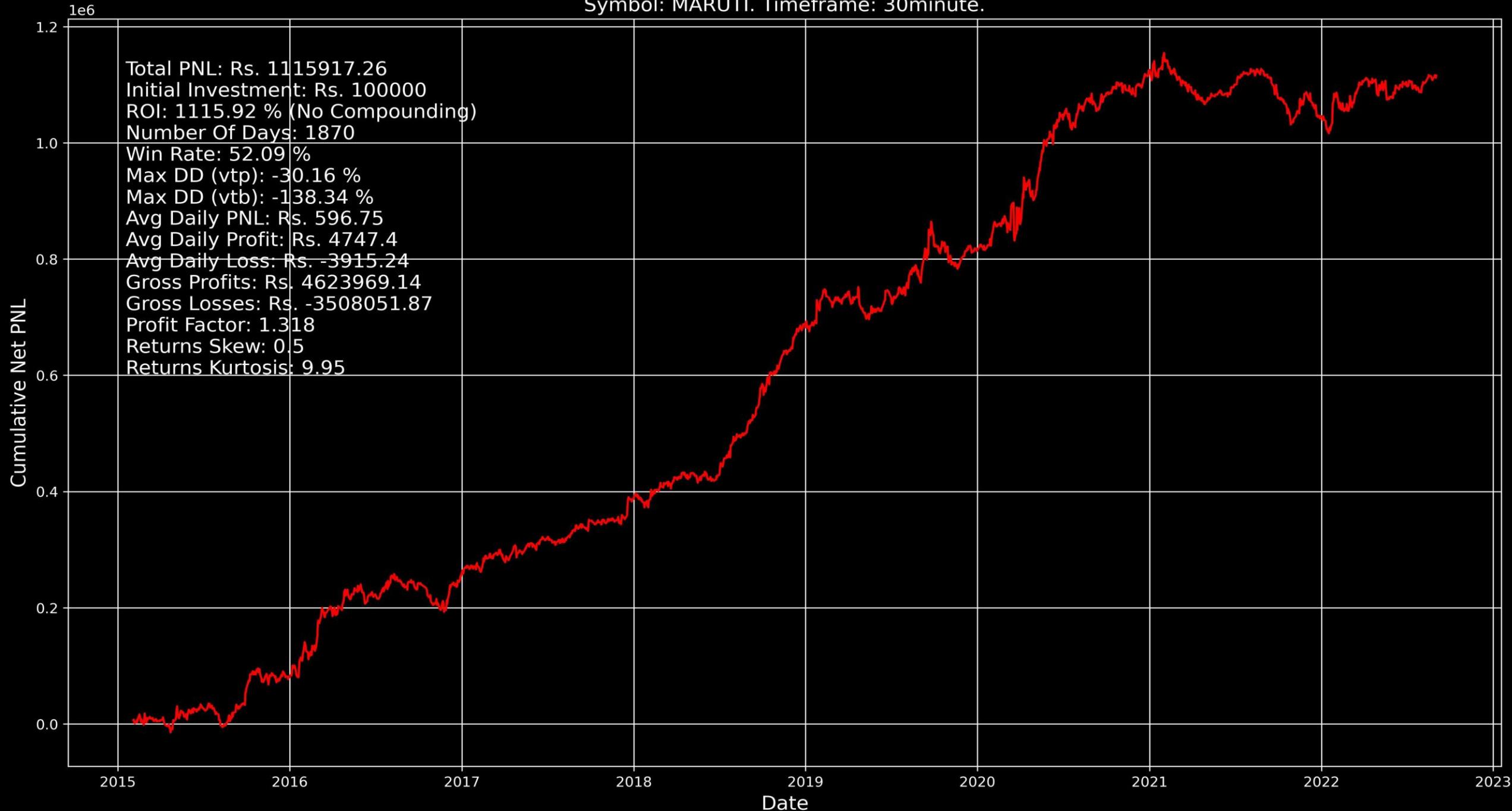
VWAP System Performance (Day-wise)
Symbol: SAIL. Timeframe: 30minute.



VWAP System Performance (Day-wise)
Symbol: TATAMOTORS. Timeframe: 30minute.



VWAP System Performance (Day-wise)
Symbol: MARUTI. Timeframe: 30minute.

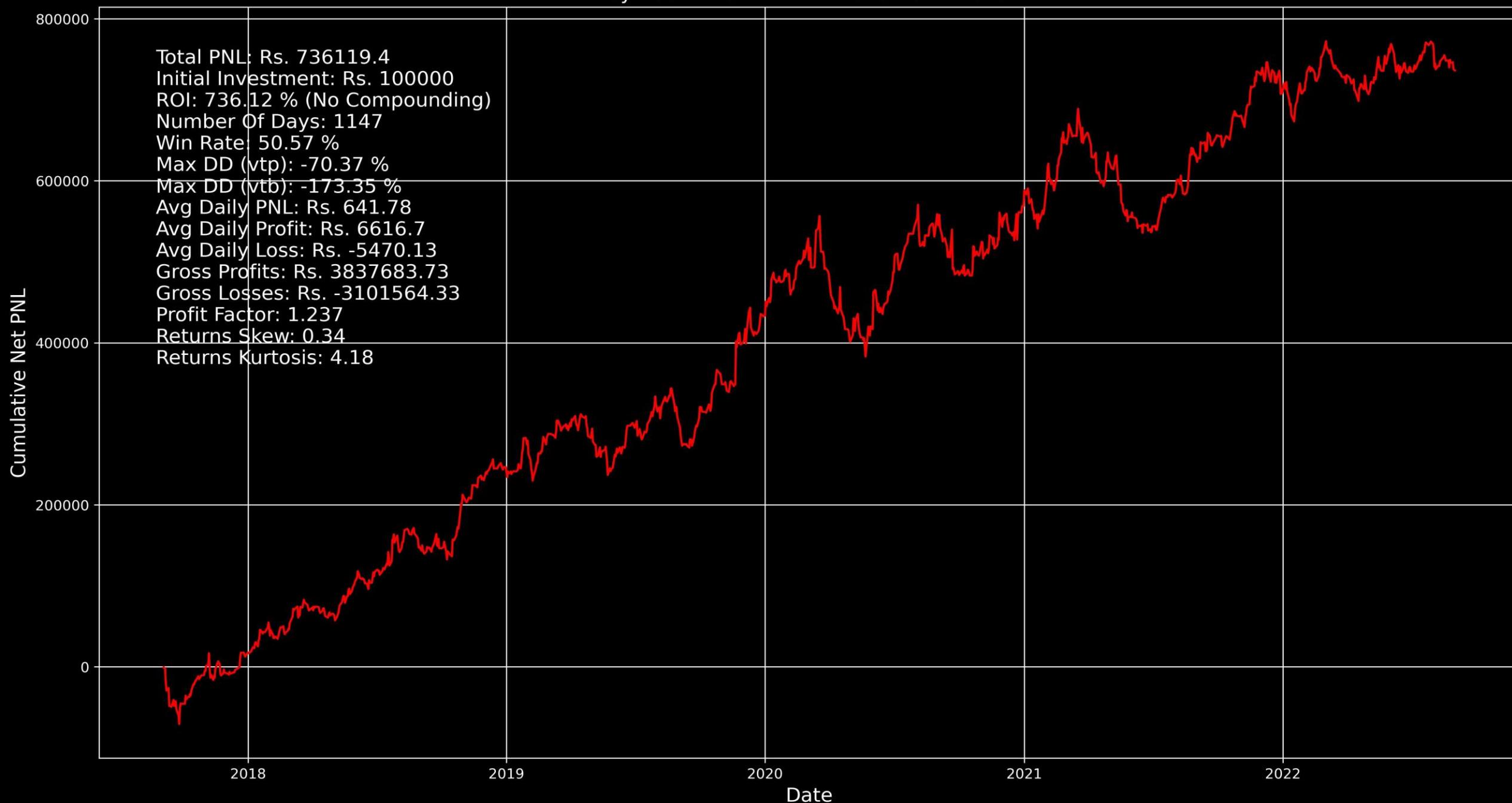


Core Block 2

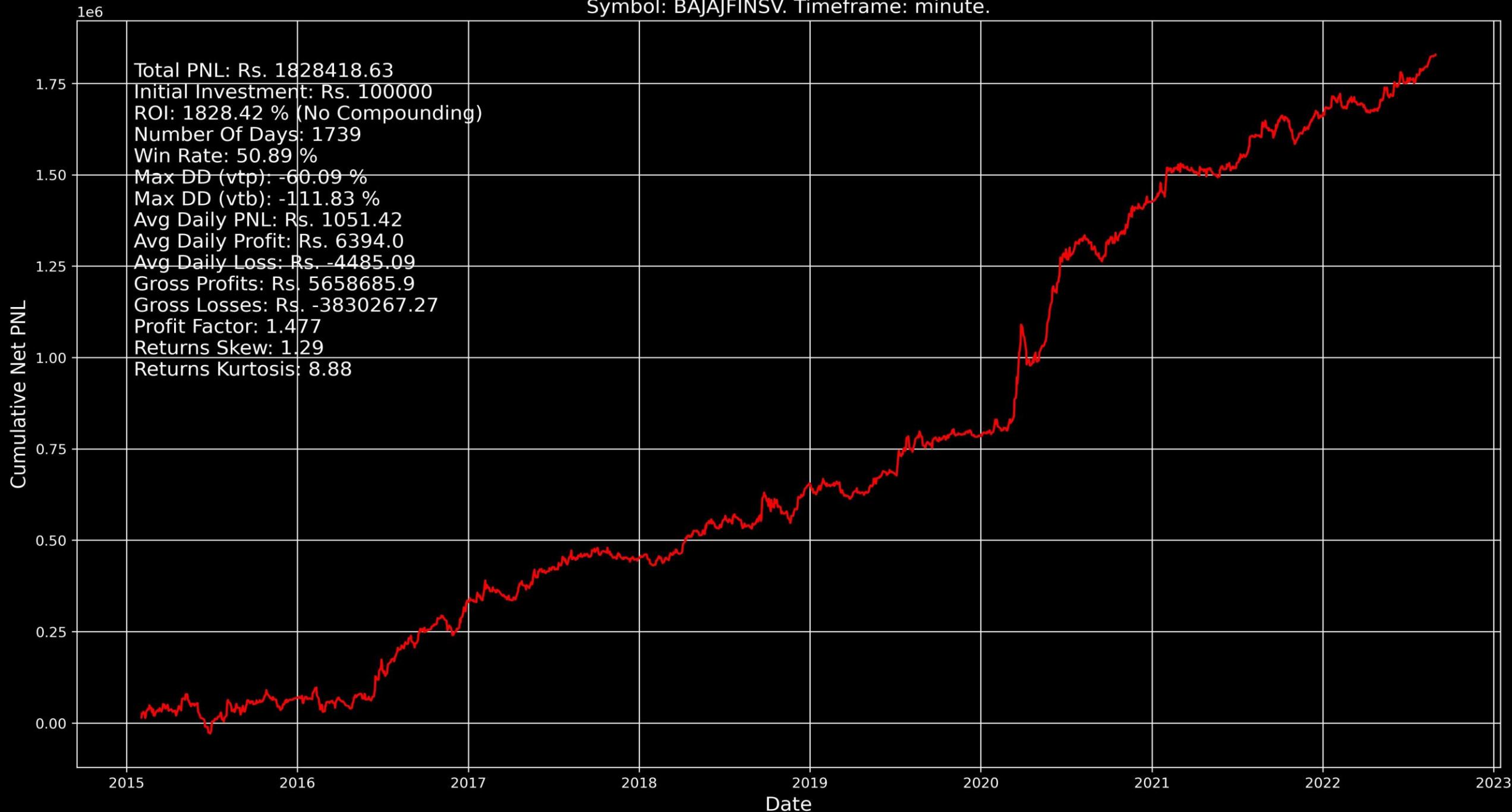
Opening Range Breakout(ORB) Based Intraday Trend
Following System

Individual Symbol-wise Performance

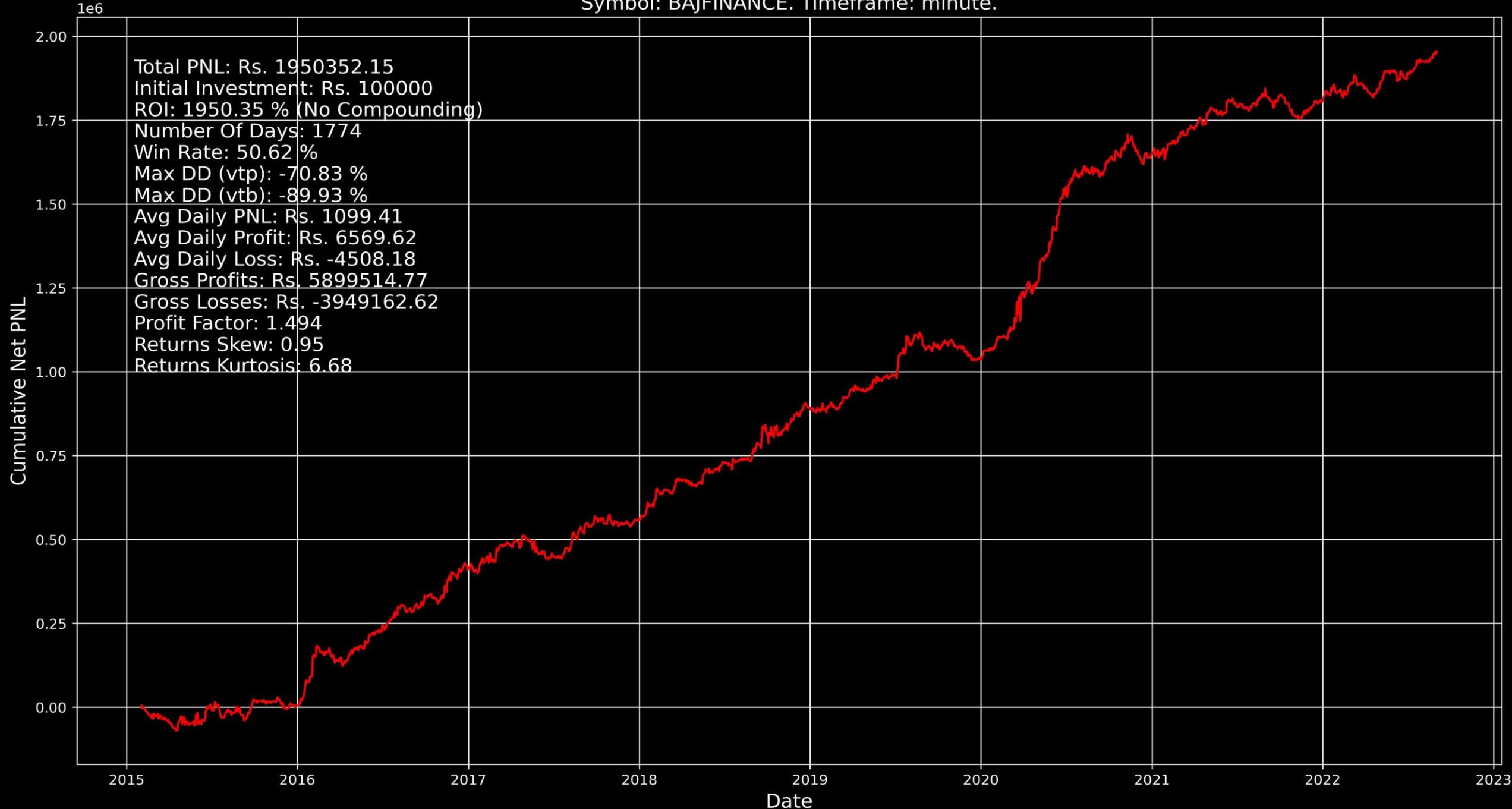
MORNING RANGE V2 System Performance (Day-wise)
Symbol: ABCAPITAL. Timeframe: minute.



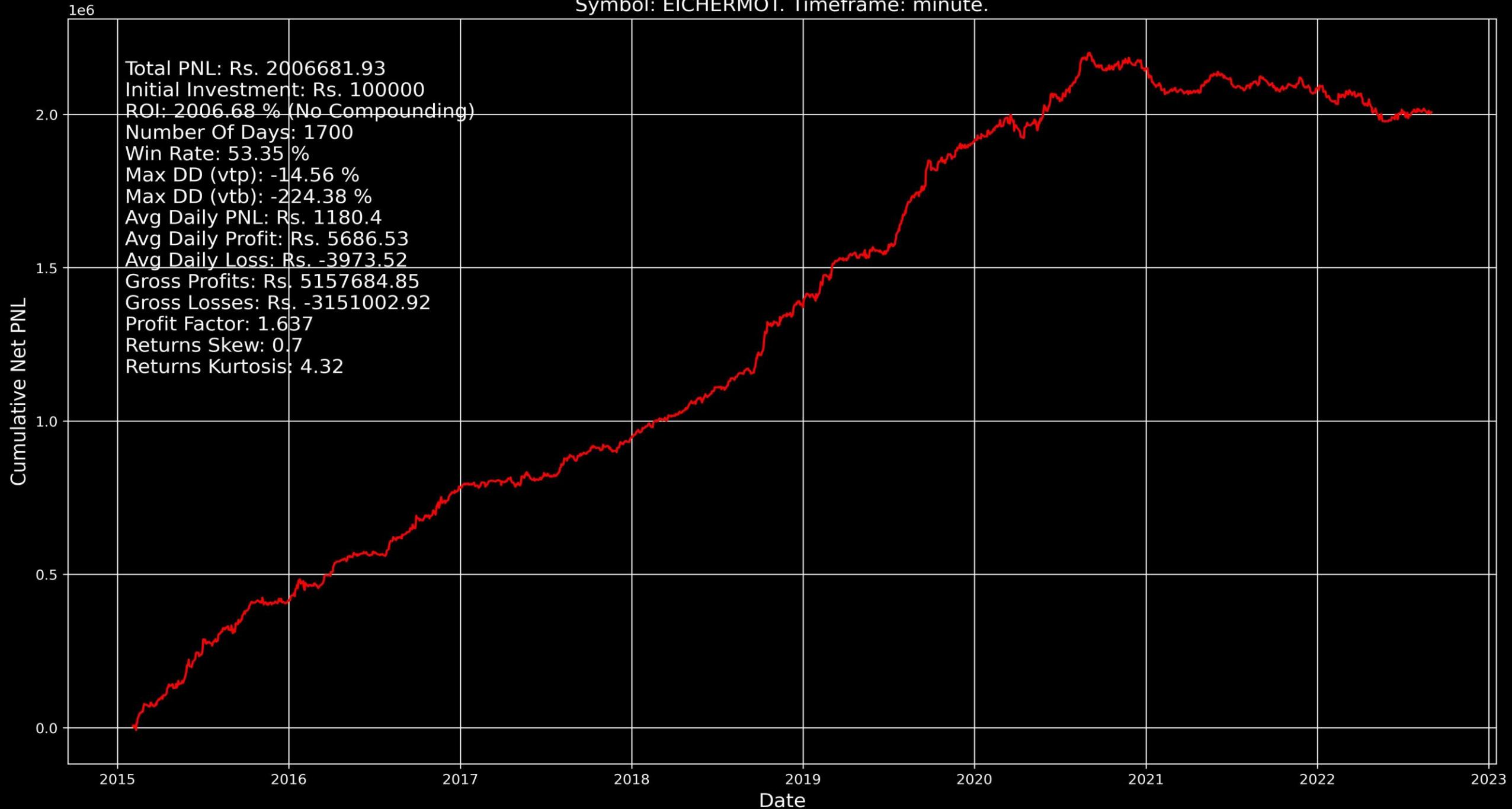
MORNING RANGE V2 System Performance (Day-wise)
Symbol: BAJAJFINSV. Timeframe: minute.



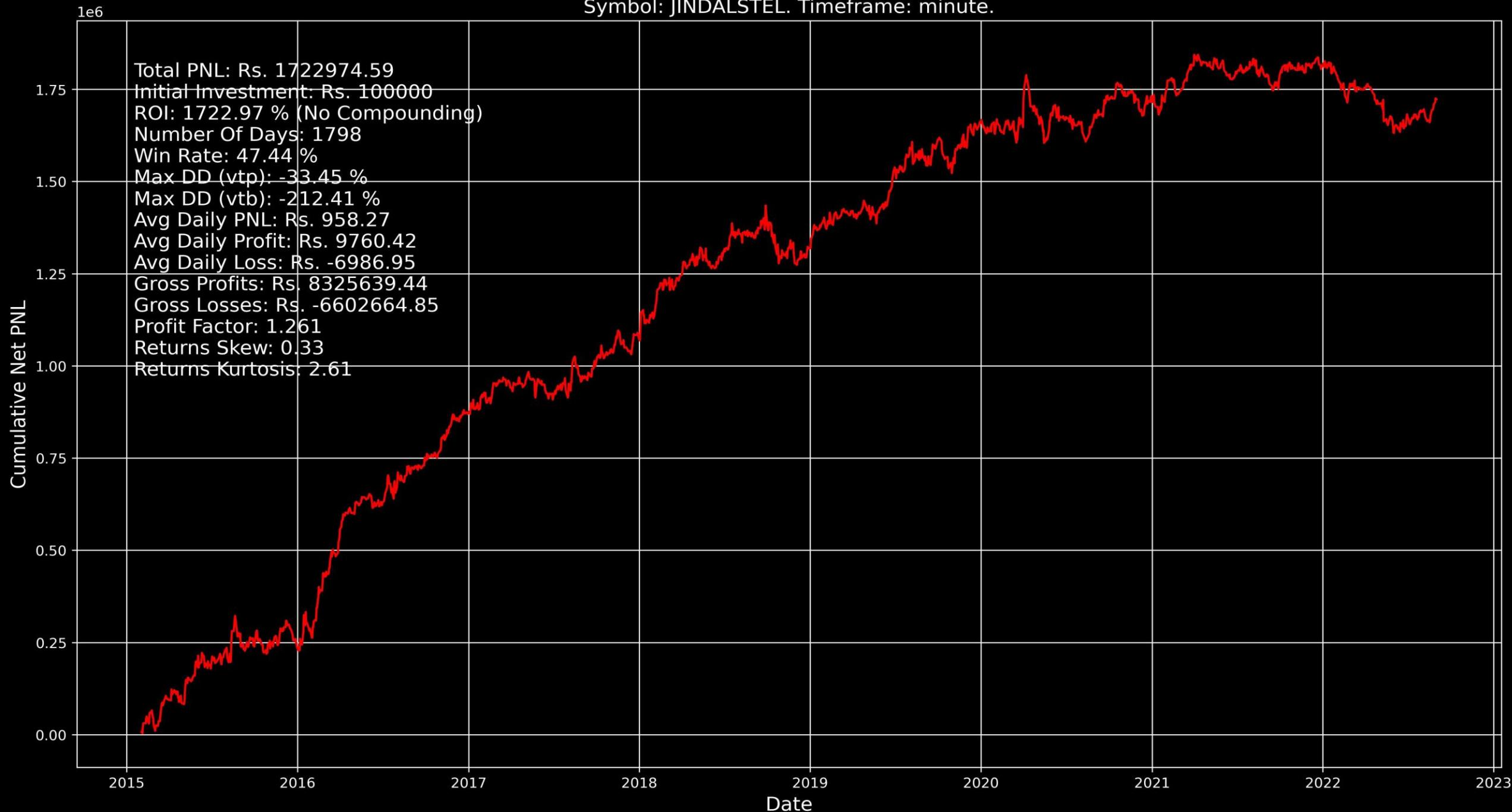
MORNING RANGE V2 System Performance (Day-wise)
Symbol: BAJFINANCE. Timeframe: minute.



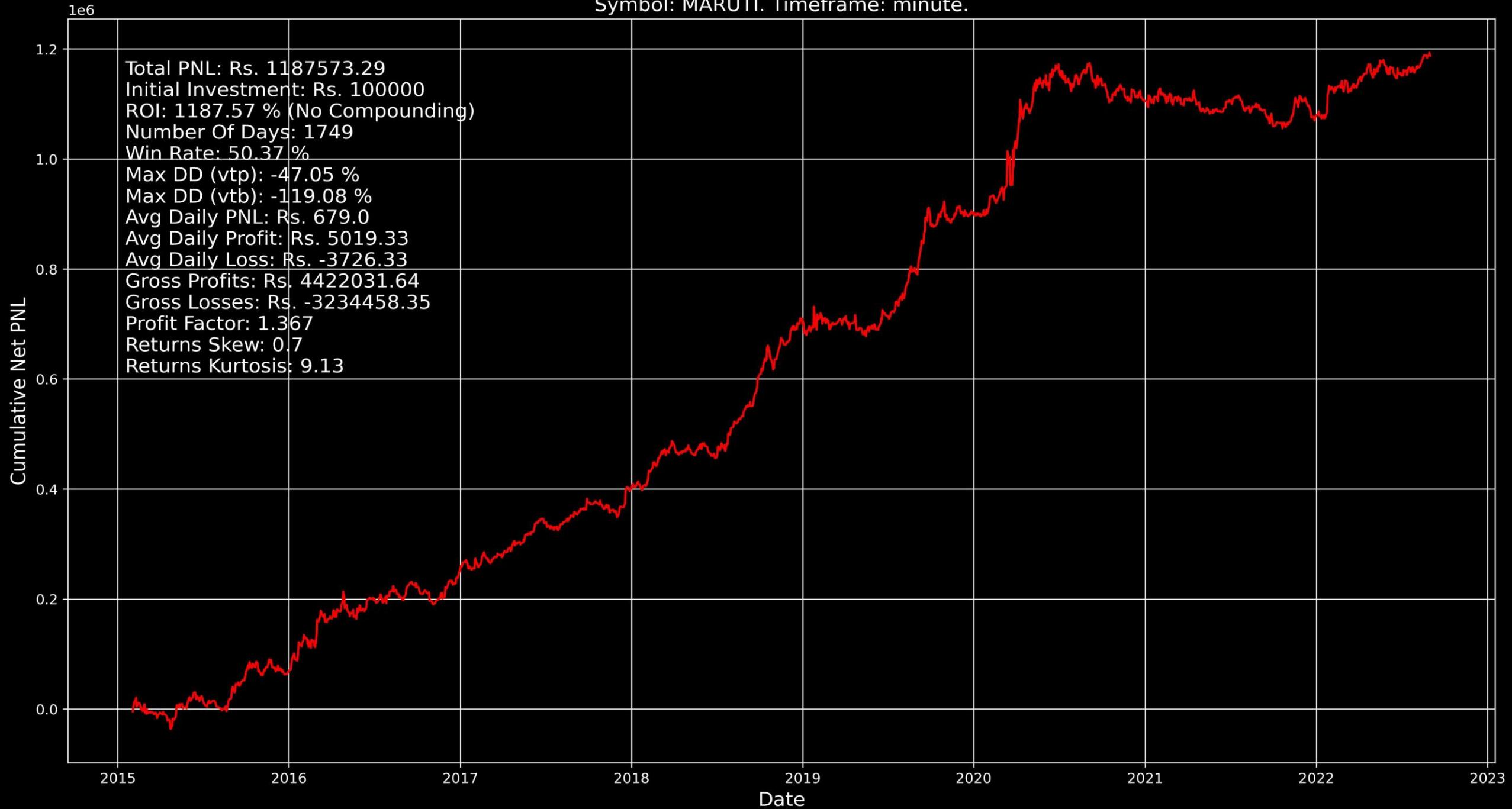
MORNING RANGE V2 System Performance (Day-wise)
Symbol: EICHERMOT. Timeframe: minute.



MORNING RANGE V2 System Performance (Day-wise)
Symbol: JINDALSTEL. Timeframe: minute.

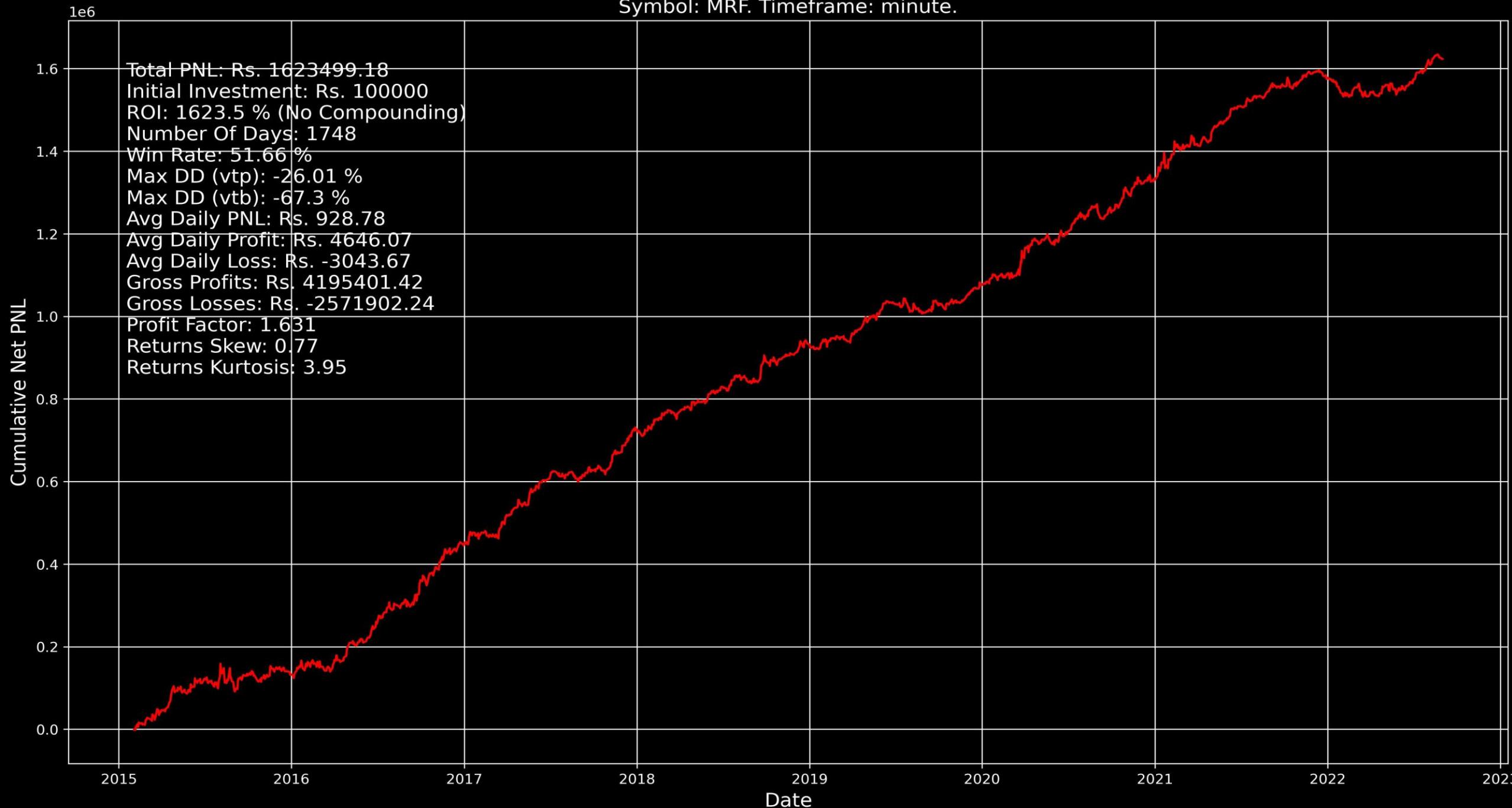


MORNING RANGE V2 System Performance (Day-wise)
Symbol: MARUTI. Timeframe: minute.

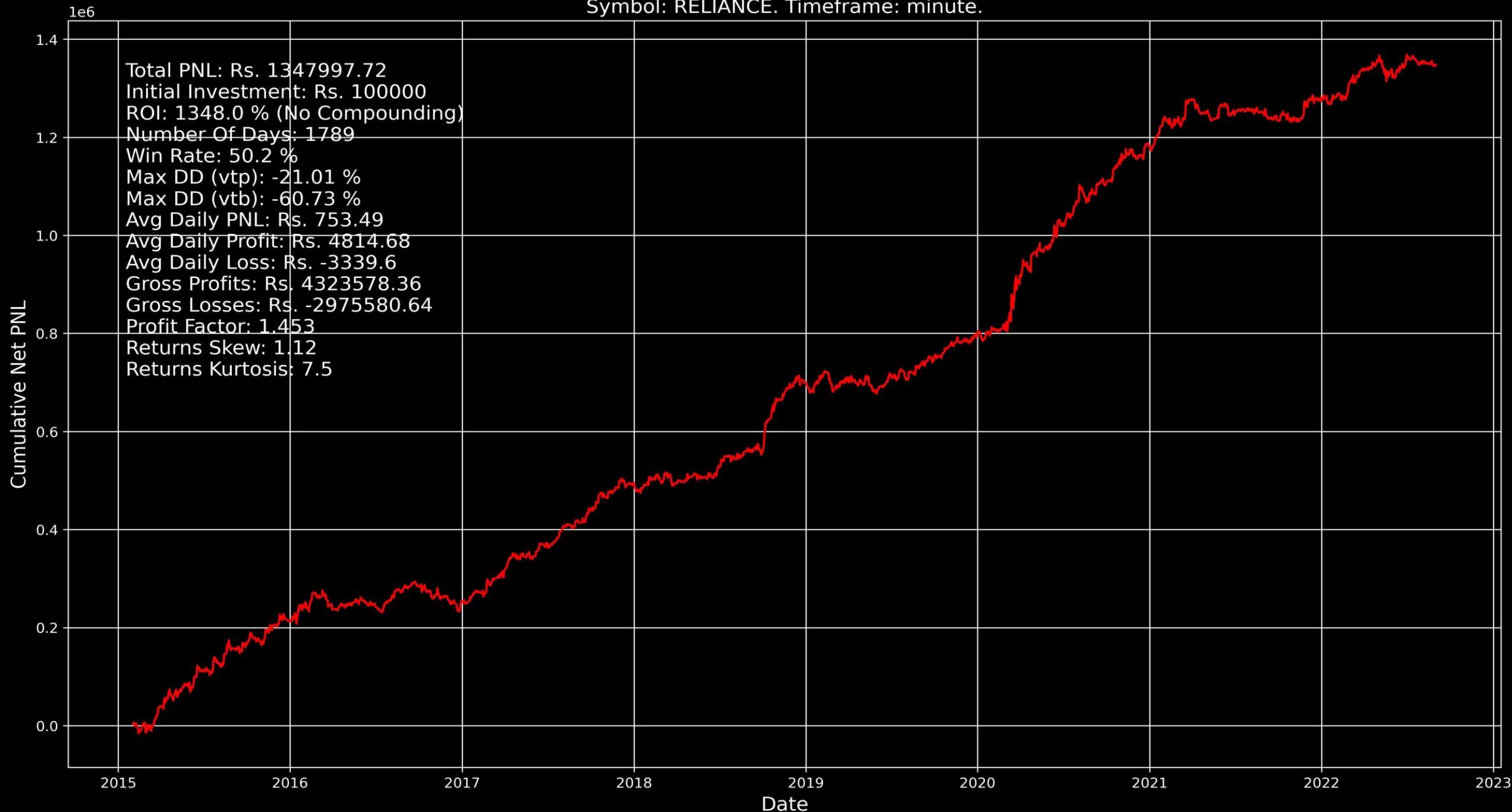


MORNING RANGE V2 System Performance (Day-wise)

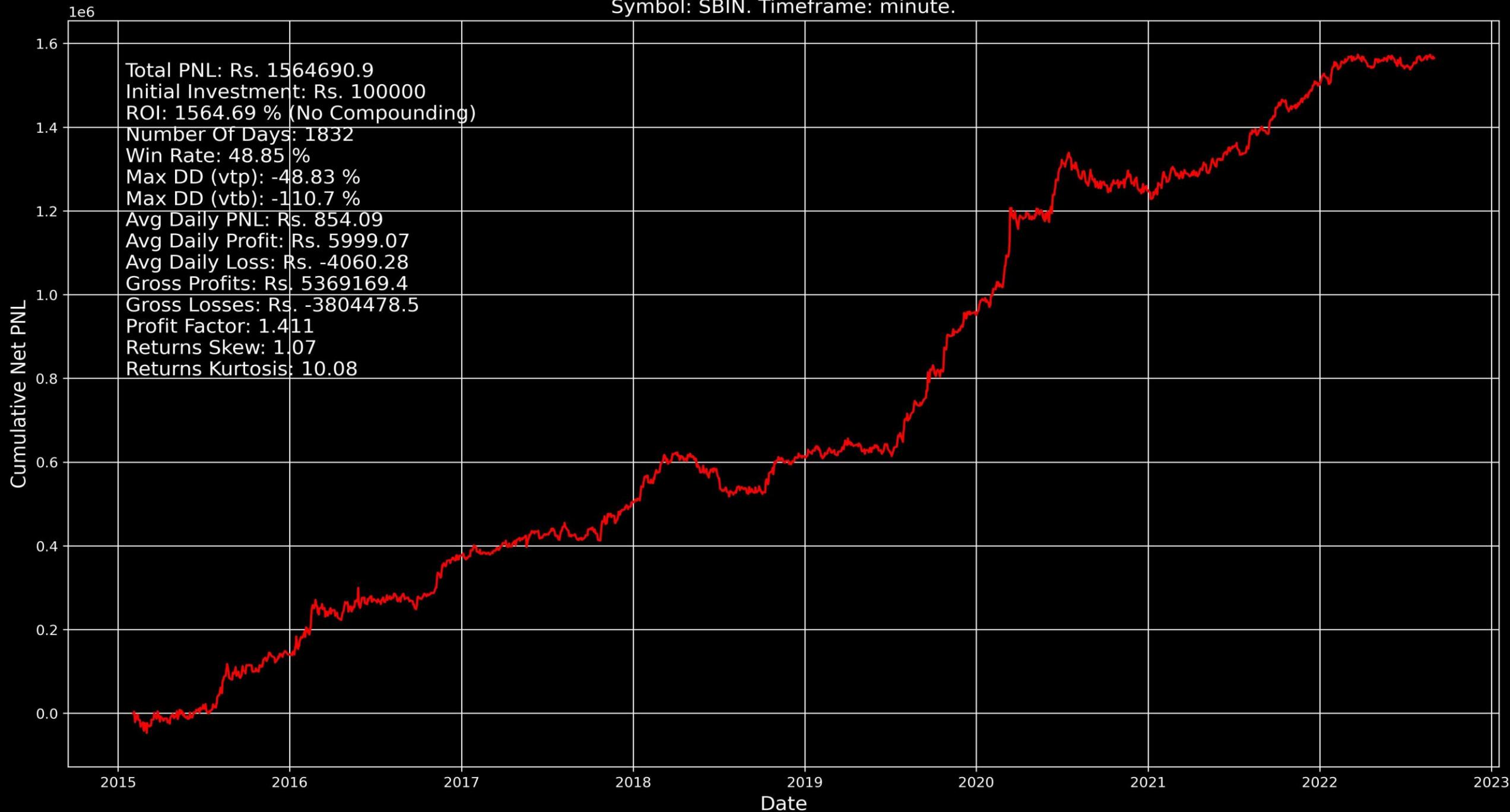
Symbol: MRF. Timeframe: minute.



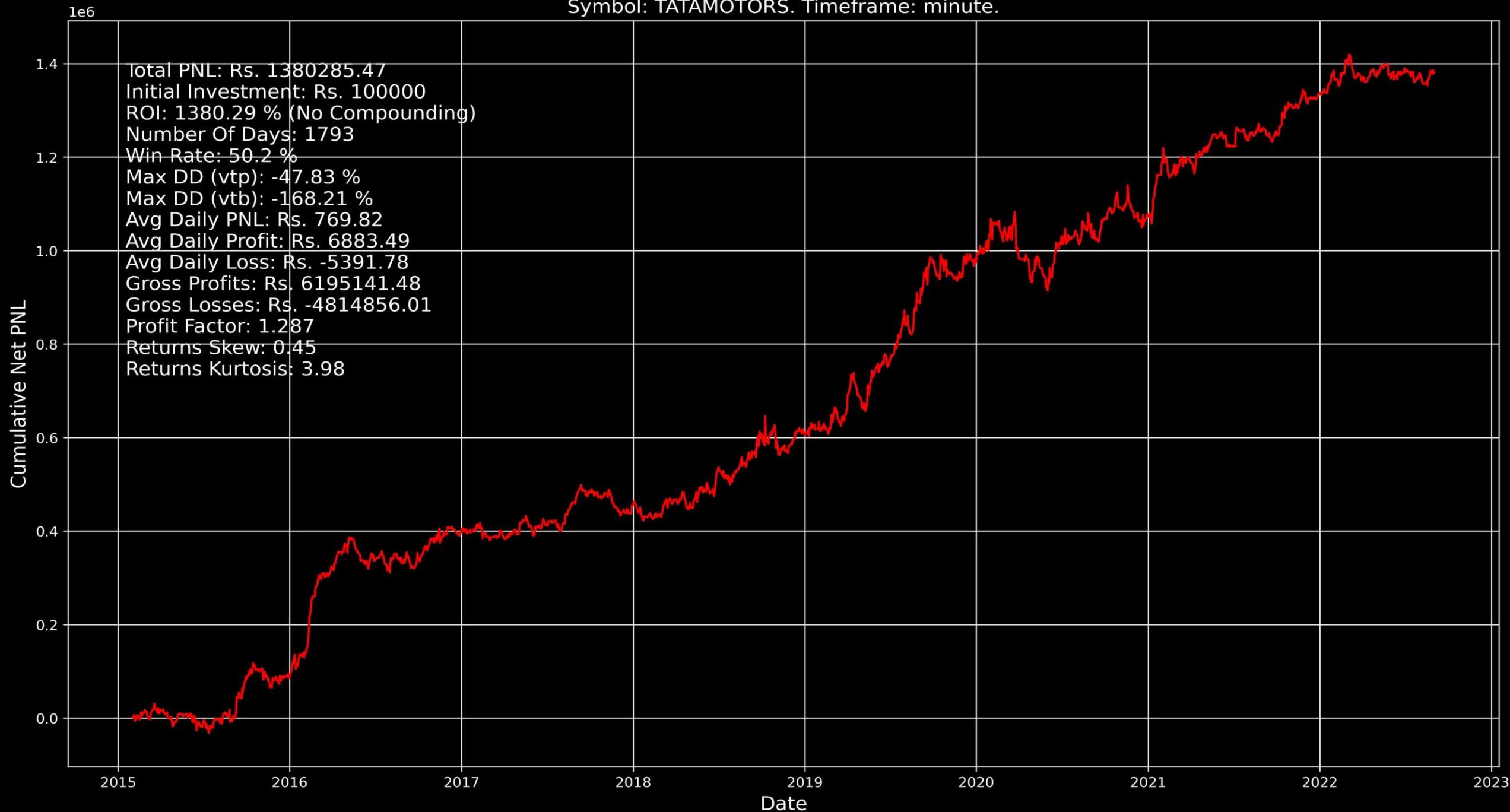
MORNING RANGE V2 System Performance (Day-wise)
Symbol: RELIANCE. Timeframe: minute.



MORNING RANGE V2 System Performance (Day-wise)
Symbol: SBIN. Timeframe: minute.



MORNING RANGE V2 System Performance (Day-wise)
Symbol: TATAMOTORS. Timeframe: minute.



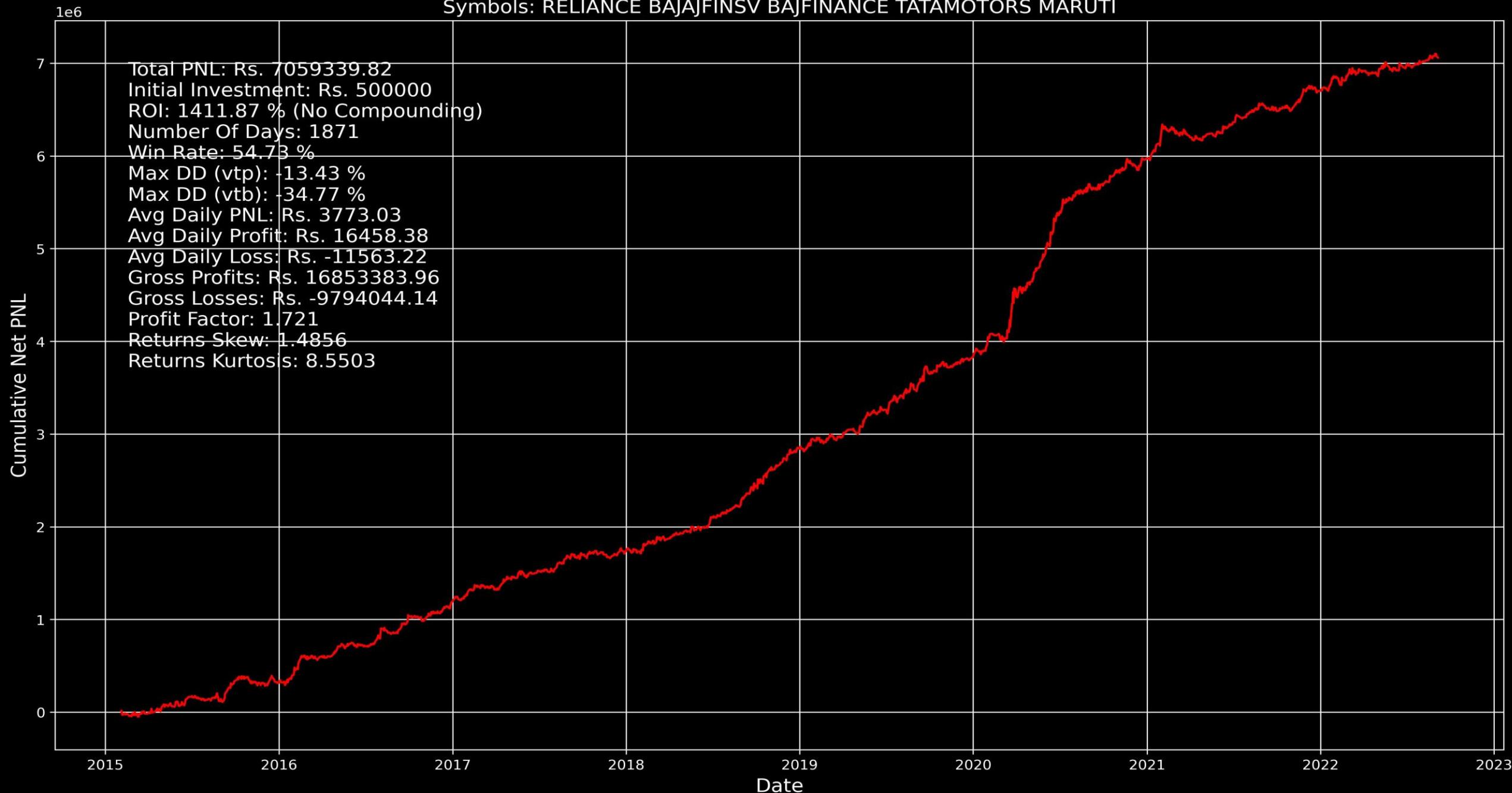
Diversification Methods

Eliminating Symbol dependent Systemic Risk

Fixed Symbol Basket (VWAP Core Block)

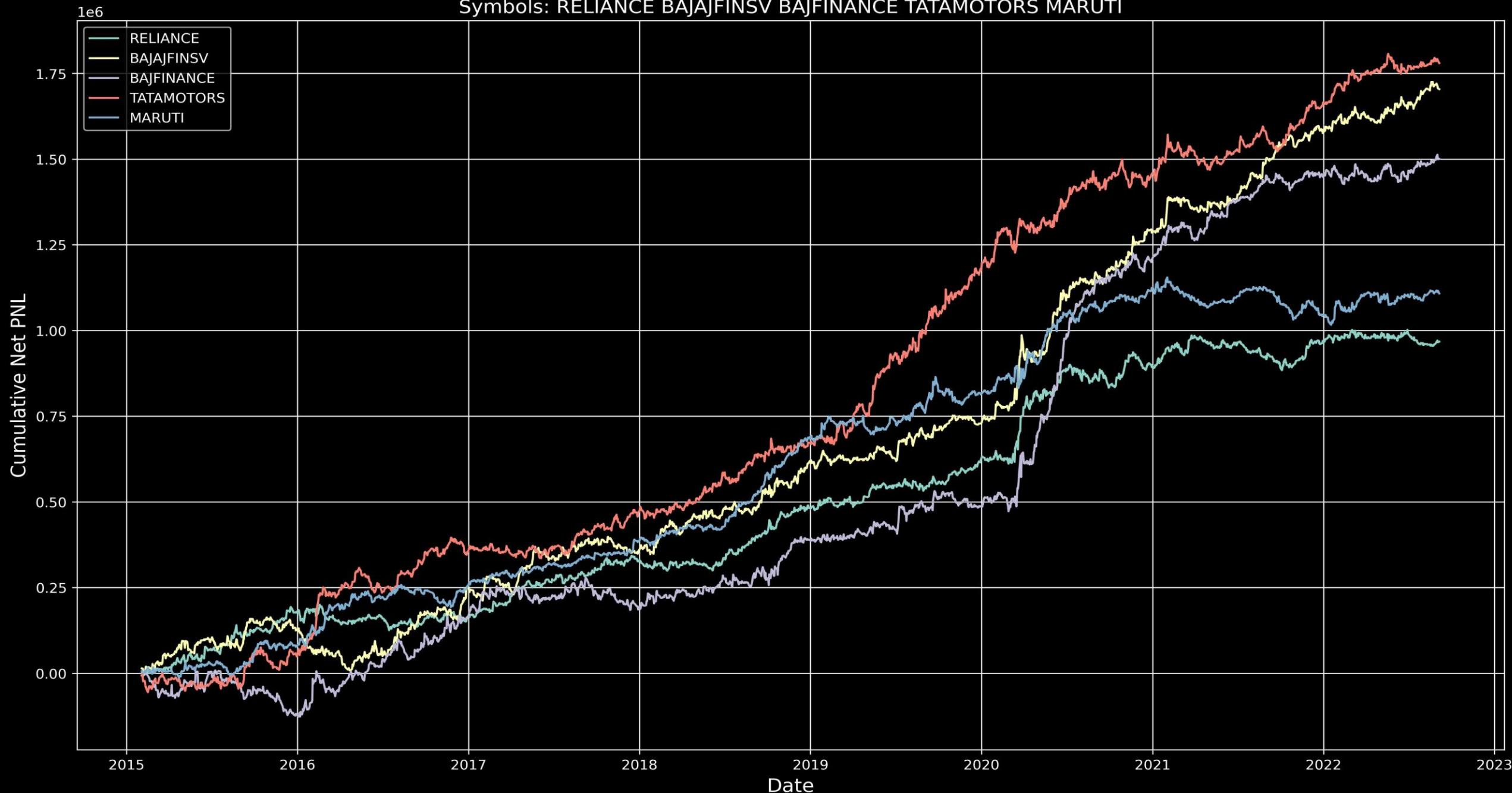
Basket Performance
System: VWAP System

Symbols: RELIANCE BAJAJFINSV BAJFINANCE TATAMOTORS MARUTI



Symbol-wise Performance Of Basket System: VWAP System

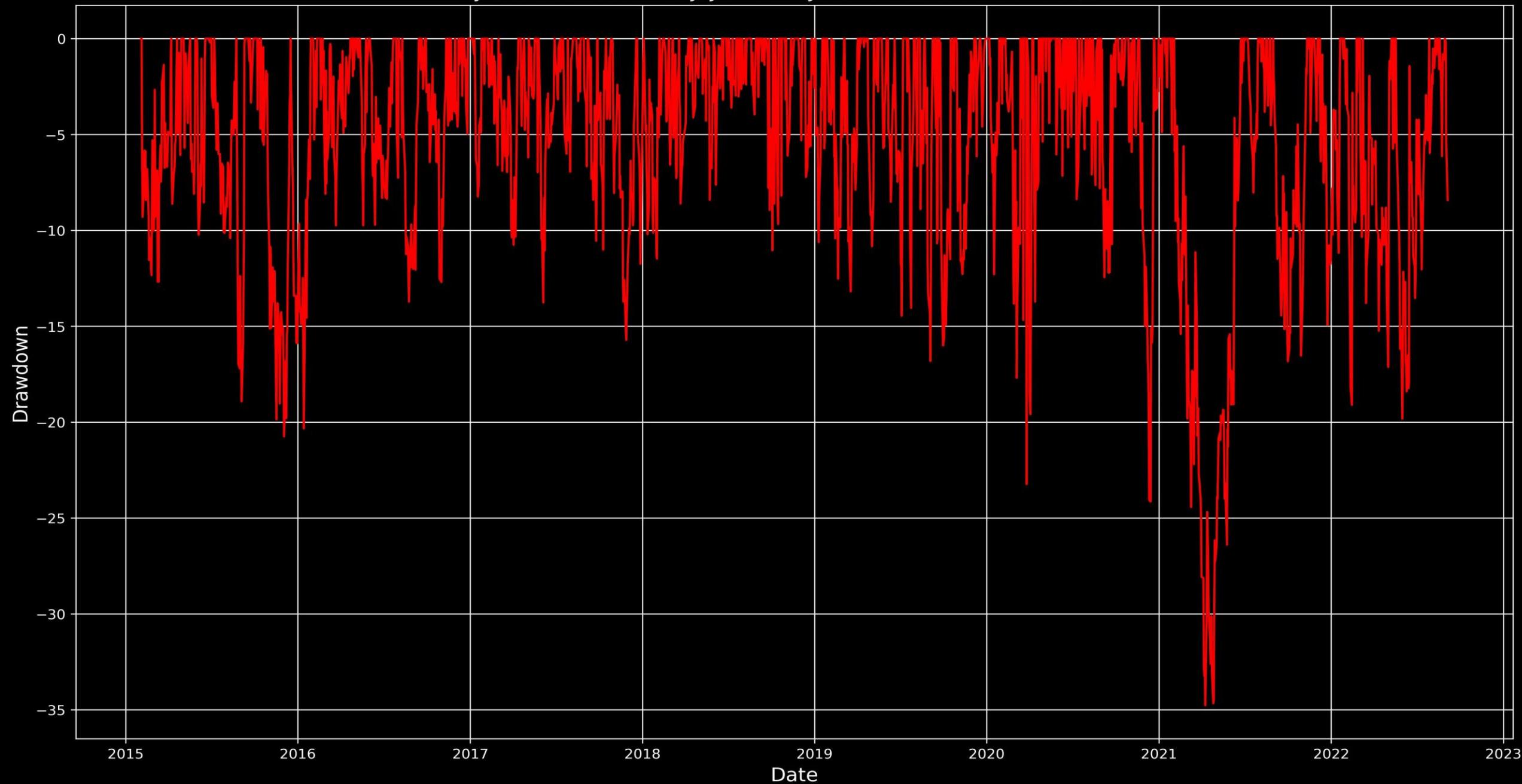
Symbols: RELIANCE BAJAJFINSV BAJFINANCE TATAMOTORS MARUTI



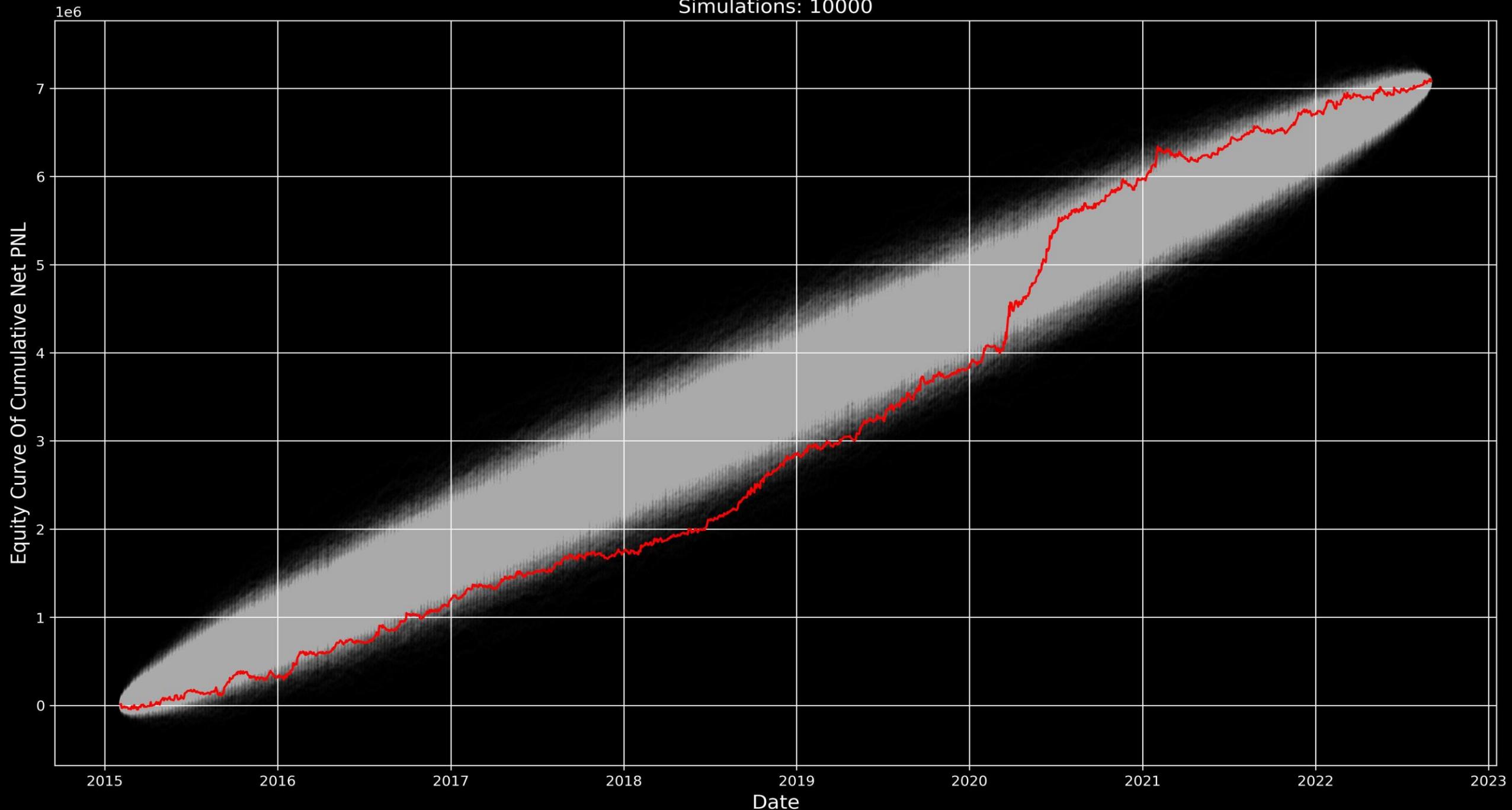
Basket Draw-down Underwater Curve (vtb)

System: VWAP System

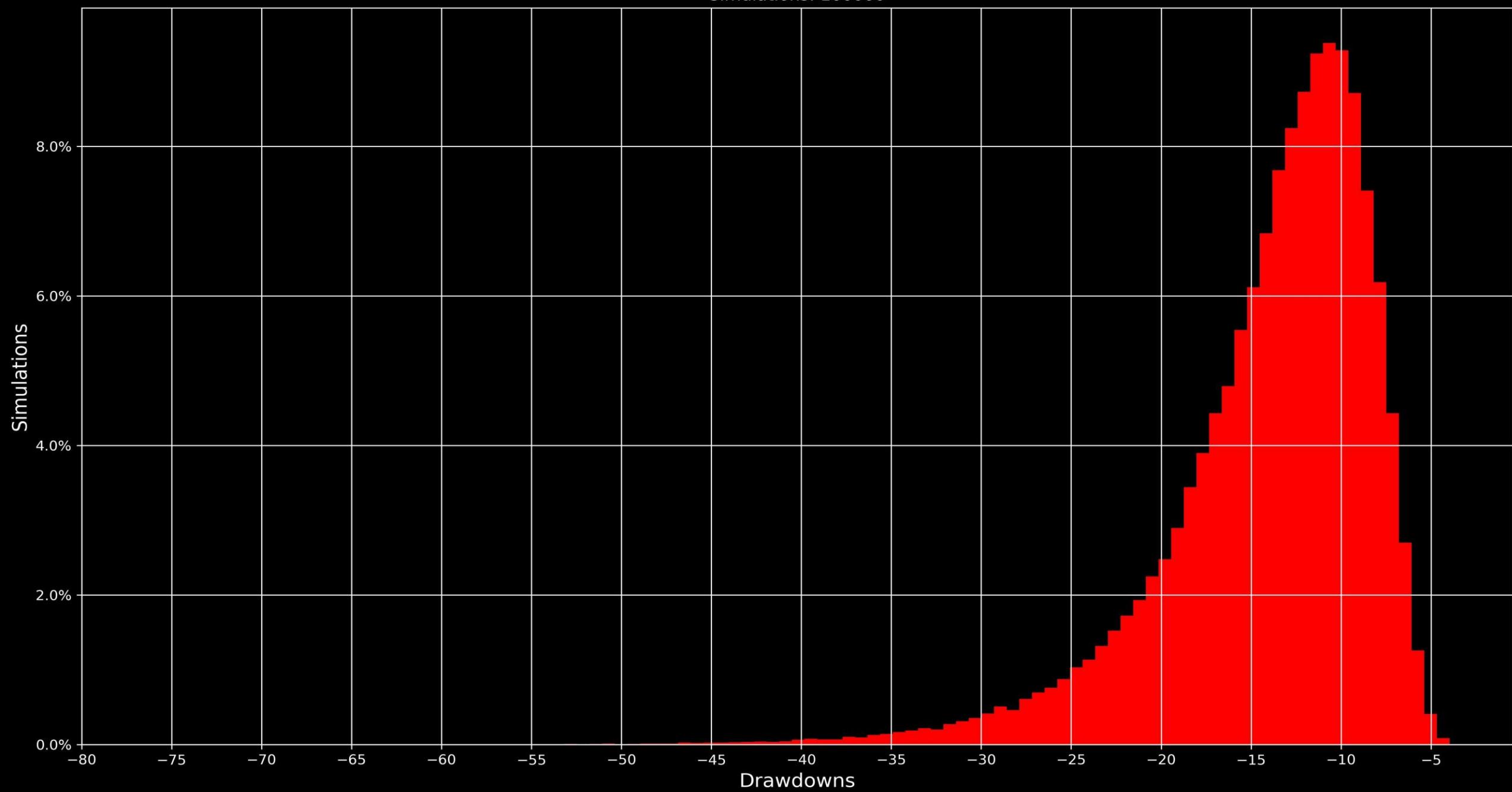
Symbols: RELIANCE BAJAJFINSV BAJFINANCE TATAMOTORS MARUTI



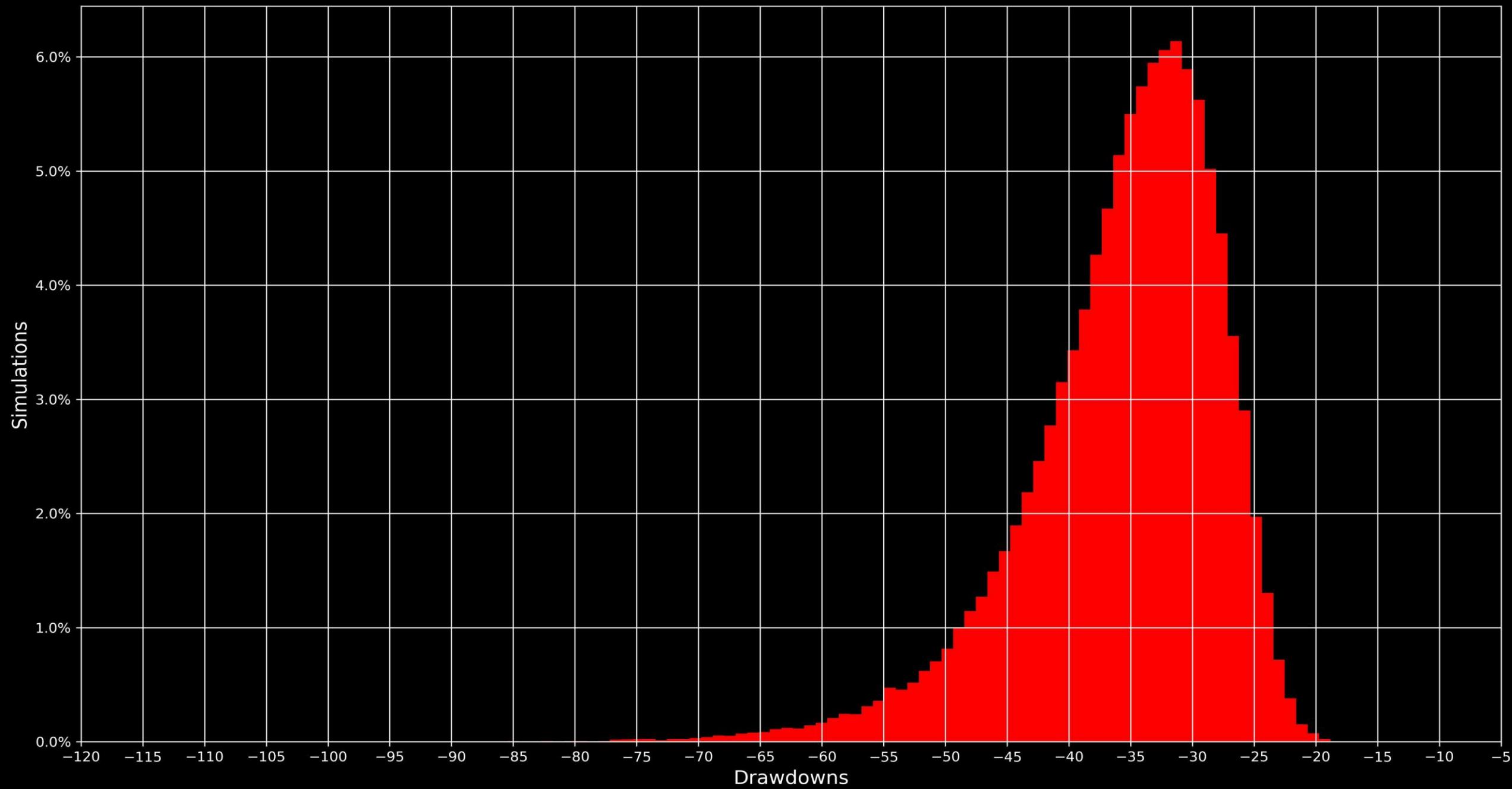
Monte Carlo Simulation (Re-shuffle)
Simulations: 10000



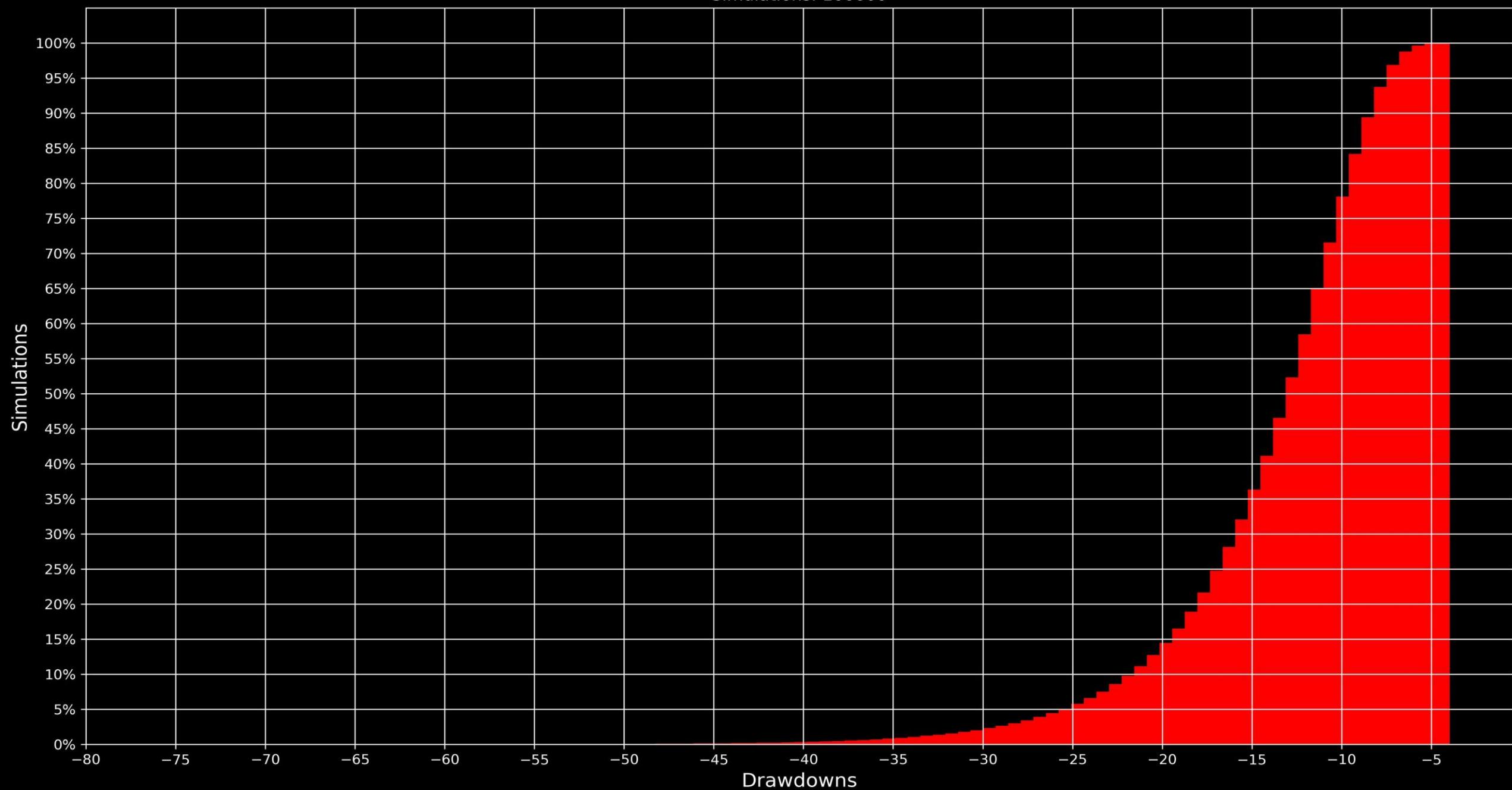
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis
Valley To Peak Drawdown Histogram
Simulations: 100000



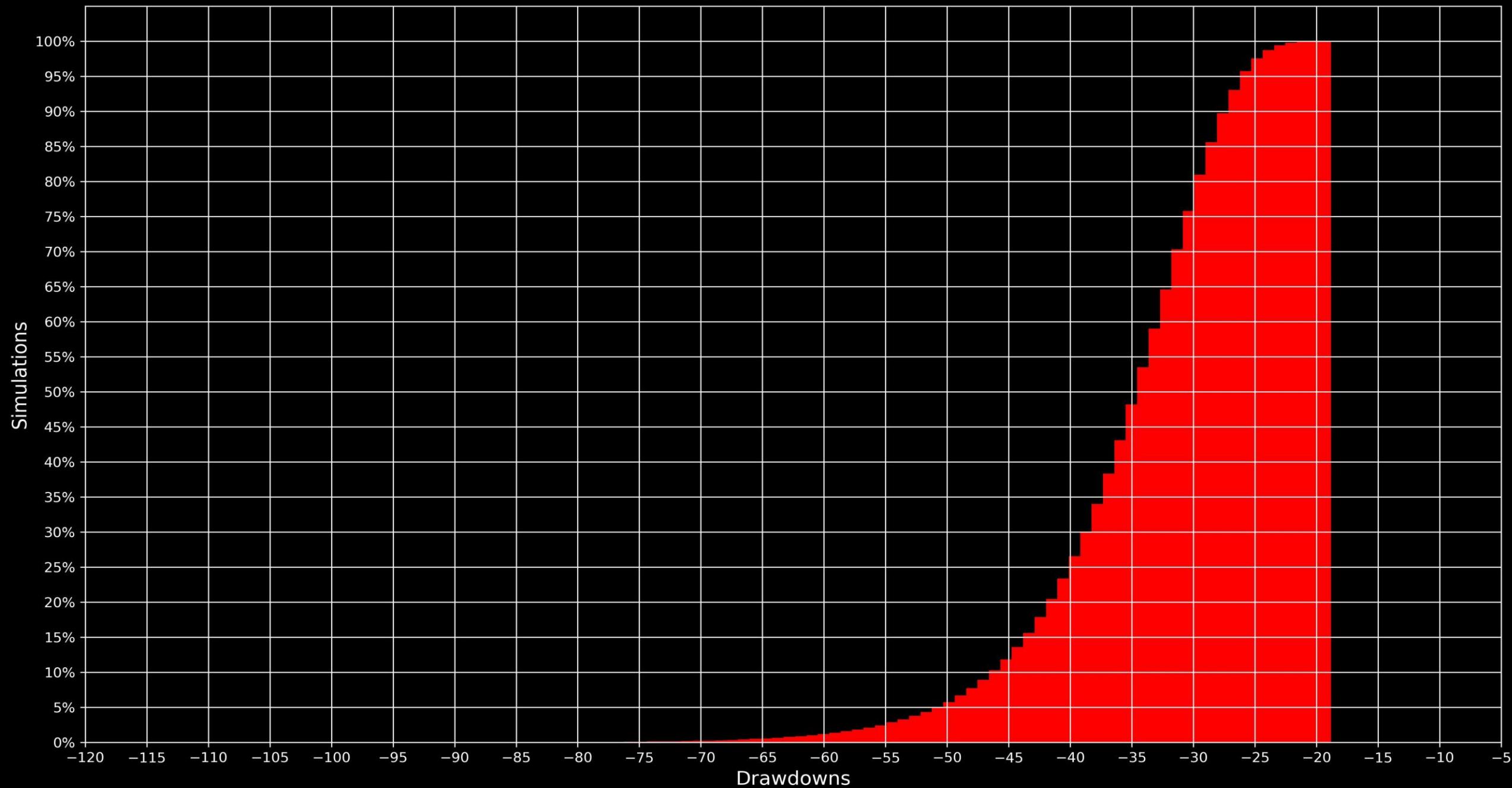
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis
Valley To Base Drawdown Histogram
Simulations: 100000



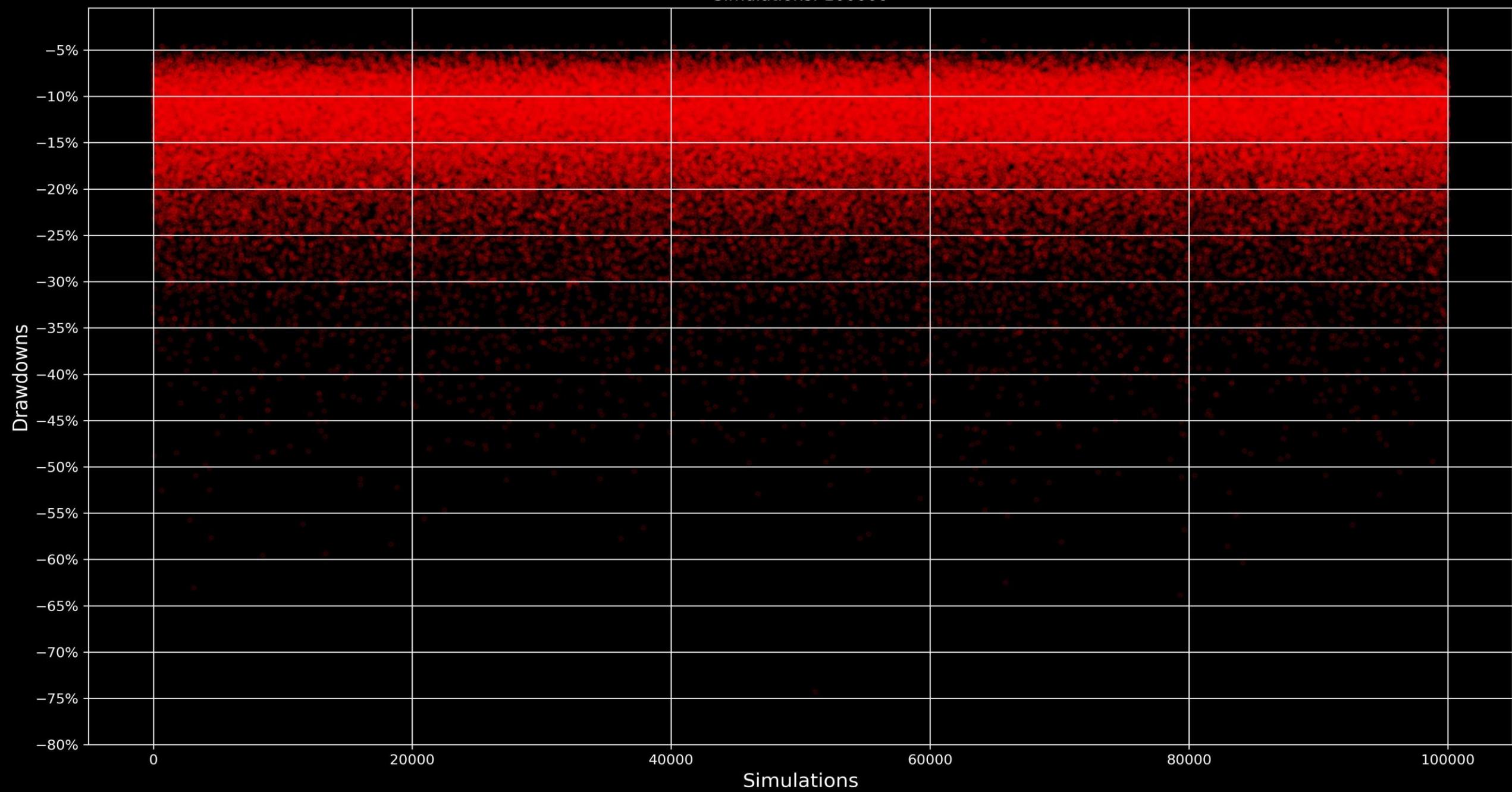
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis
Valley To Peak Drawdown Histogram (Cumulative)
Simulations: 100000



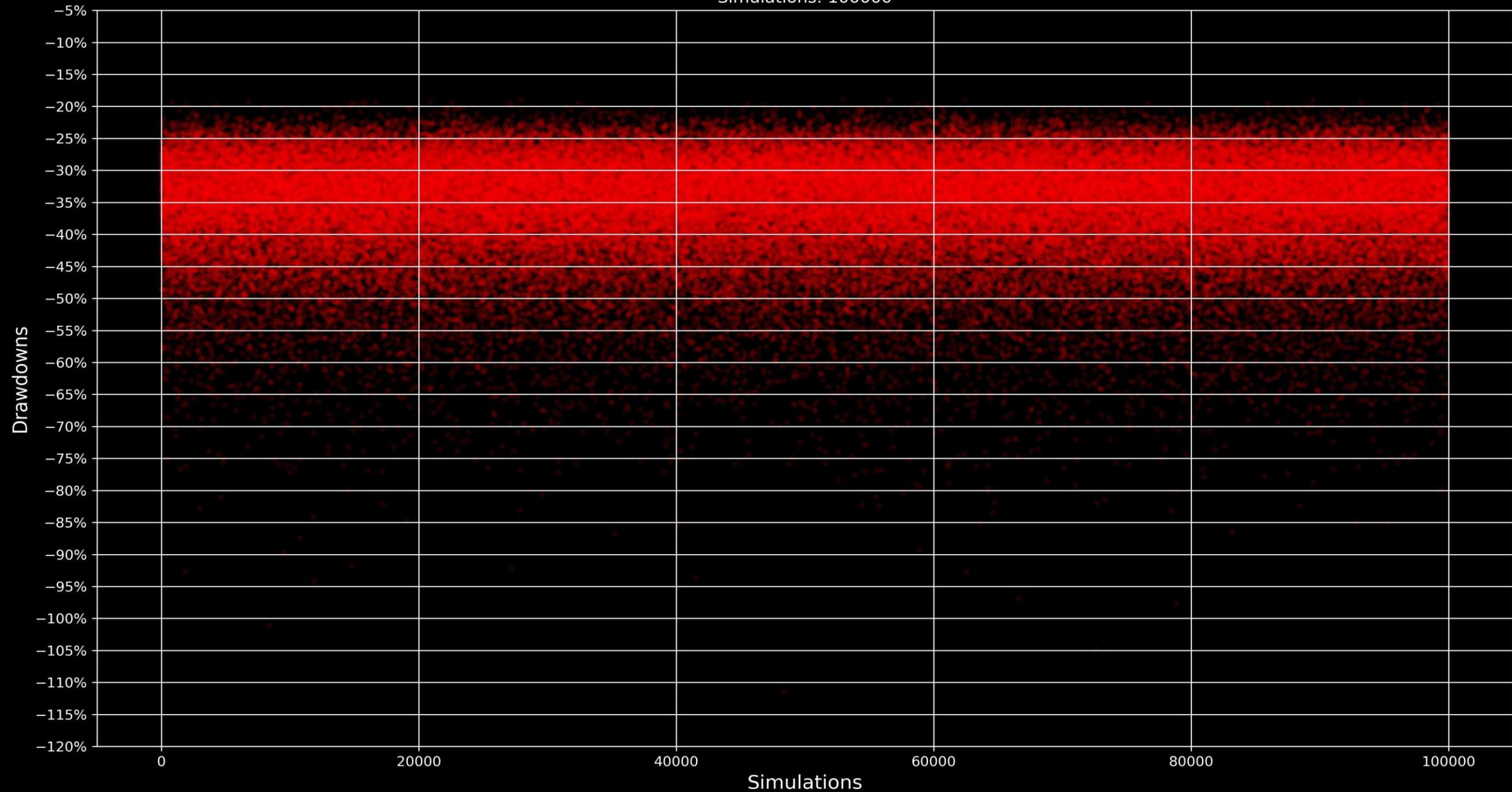
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis
Valley To Base Drawdown Histogram (Cumulative)
Simulations: 100000



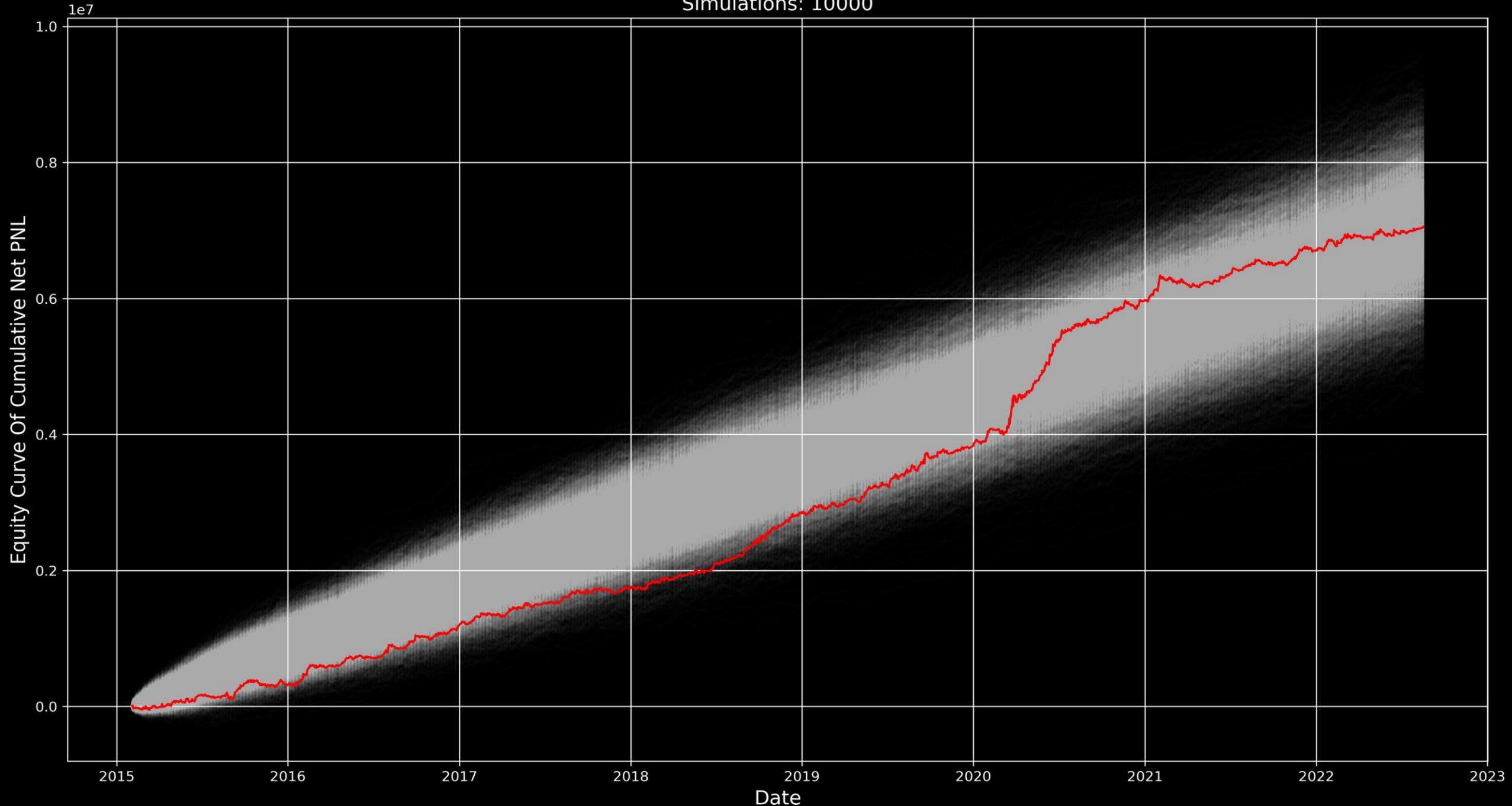
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis
Valley To Peak Drawdown Scatter Plot
Simulations: 100000



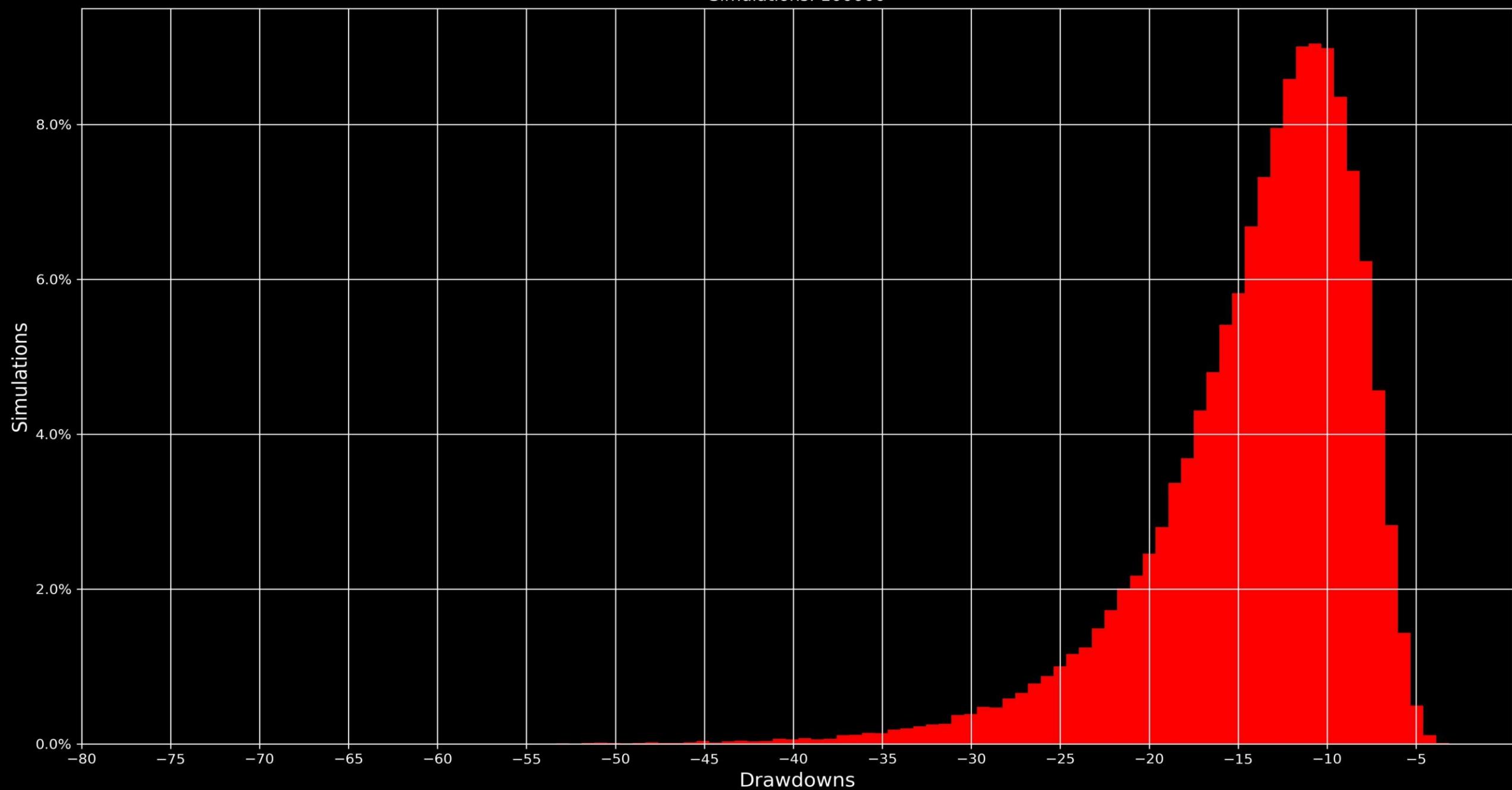
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis
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Simulations: 100000



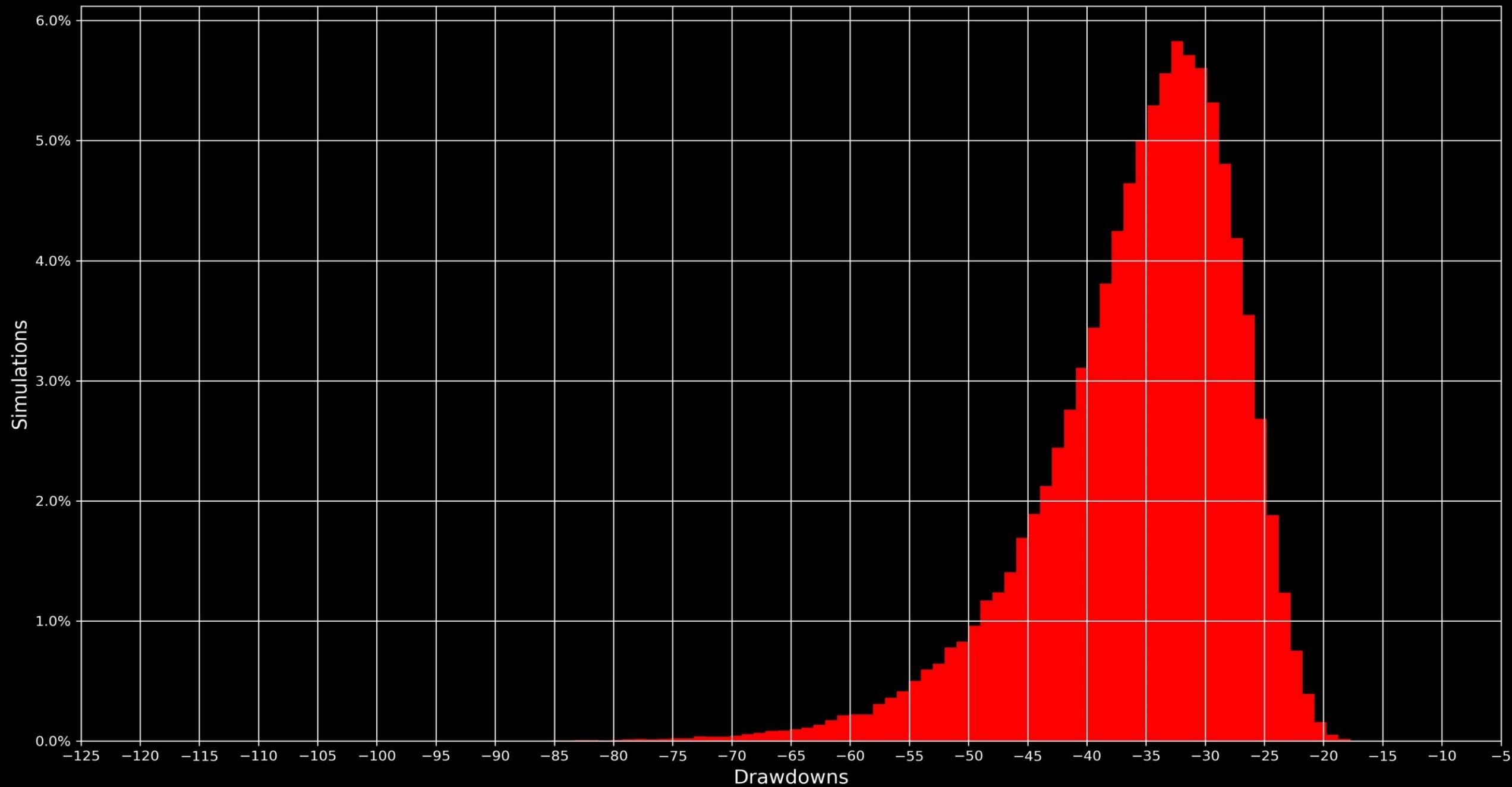
Monte Carlo Simulation (Re-sample)
Simulations: 10000



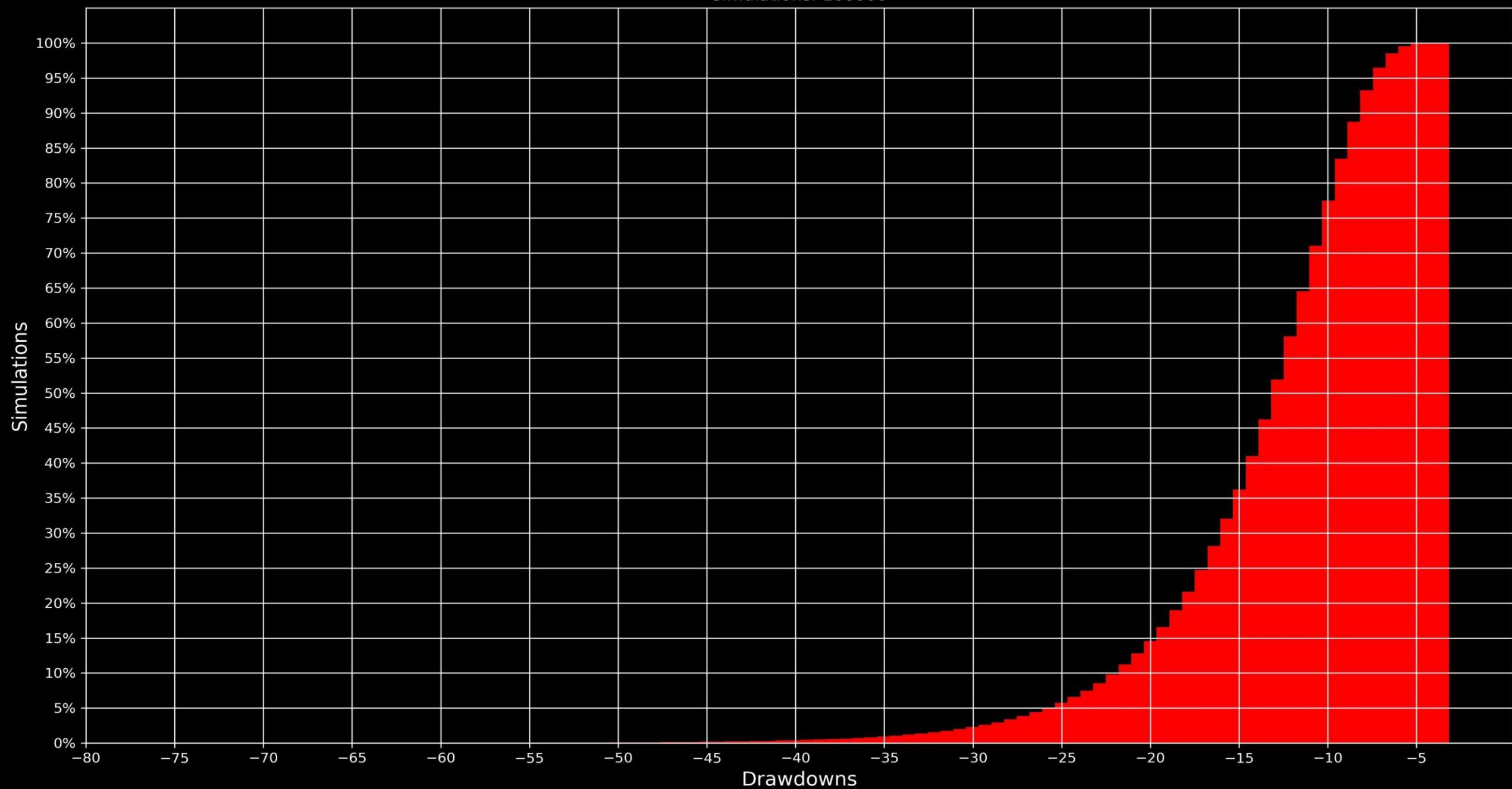
Monte Carlo Simulation (Re-sample) Drawdown Analysis
Valley To Peak Drawdown Histogram
Simulations: 100000



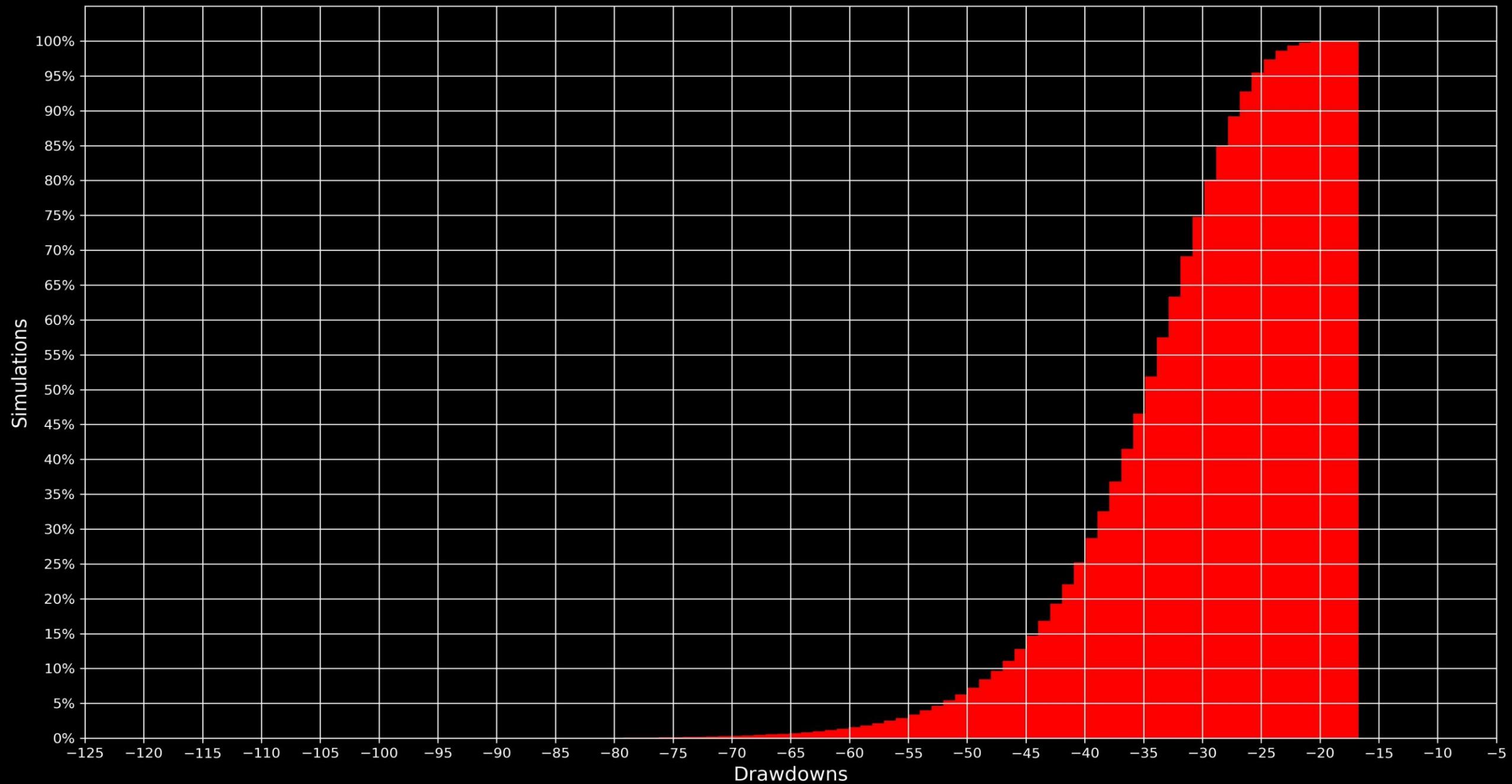
Monte Carlo Simulation (Re-sample) Drawdown Analysis
Valley To Base Drawdown Histogram
Simulations: 100000



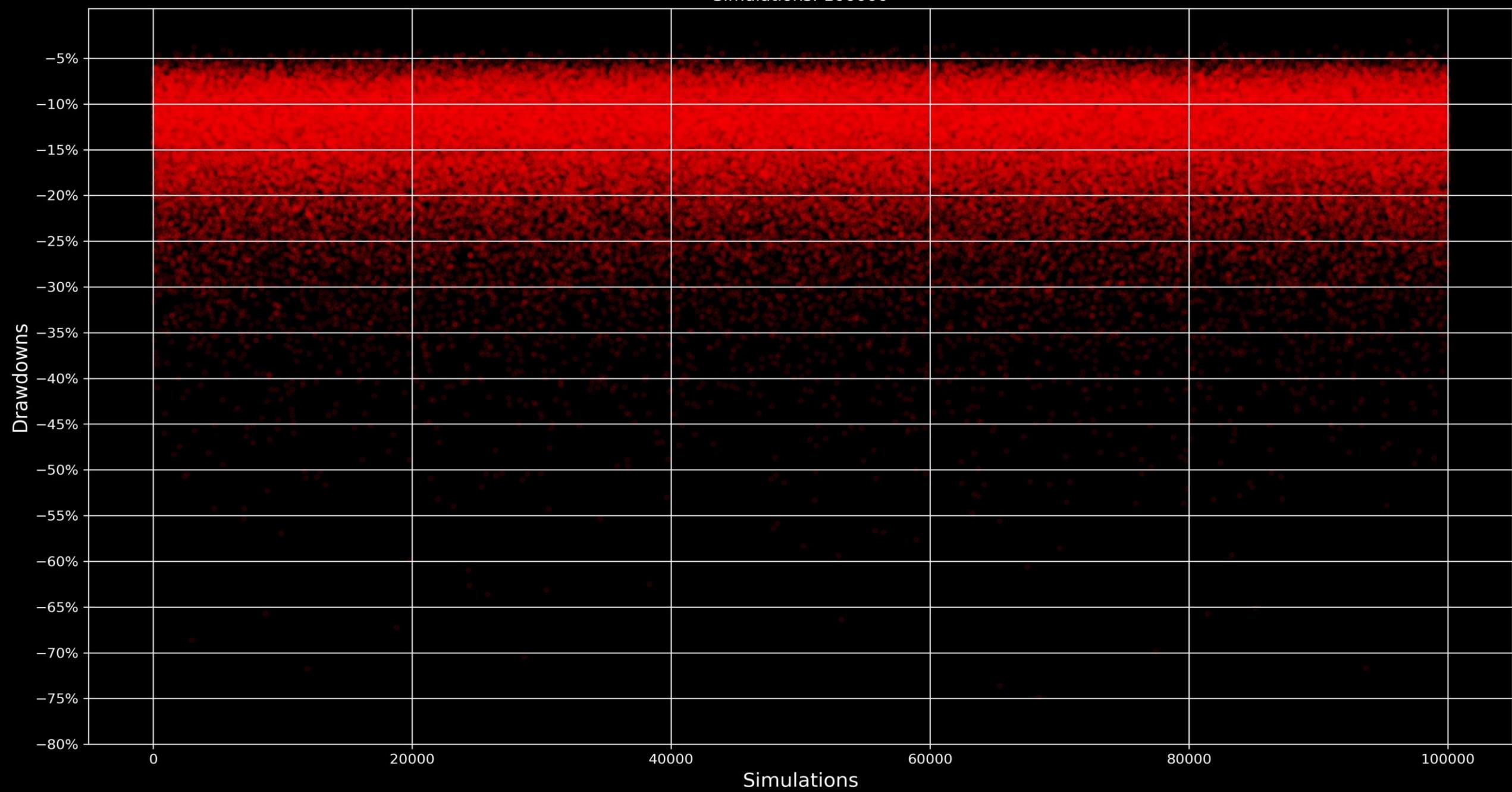
Monte Carlo Simulation (Re-sample) Drawdown Analysis
Valley To Peak Drawdown Histogram (Cumulative)
Simulations: 100000



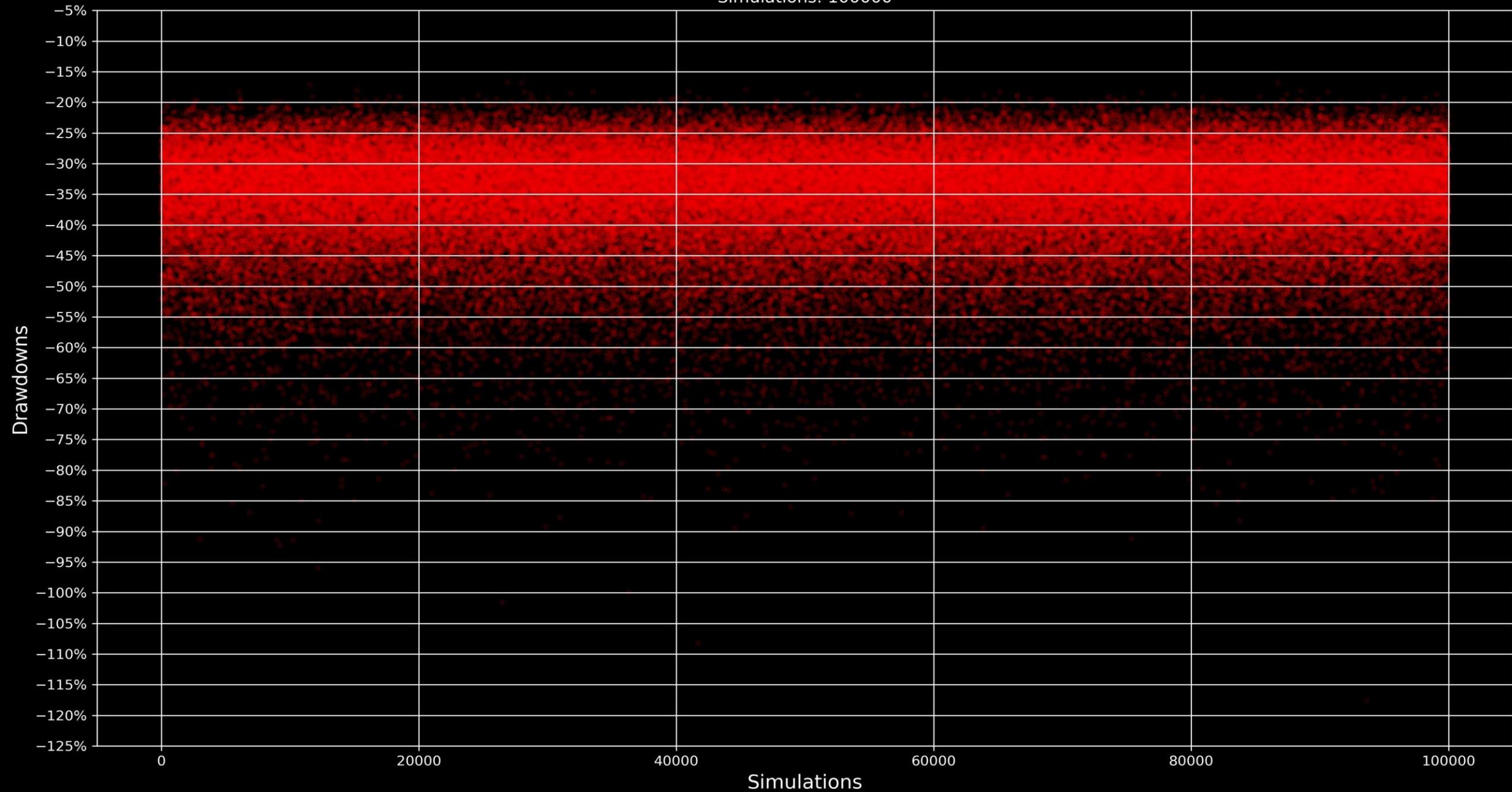
Monte Carlo Simulation (Re-sample) Drawdown Analysis
Valley To Base Drawdown Histogram (Cumulative)
Simulations: 100000



Monte Carlo Simulation (Re-sample) Drawdown Analysis
Valley To Peak Drawdown Scatter Plot
Simulations: 100000



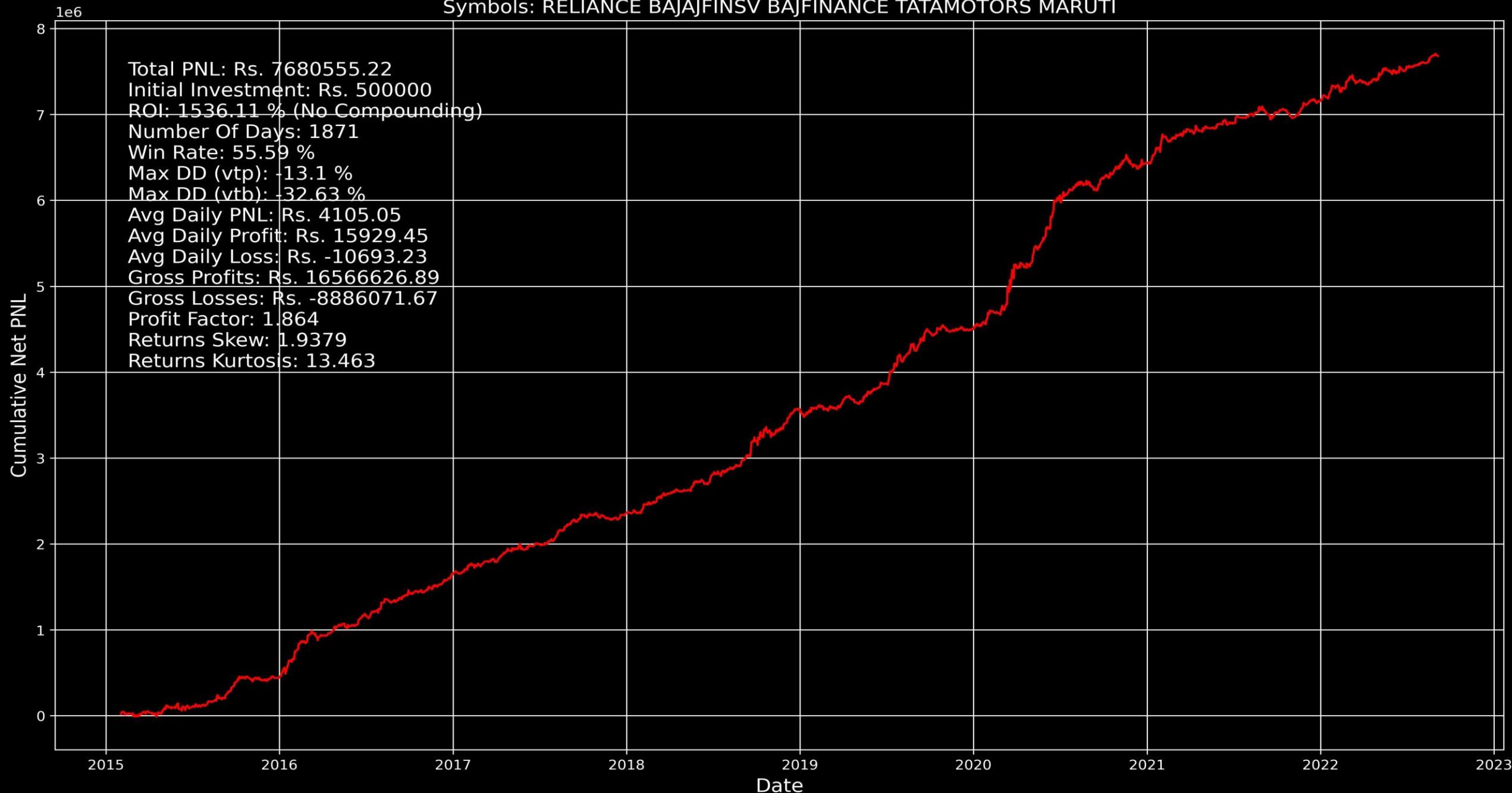
Monte Carlo Simulation (Re-sample) Drawdown Analysis
Valley To Base Drawdown Scatter Plot
Simulations: 100000



Fixed Symbol Basket (ORB Core Block)

Basket Performance
System: Morning Range System V2

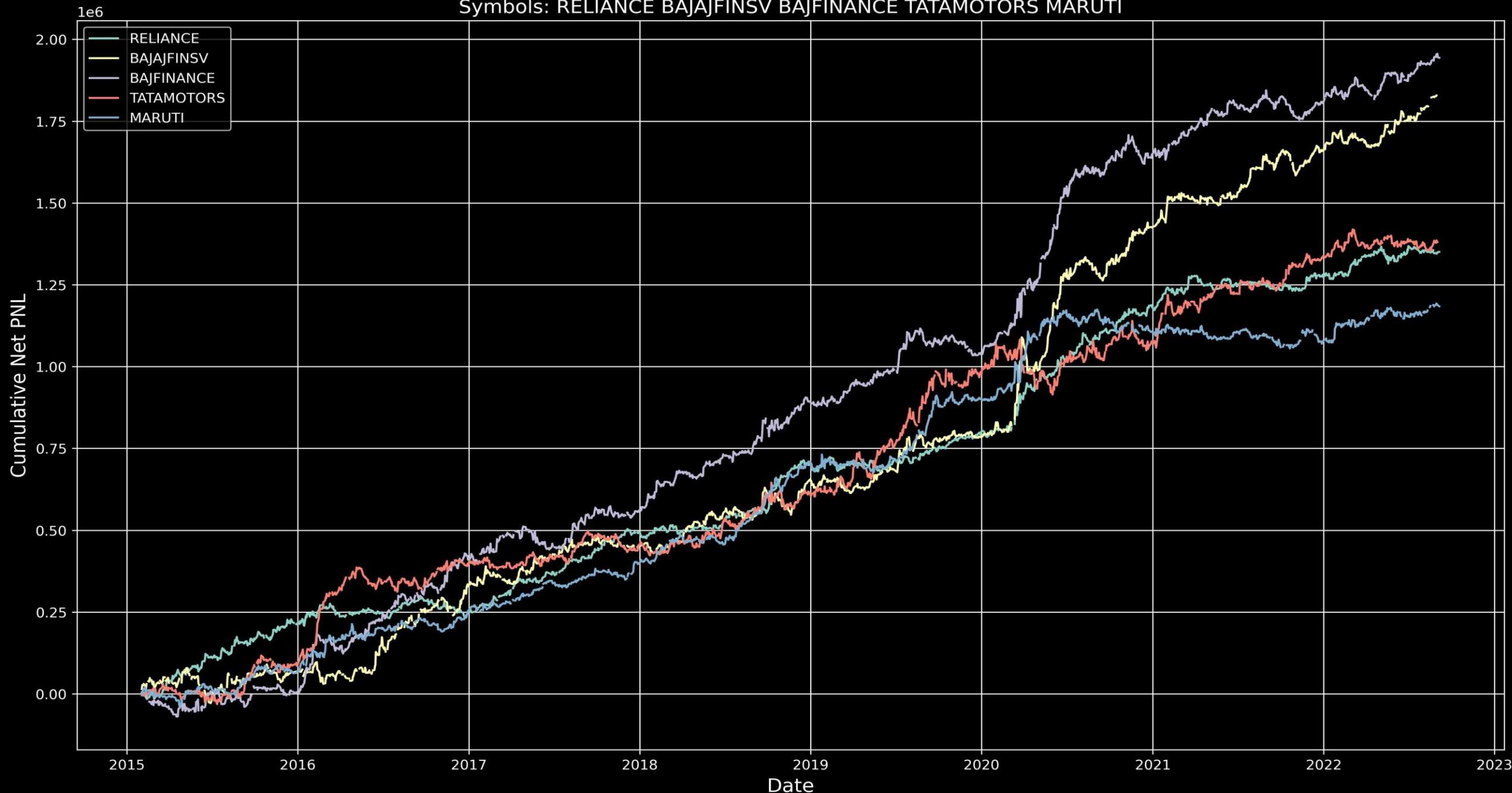
Symbols: RELIANCE BAJAJFINSV BAJFINANCE TATAMOTORS MARUTI



Symbol-wise Performance Of Basket

System: Morning Range System V2

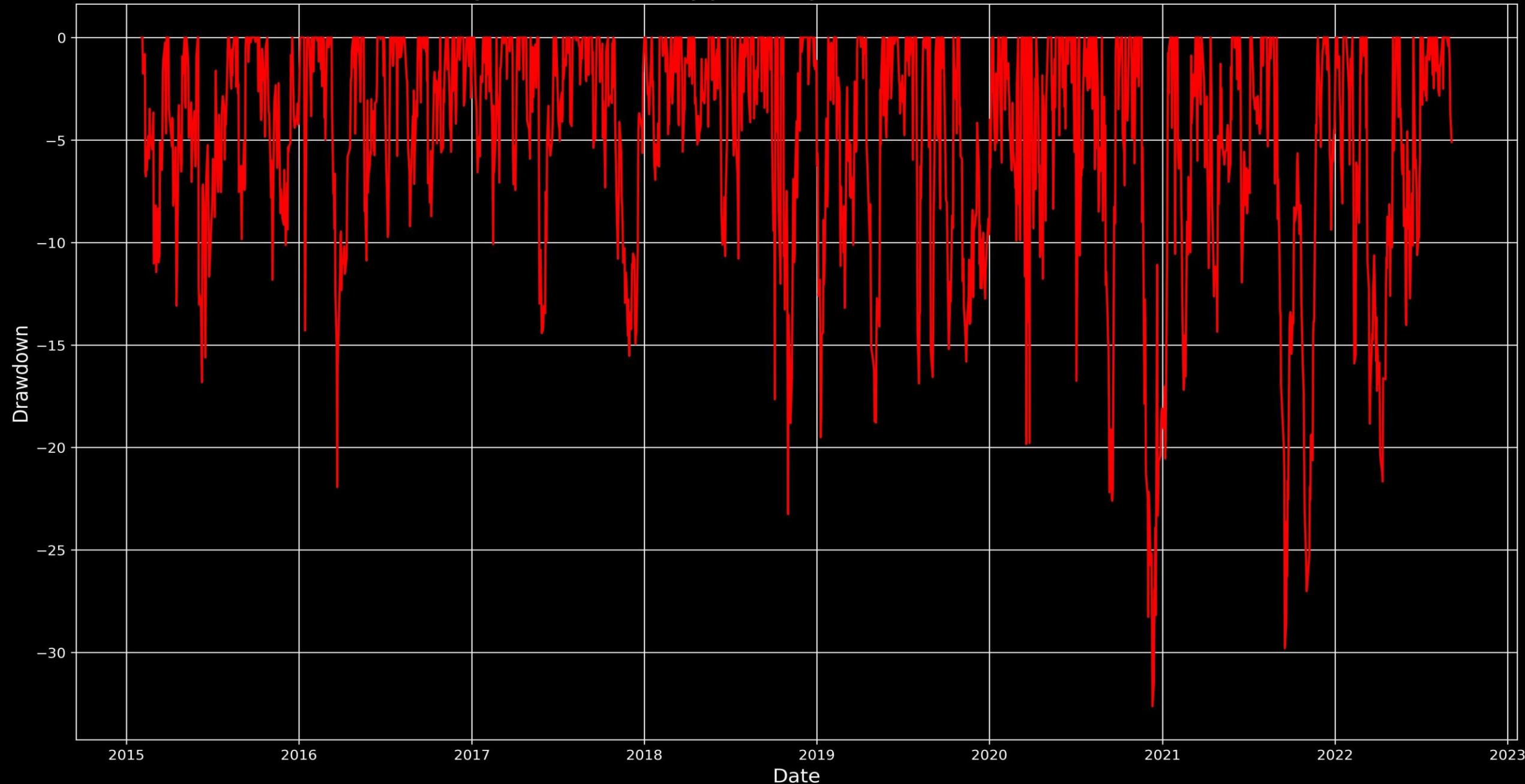
Symbols: RELIANCE BAJAJFINSV BAJFINANCE TATAMOTORS MARUTI



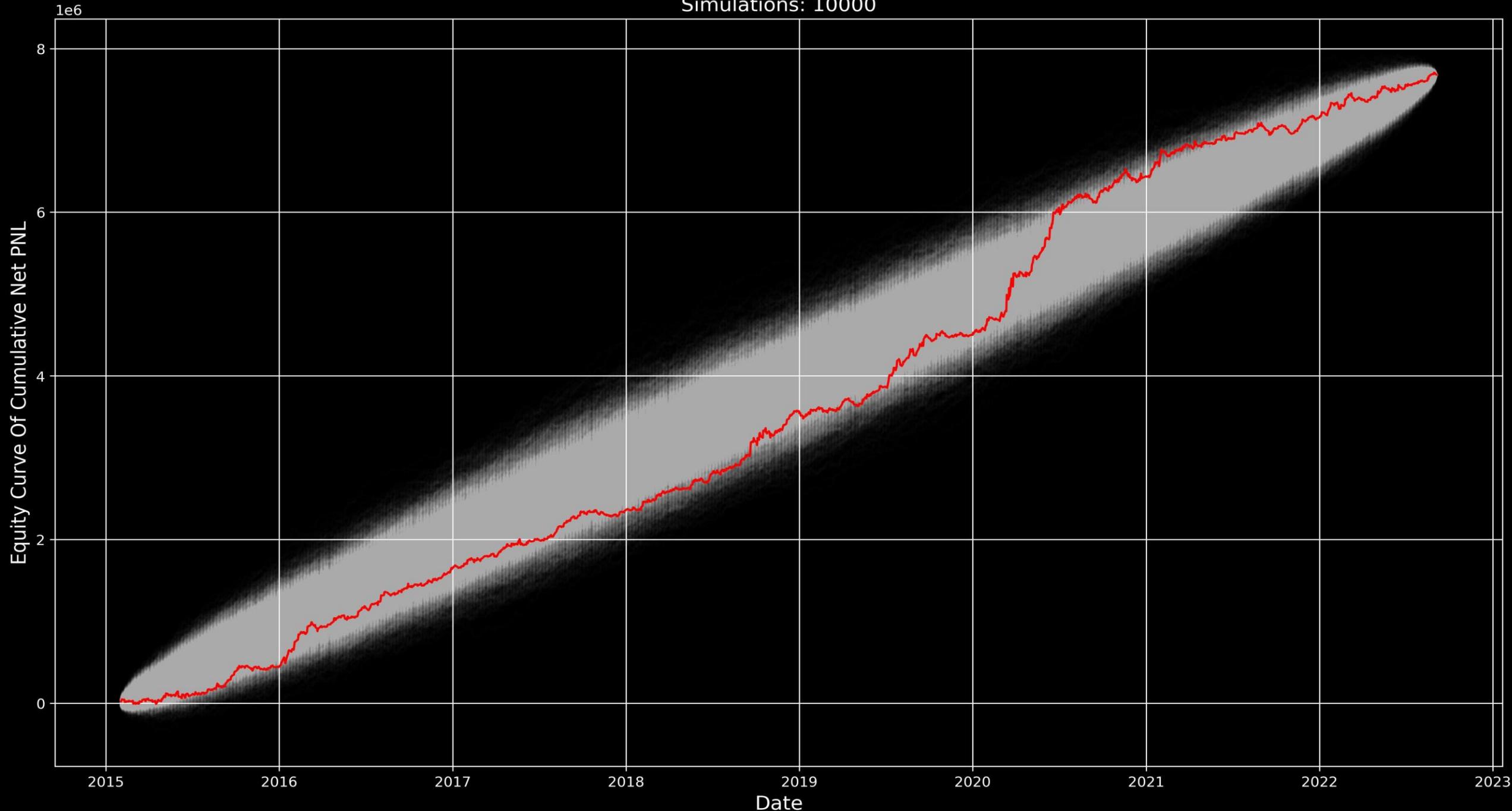
Basket Draw-down Underwater Curve (vtb)

System: Morning Range System V2

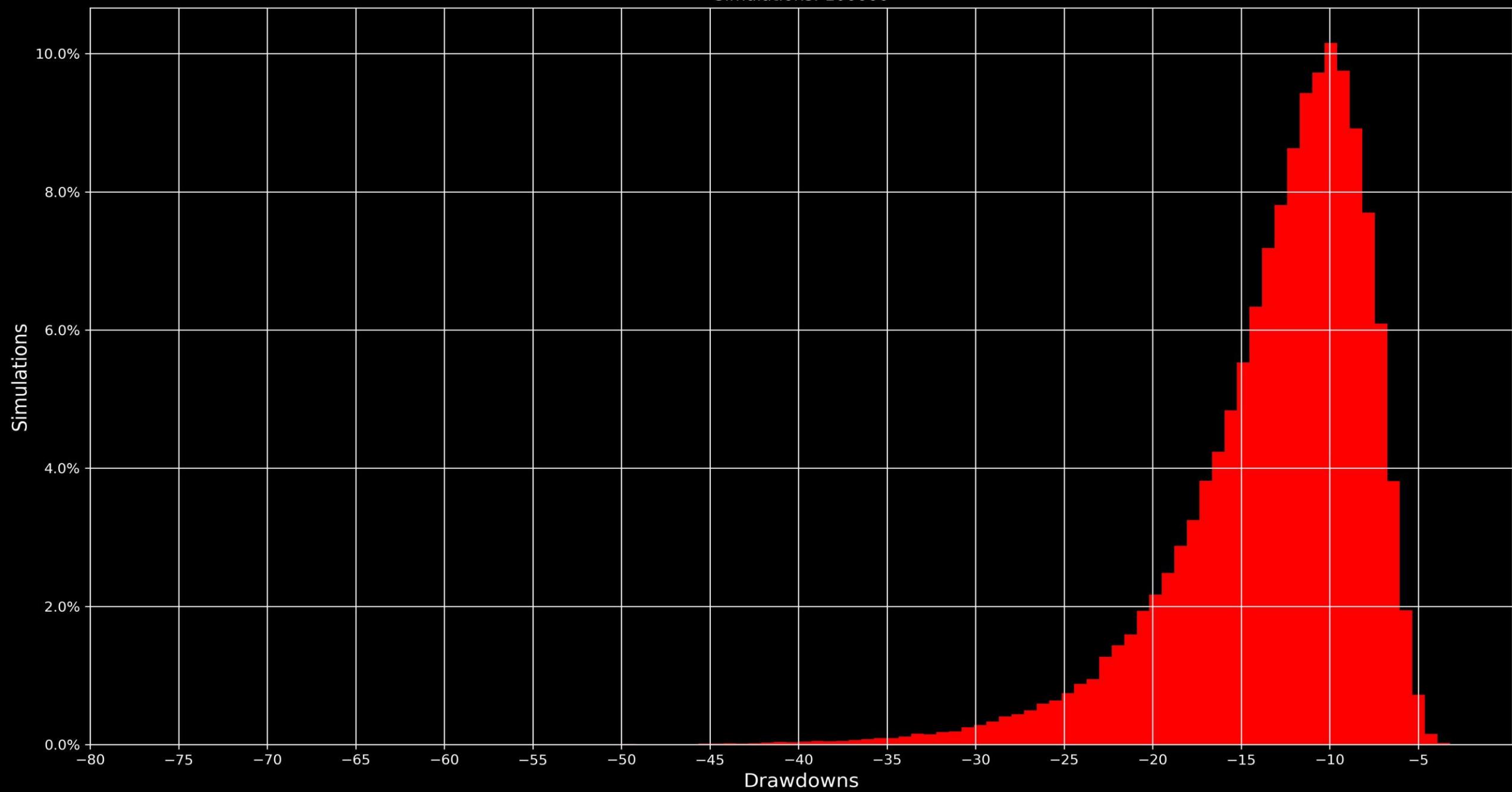
Symbols: RELIANCE BAJAJFINSV BAJFINANCE TATAMOTORS MARUTI



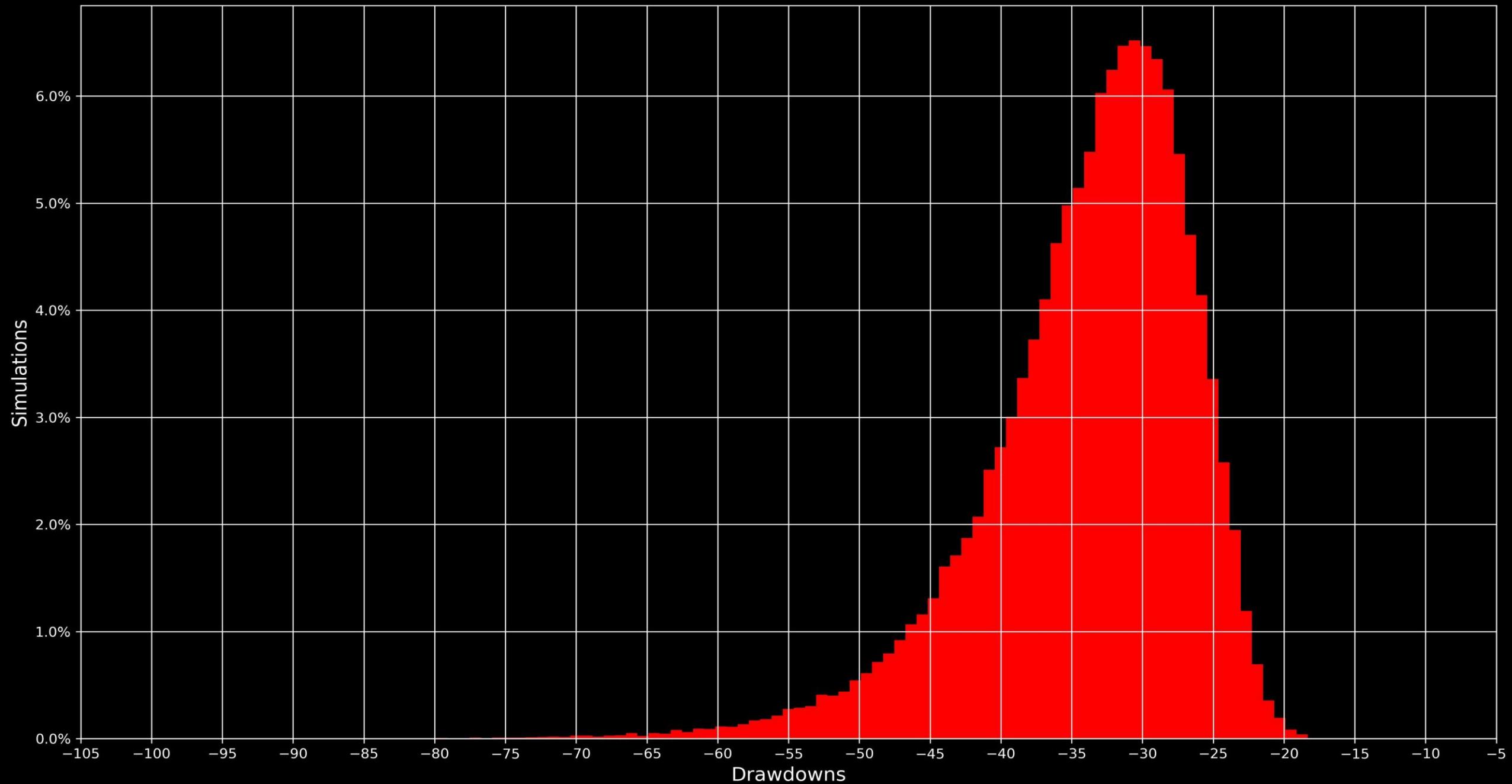
Monte Carlo Simulation (Re-shuffle)
Simulations: 10000



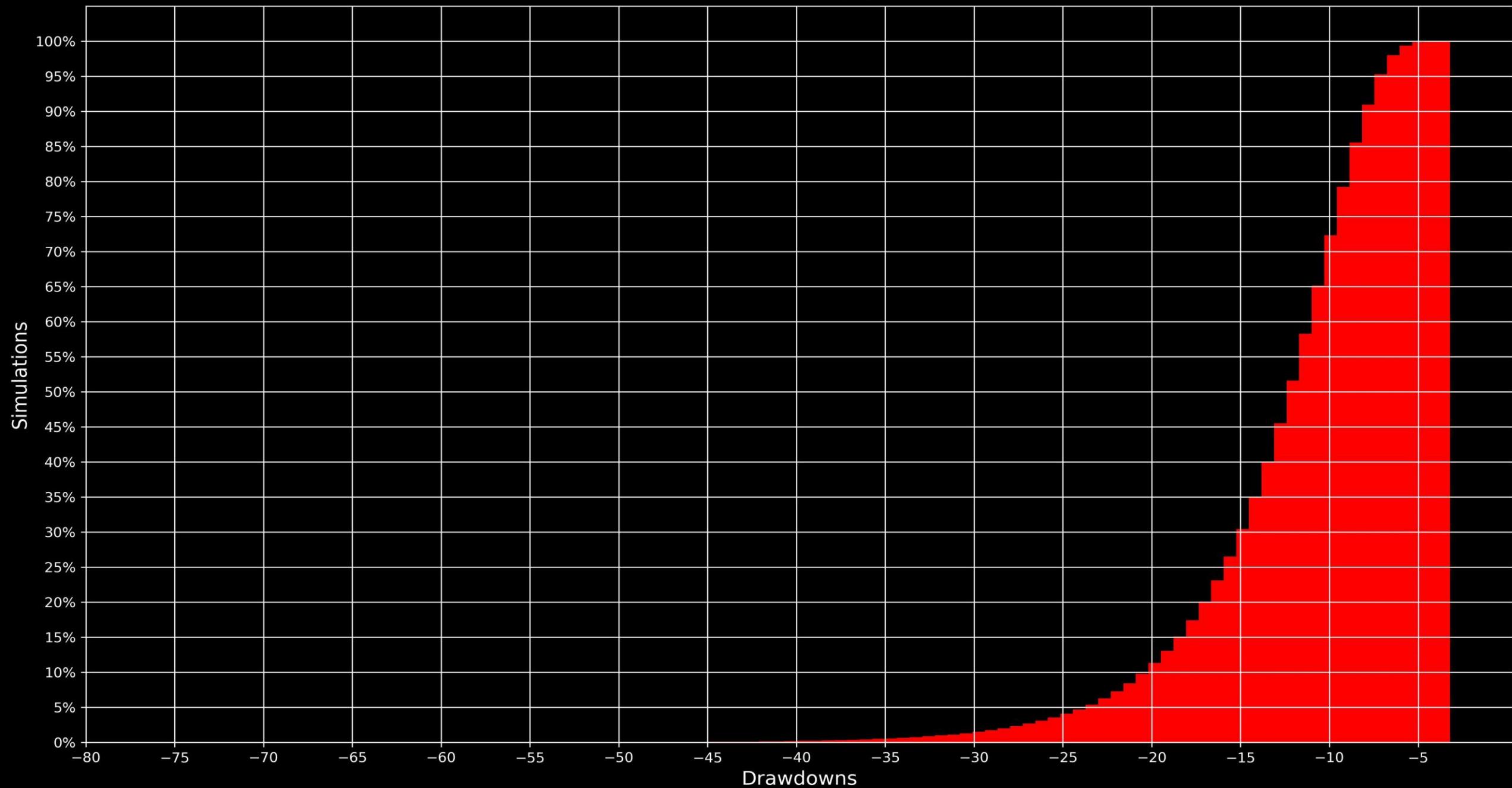
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis
Valley To Peak Drawdown Histogram
Simulations: 100000



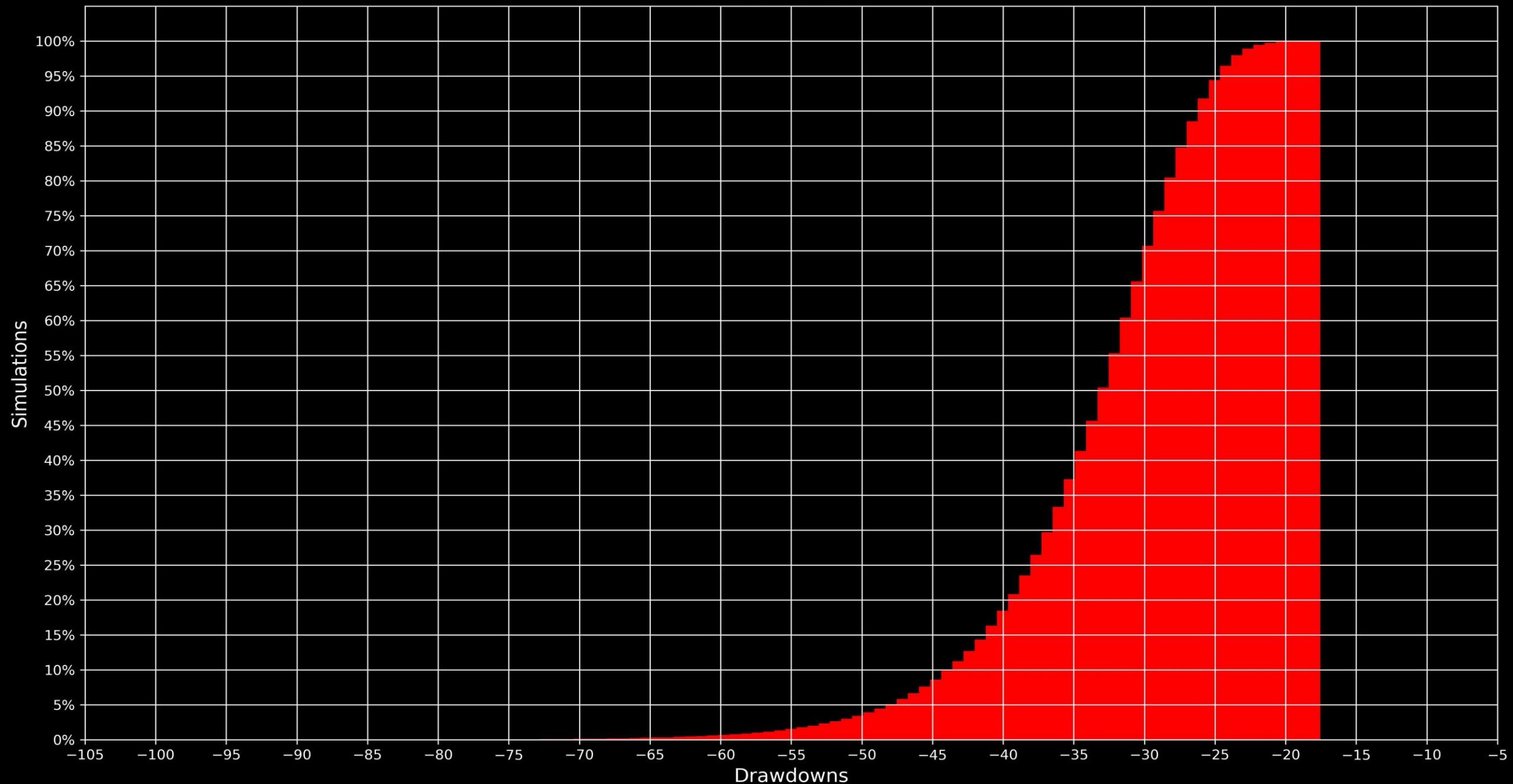
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis
Valley To Base Drawdown Histogram
Simulations: 100000



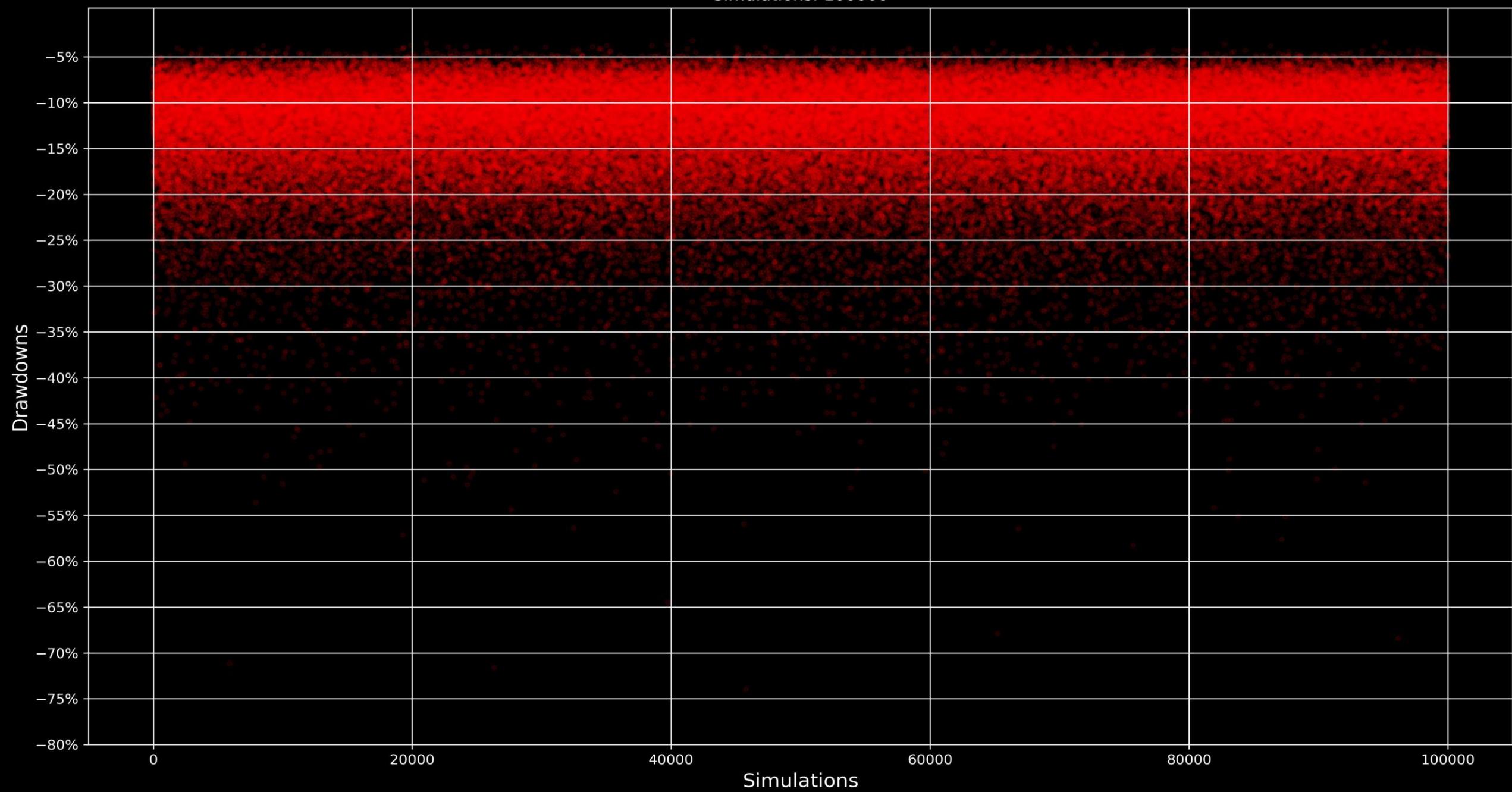
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis
Valley To Peak Drawdown Histogram (Cumulative)
Simulations: 100000



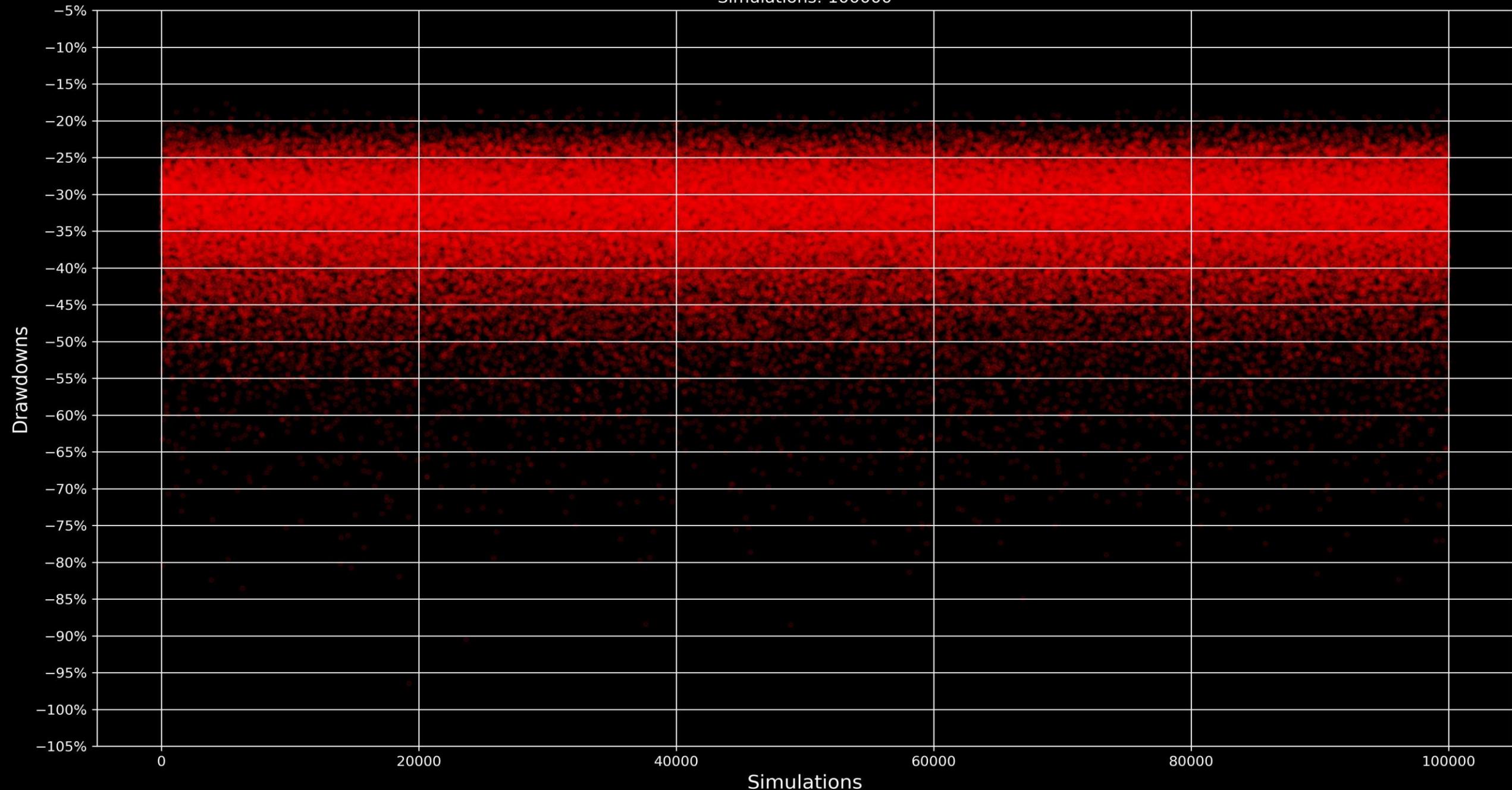
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis
Valley To Base Drawdown Histogram (Cumulative)
Simulations: 100000



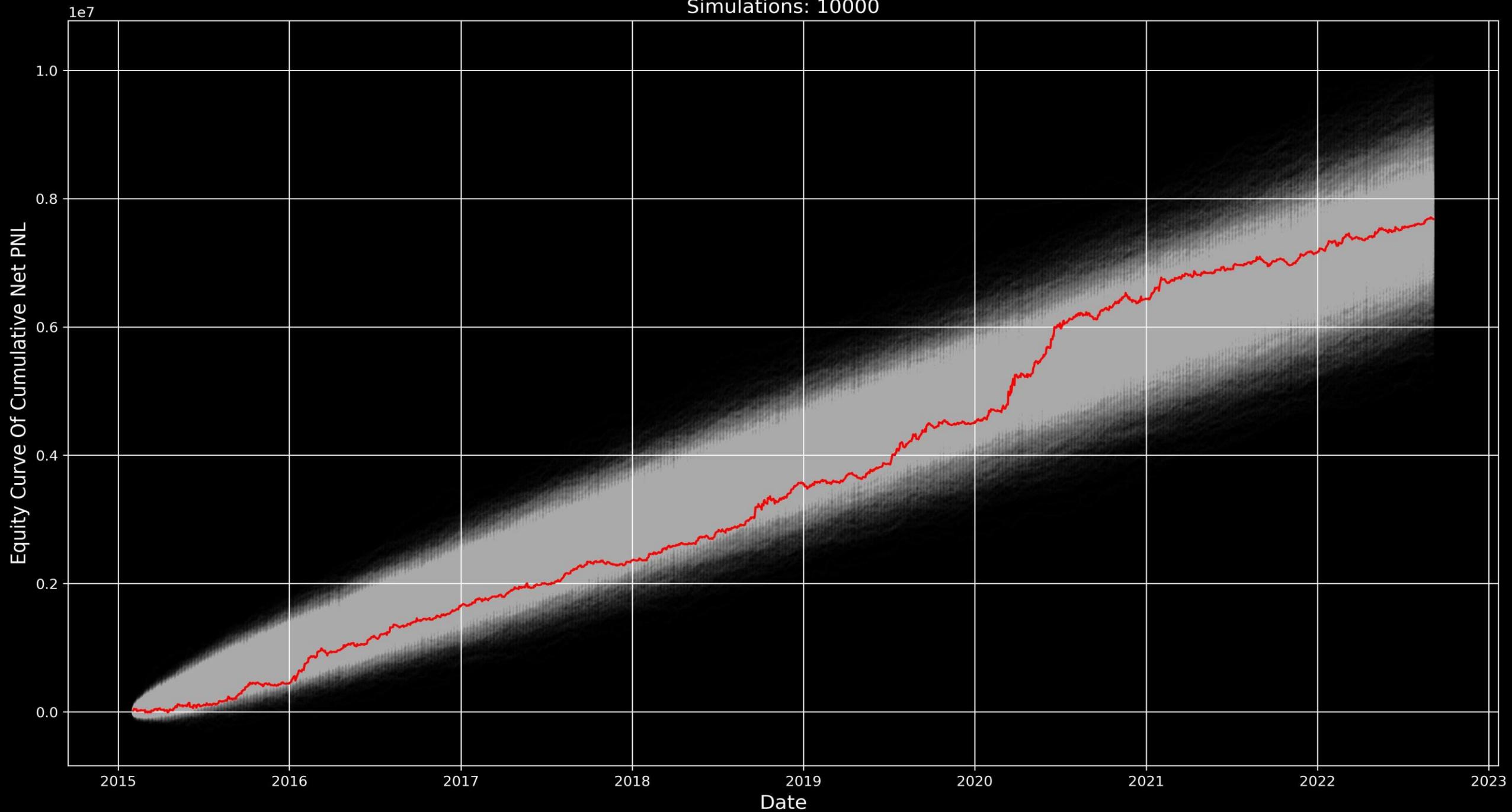
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis
Valley To Peak Drawdown Scatter Plot
Simulations: 100000



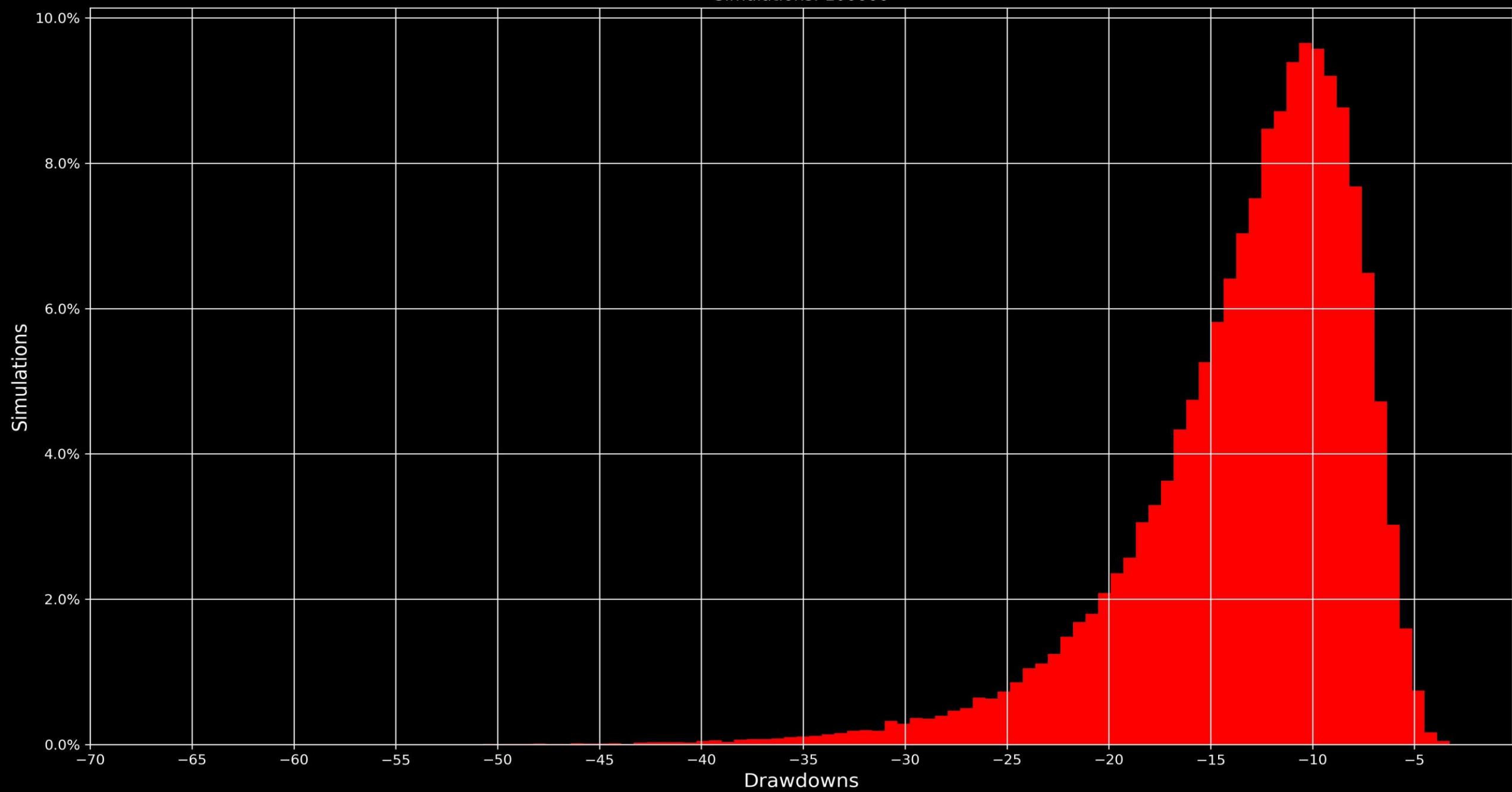
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis
Valley To Base Drawdown Scatter Plot
Simulations: 100000



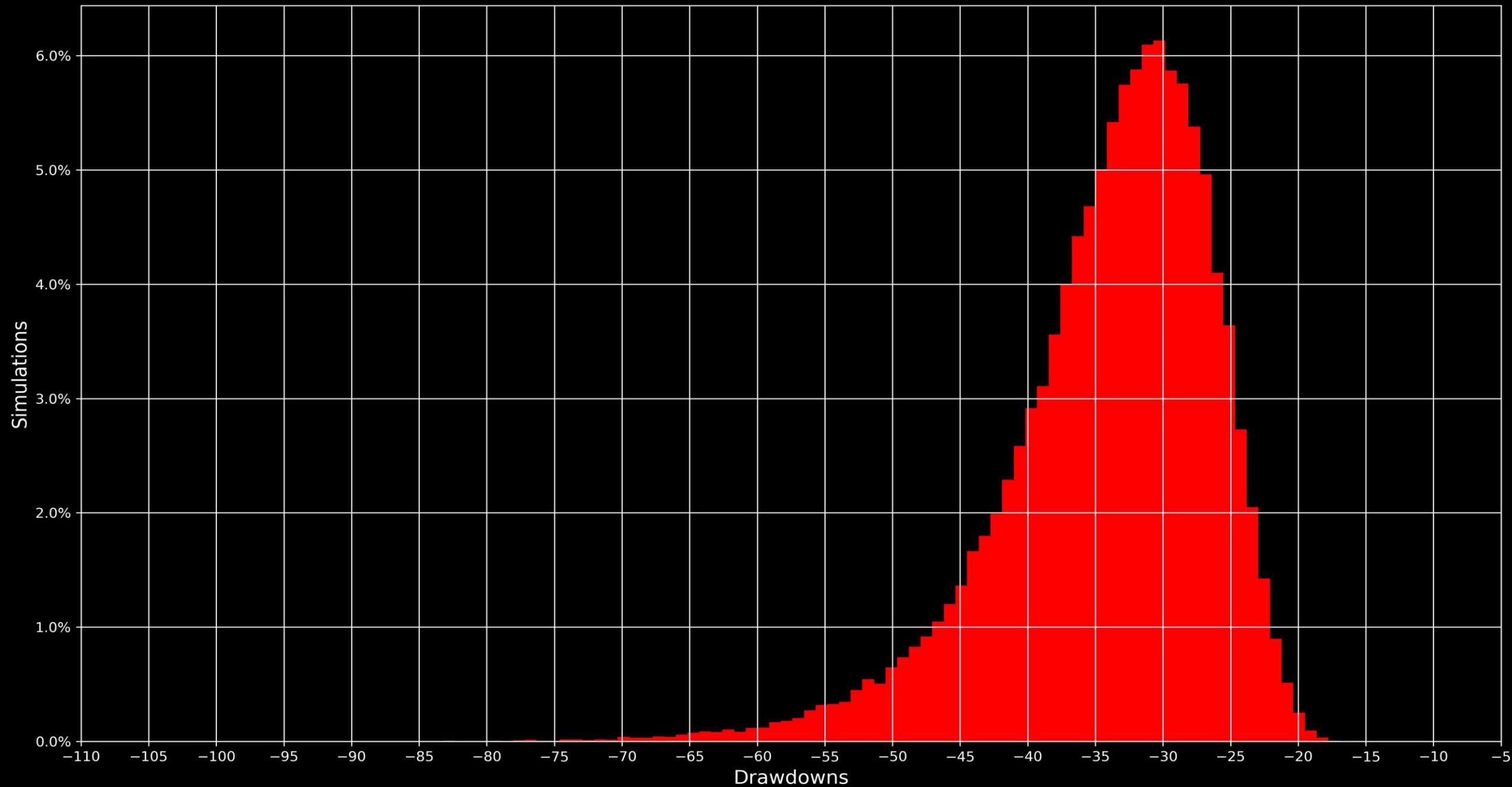
Monte Carlo Simulation (Re-sample)
Simulations: 10000



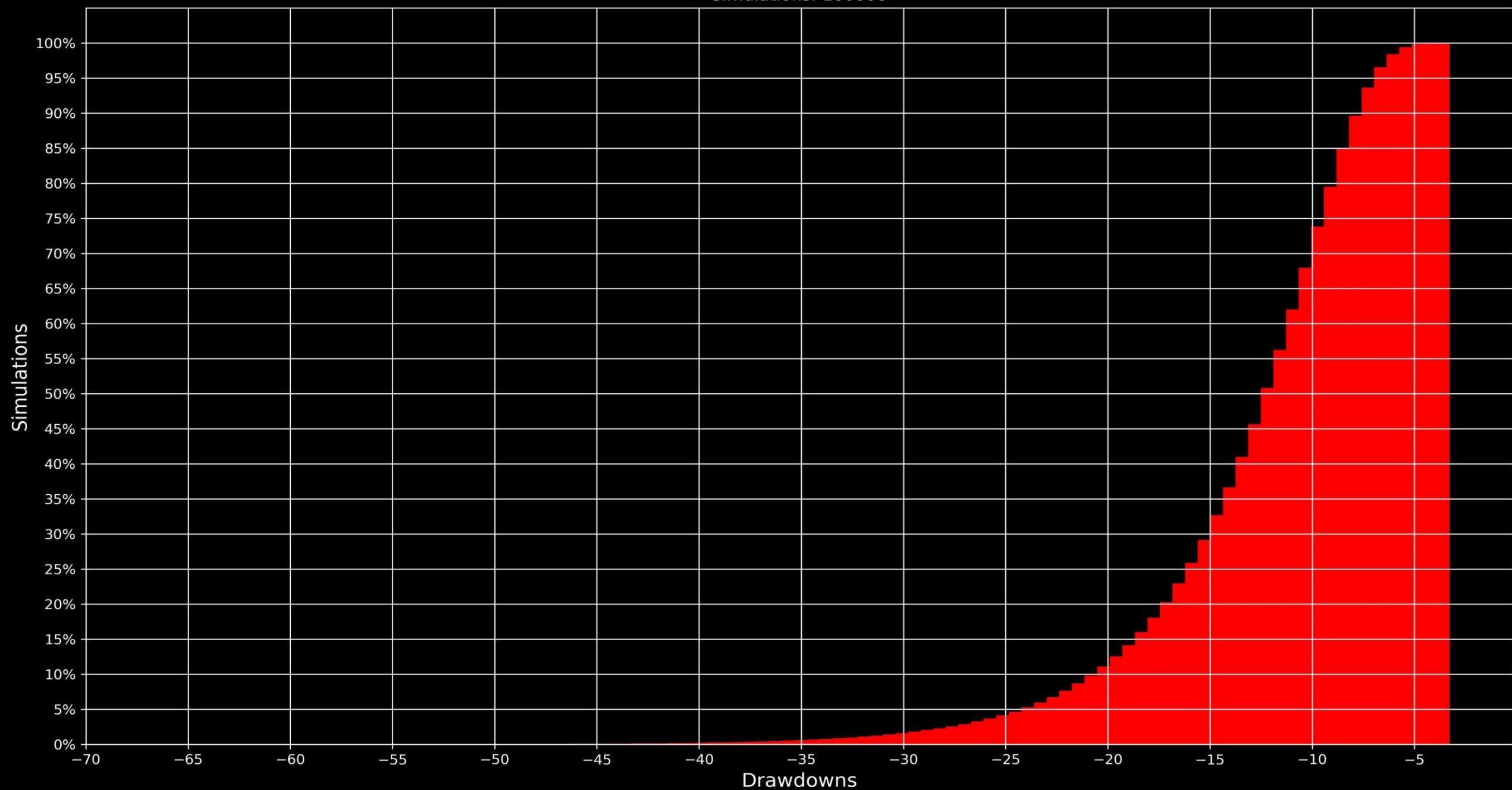
Monte Carlo Simulation (Re-sample) Drawdown Analysis
Valley To Peak Drawdown Histogram
Simulations: 100000



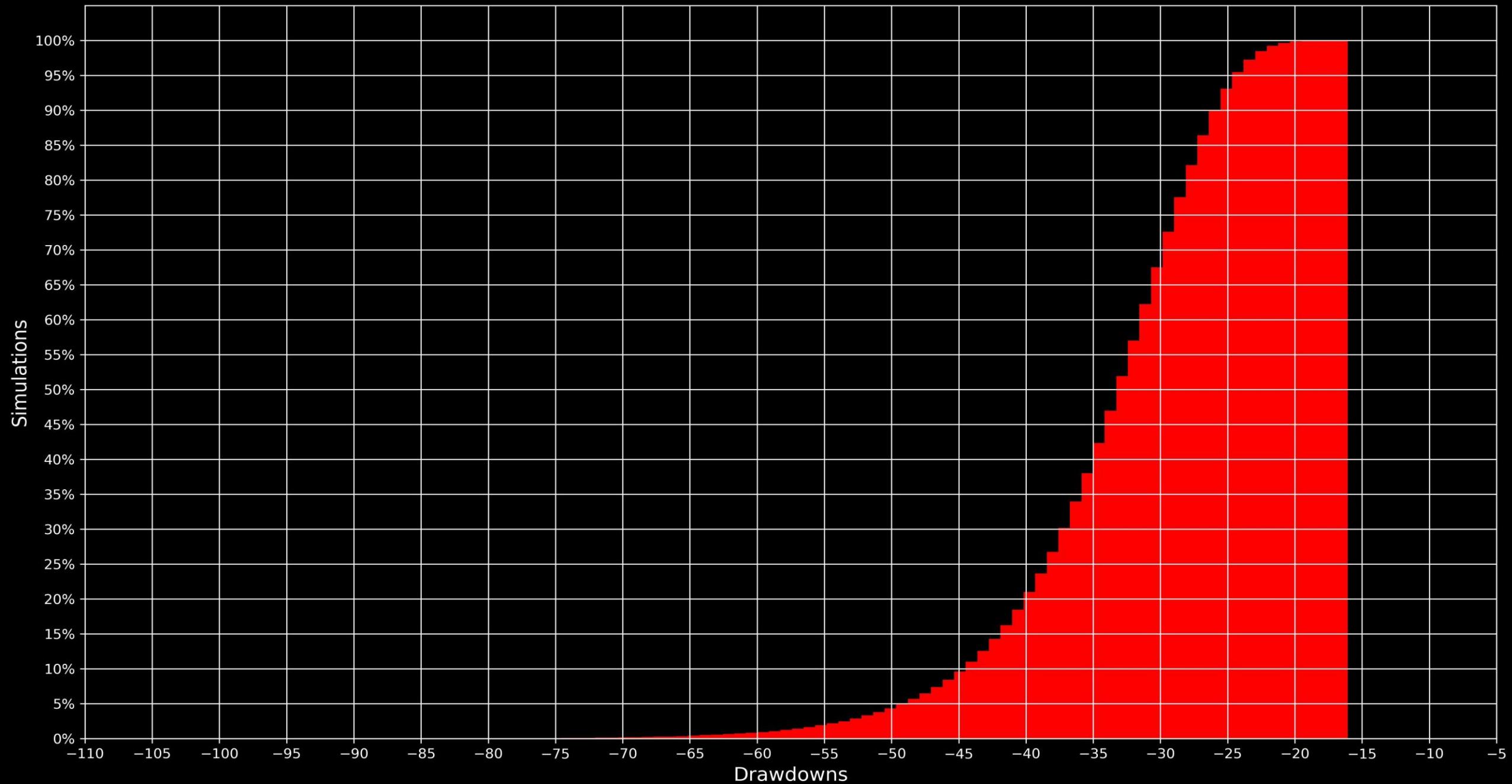
Monte Carlo Simulation (Re-sample) Drawdown Analysis
Valley To Base Drawdown Histogram
Simulations: 100000



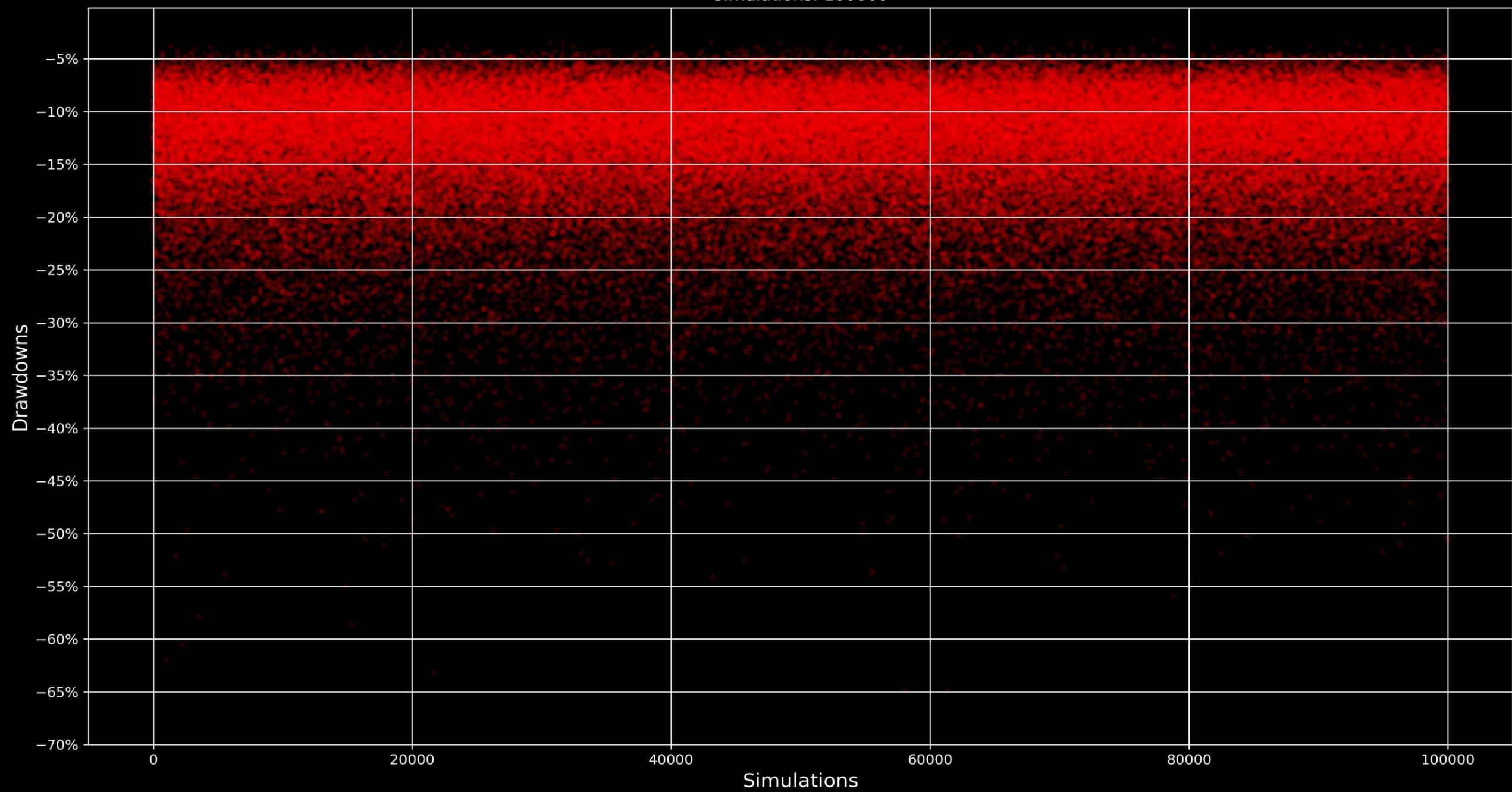
Monte Carlo Simulation (Re-sample) Drawdown Analysis
Valley To Peak Drawdown Histogram (Cumulative)
Simulations: 100000



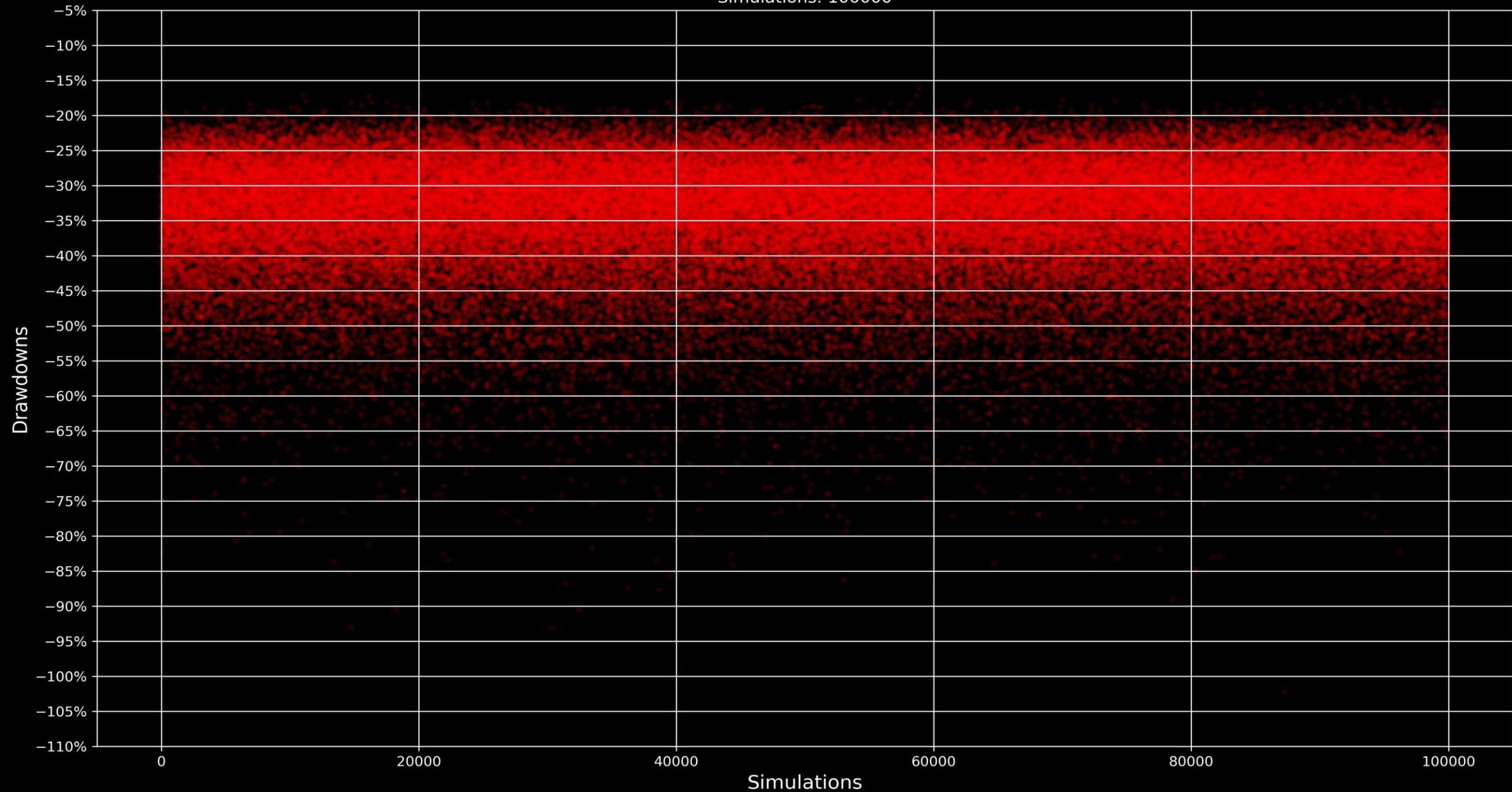
Monte Carlo Simulation (Re-sample) Drawdown Analysis Valley To Base Drawdown Histogram (Cumulative) Simulations: 100000



Monte Carlo Simulation (Re-sample) Drawdown Analysis
Valley To Peak Drawdown Scatter Plot
Simulations: 100000

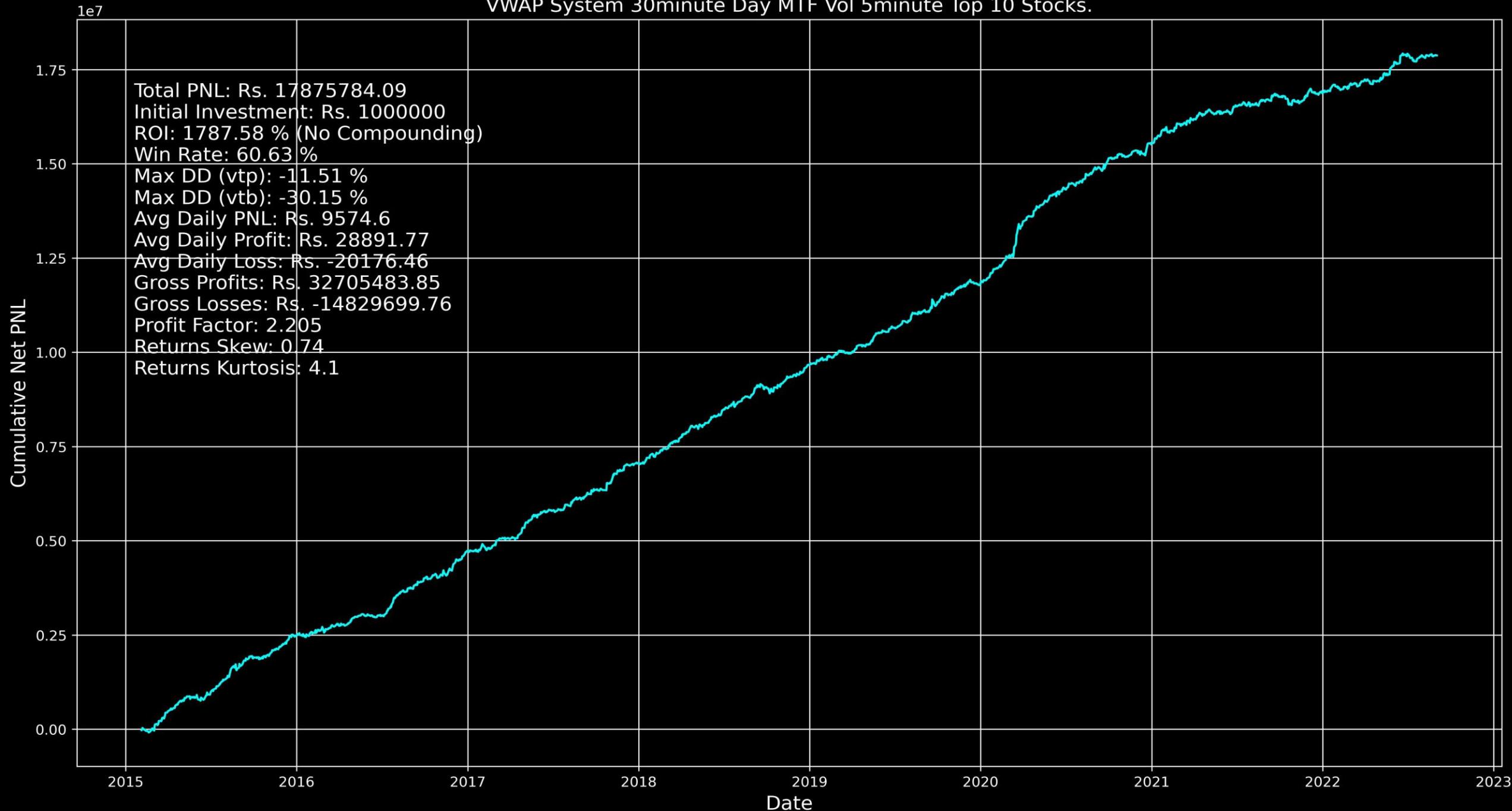


Monte Carlo Simulation (Re-sample) Drawdown Analysis
Valley To Base Drawdown Scatter Plot
Simulations: 100000

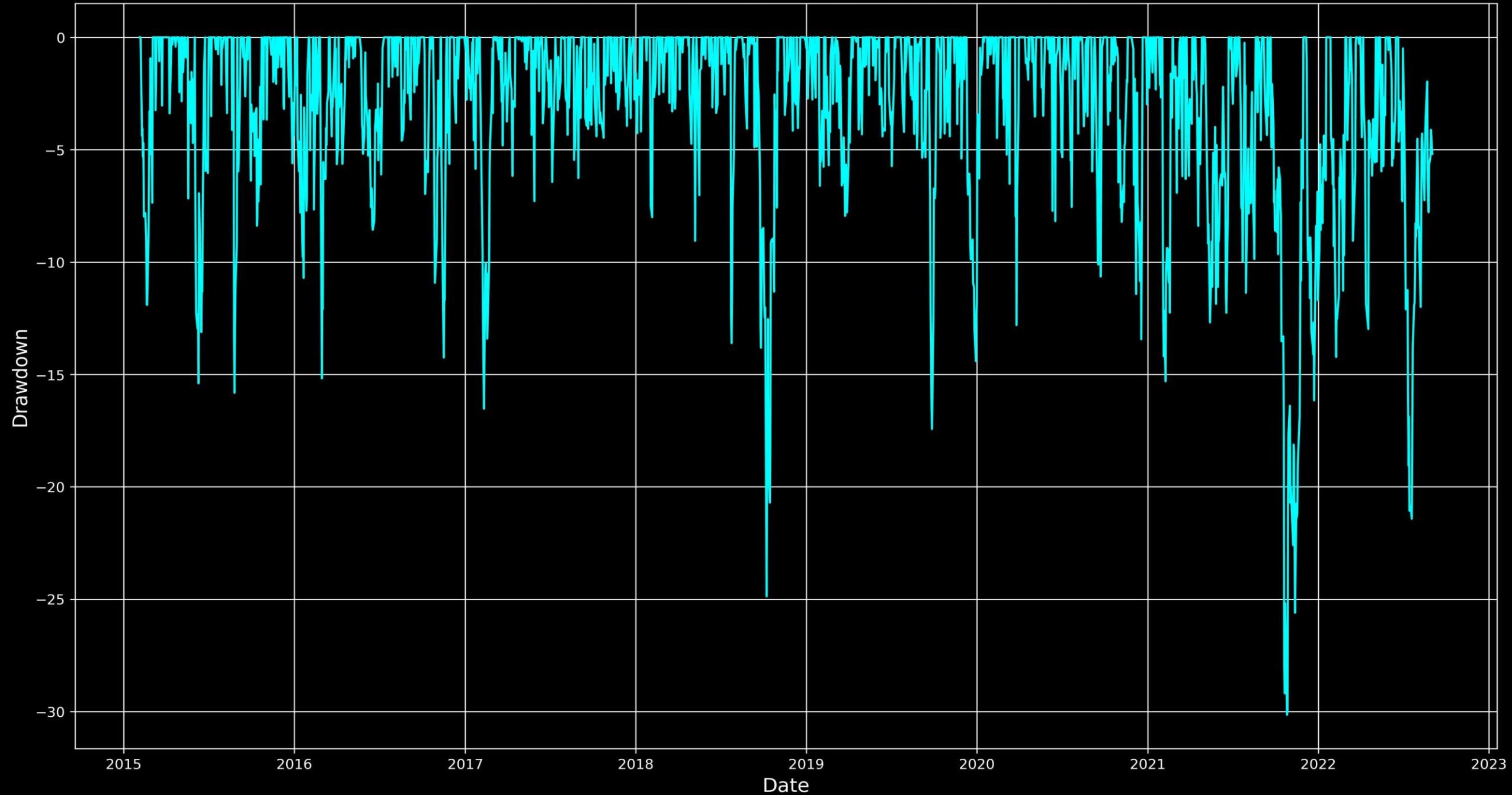


FNO Universe Ranked
Dynamic Basket
(VWAP Core Block)

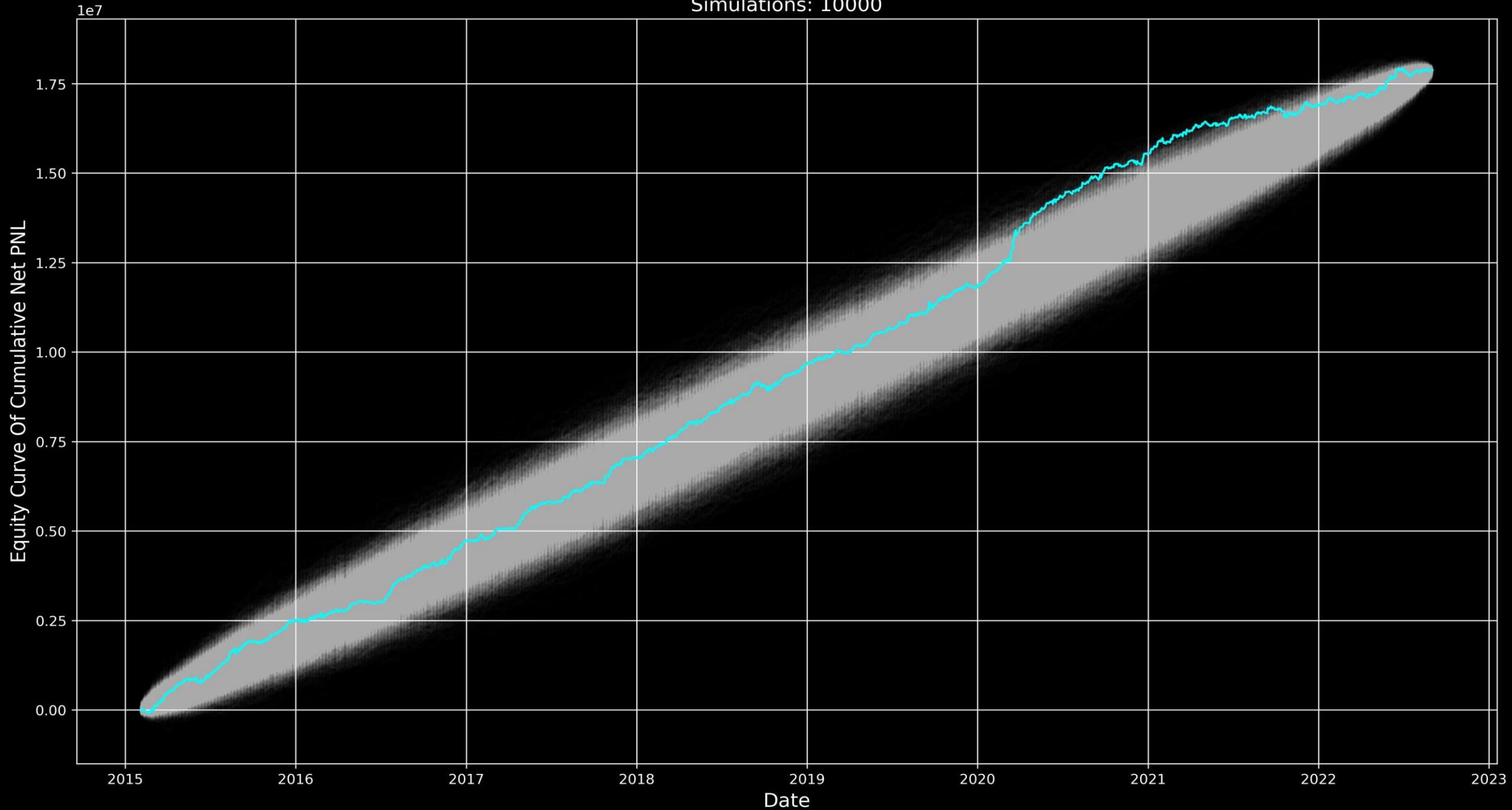
Ranked Universe System Performance (Day-wise)
VWAP System 30minute Day MTF Vol 5minute Top 10 Stocks.



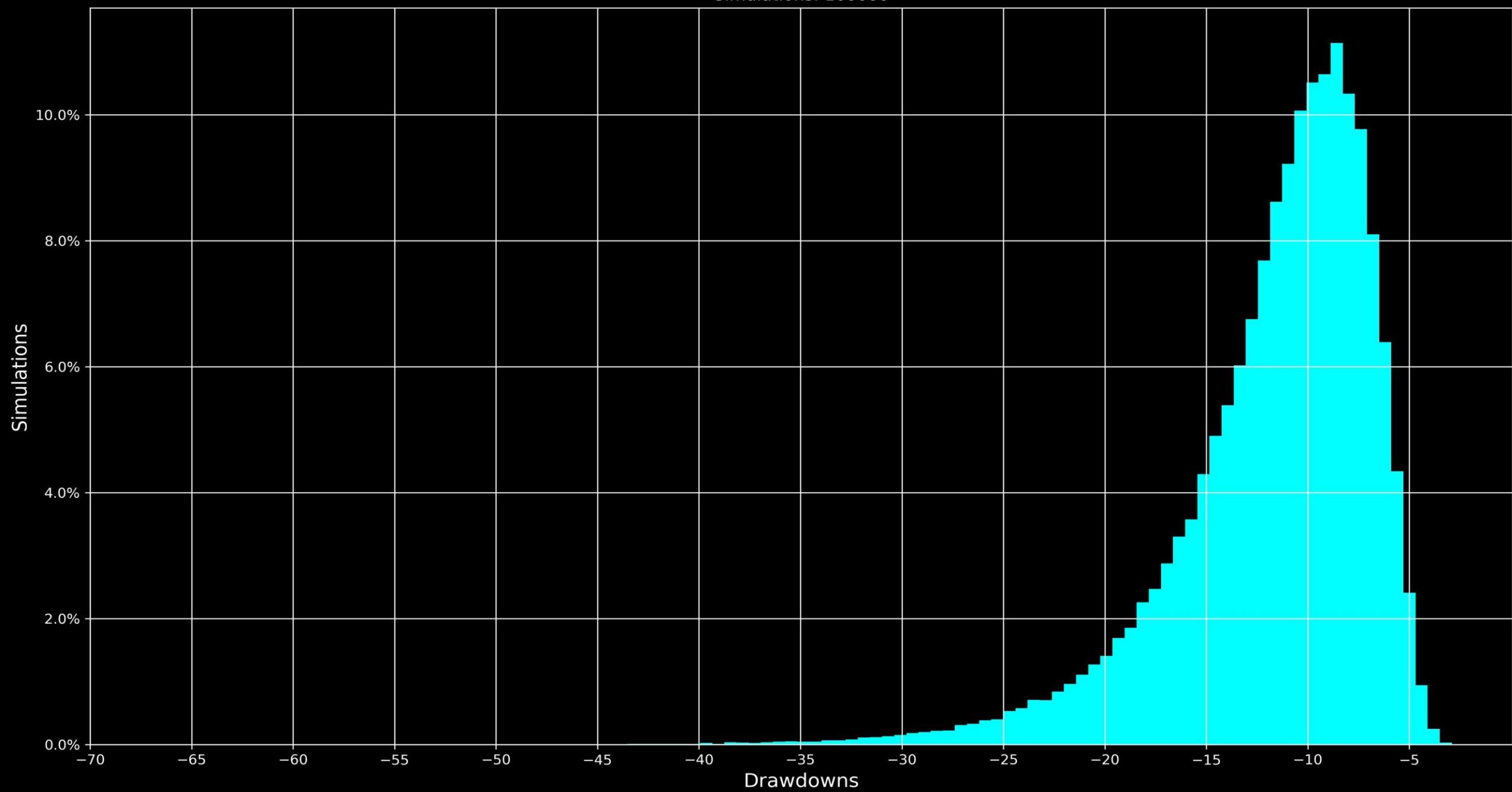
Draw-down Underwater Curve (vtb)
VWAP System 30minute Day MTF Vol 5minute Top 10 Stocks.



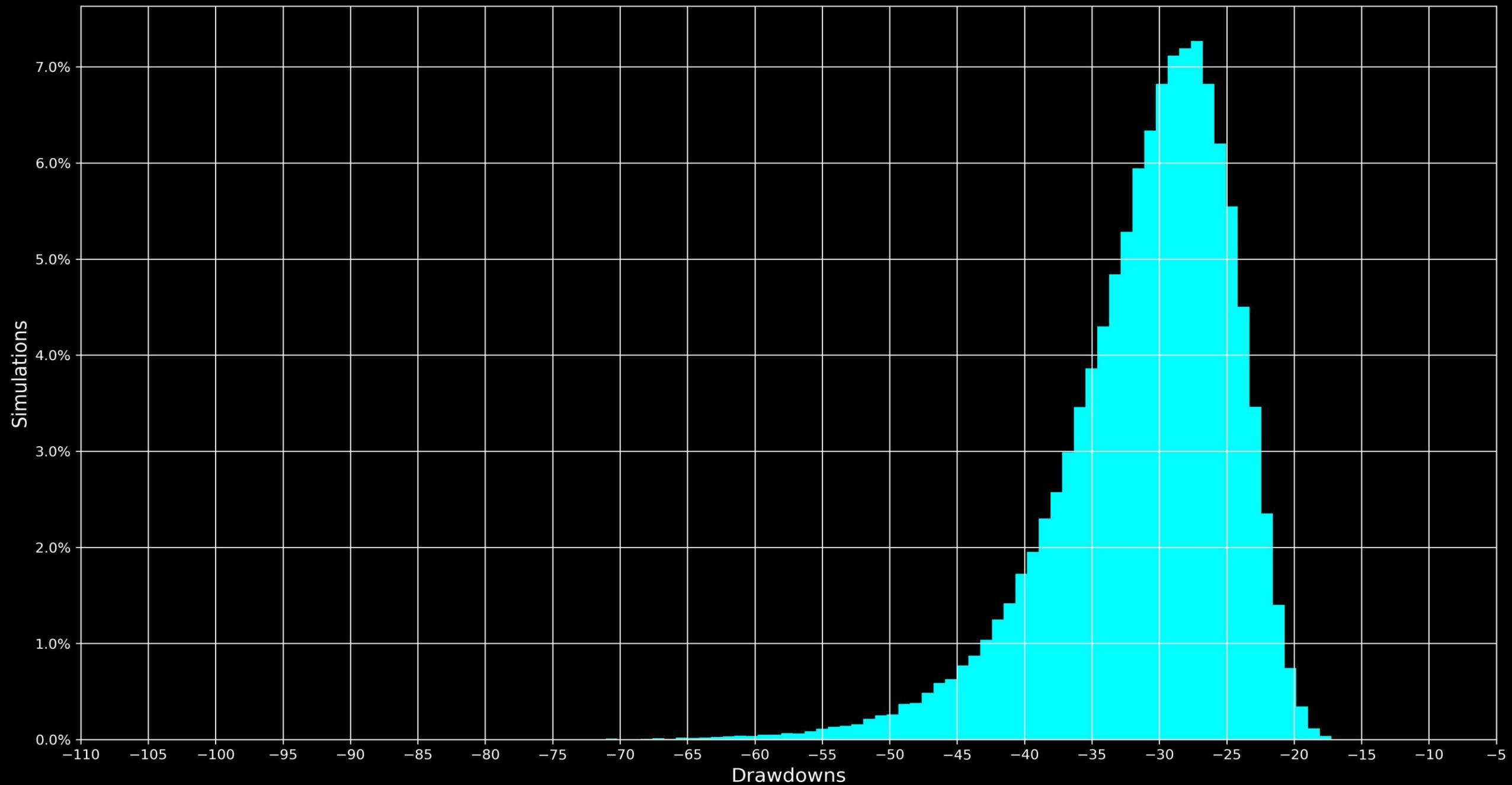
Monte Carlo Simulation (Re-shuffle)
Simulations: 10000



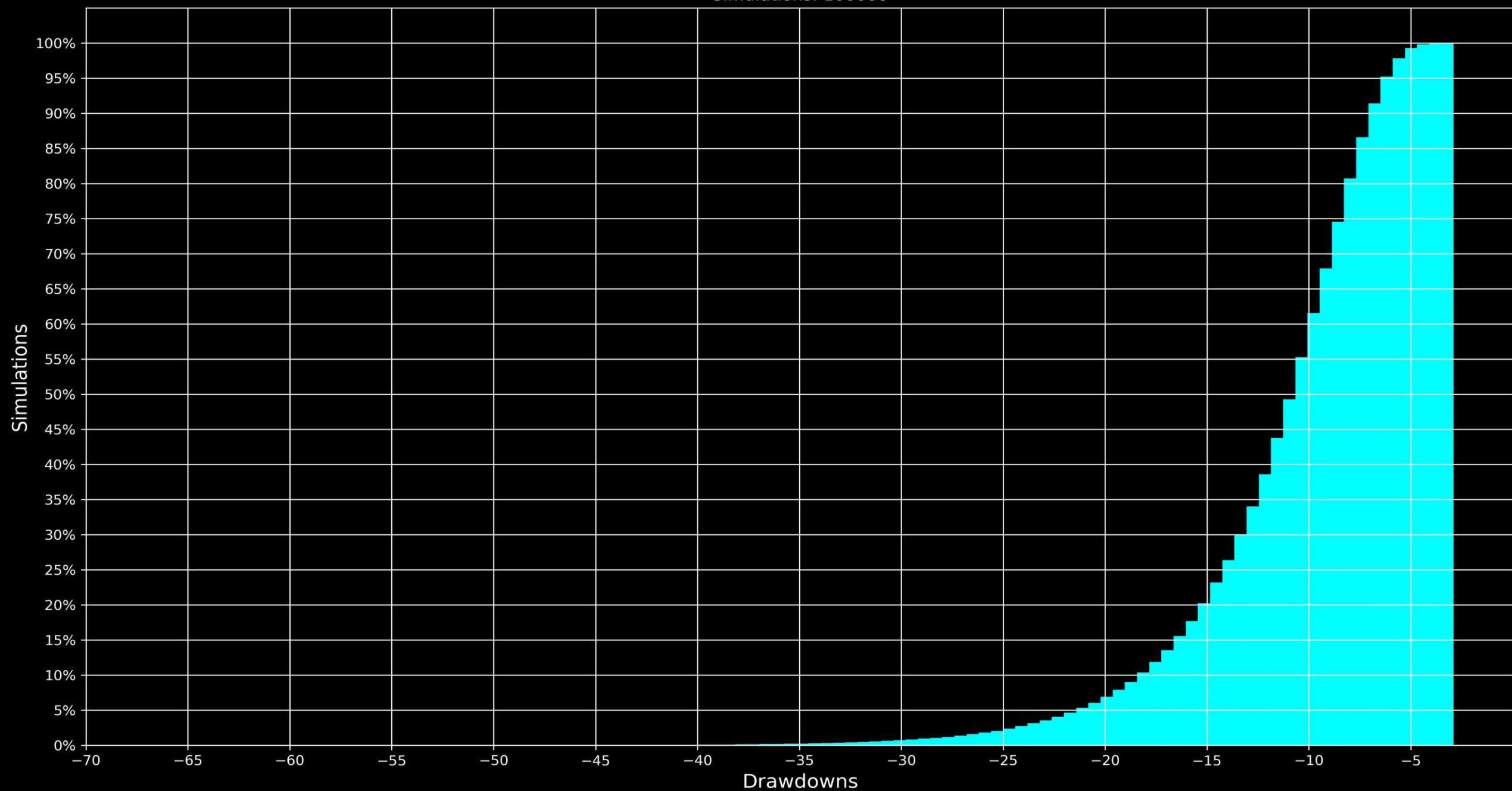
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis
Valley To Peak Drawdown Histogram
Simulations: 100000



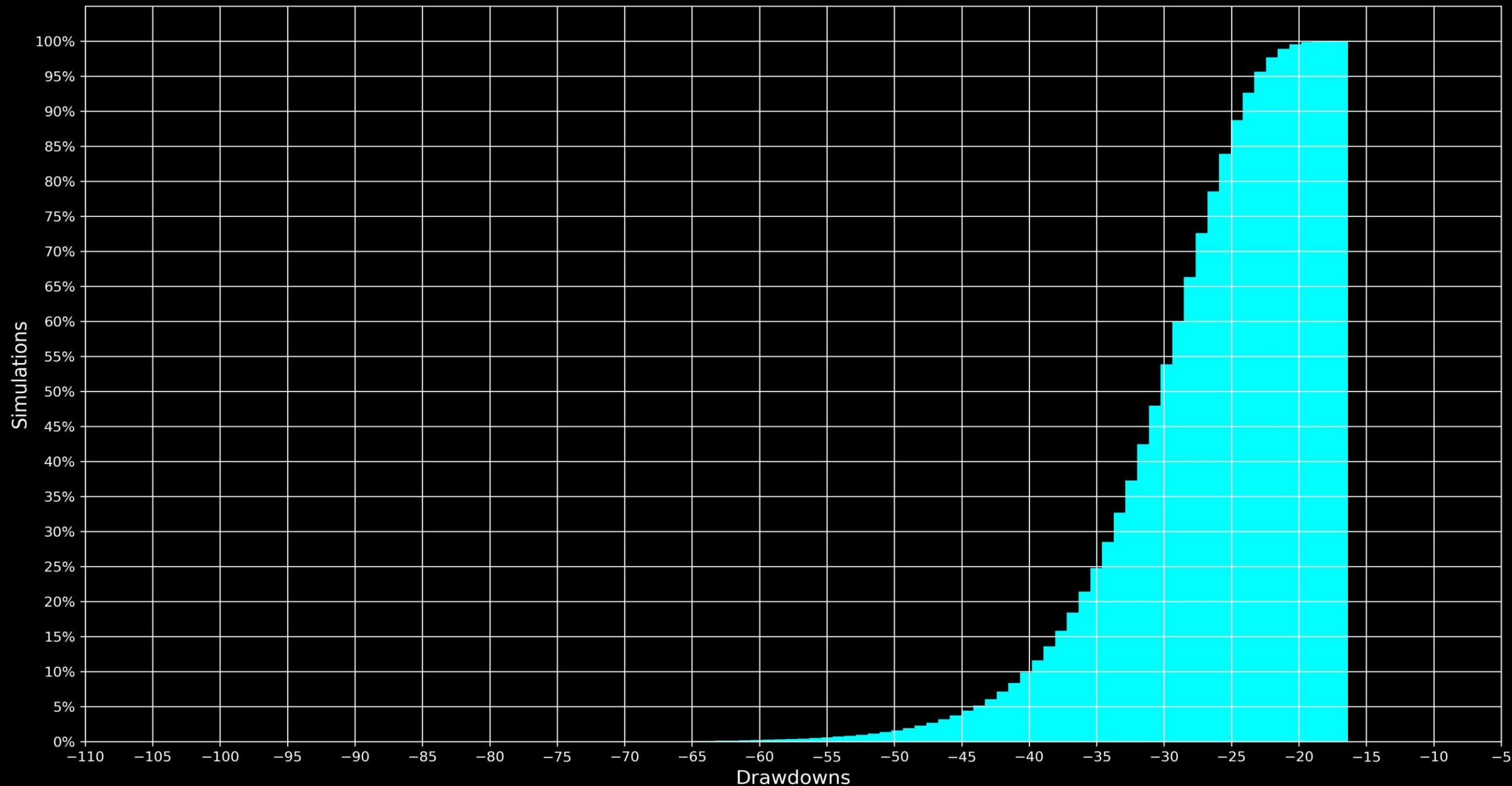
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis
Valley To Base Drawdown Histogram
Simulations: 100000



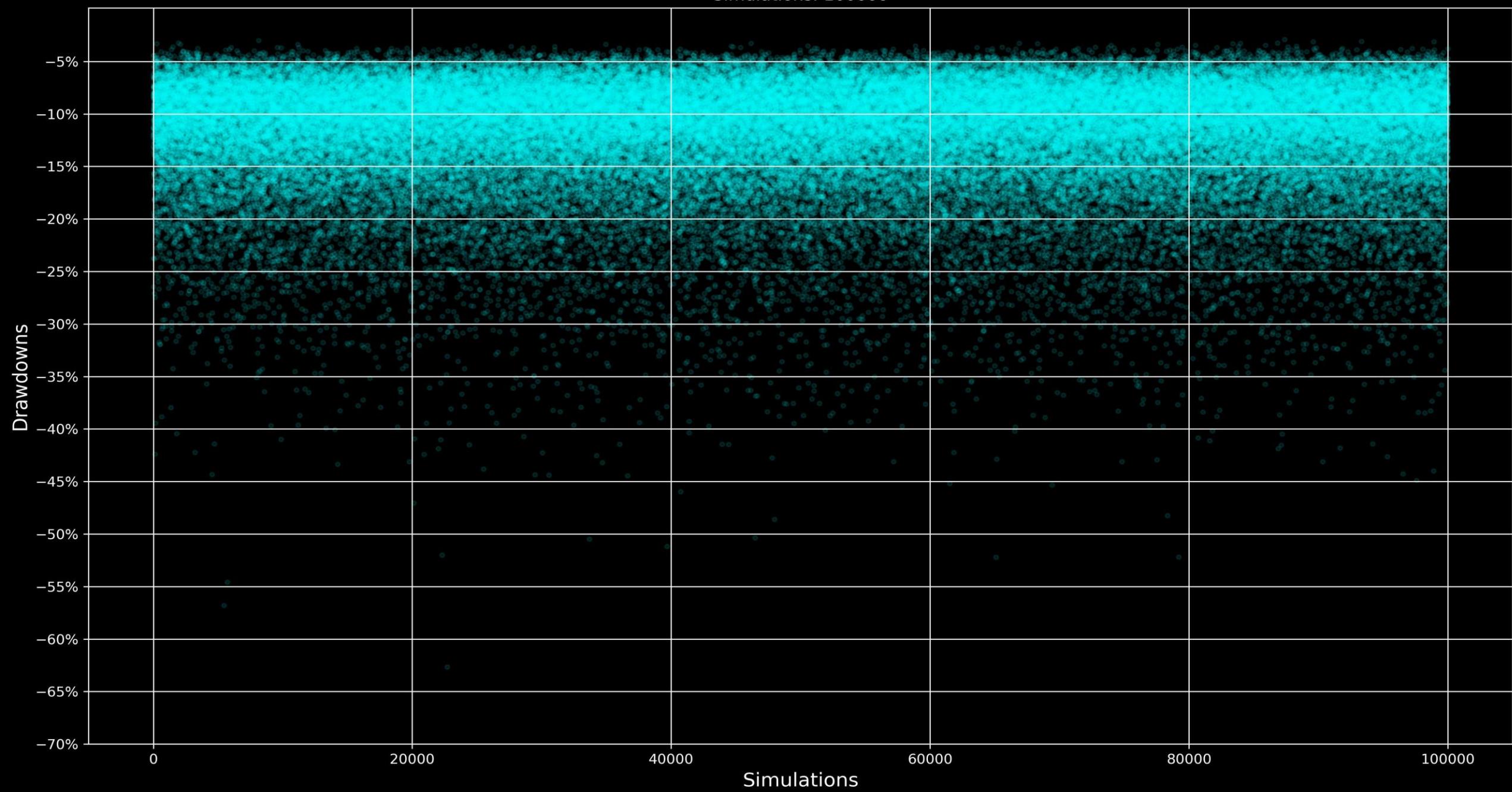
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis
Valley To Peak Drawdown Histogram (Cumulative)
Simulations: 100000



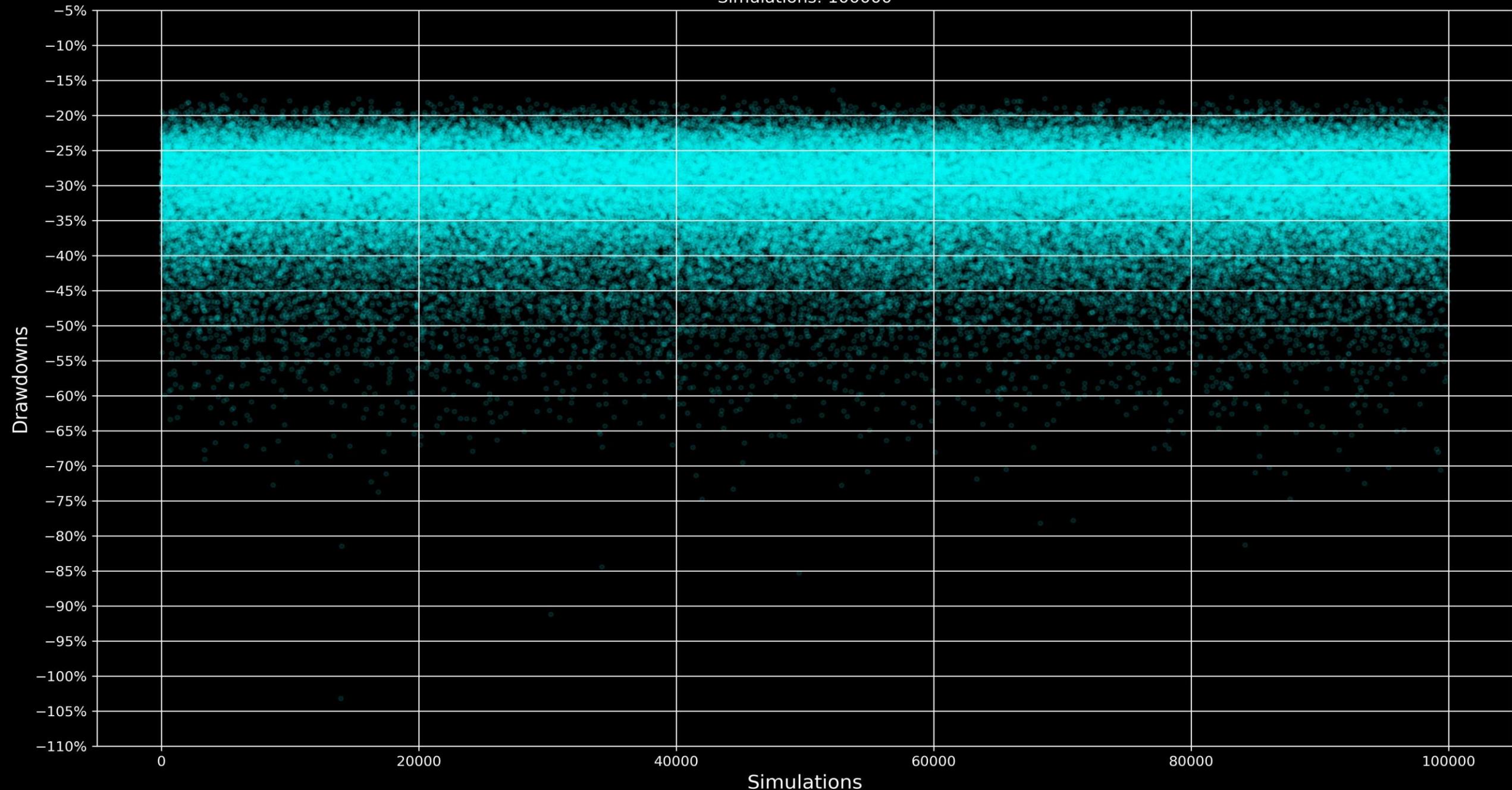
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis
Valley To Base Drawdown Histogram (Cumulative)
Simulations: 100000



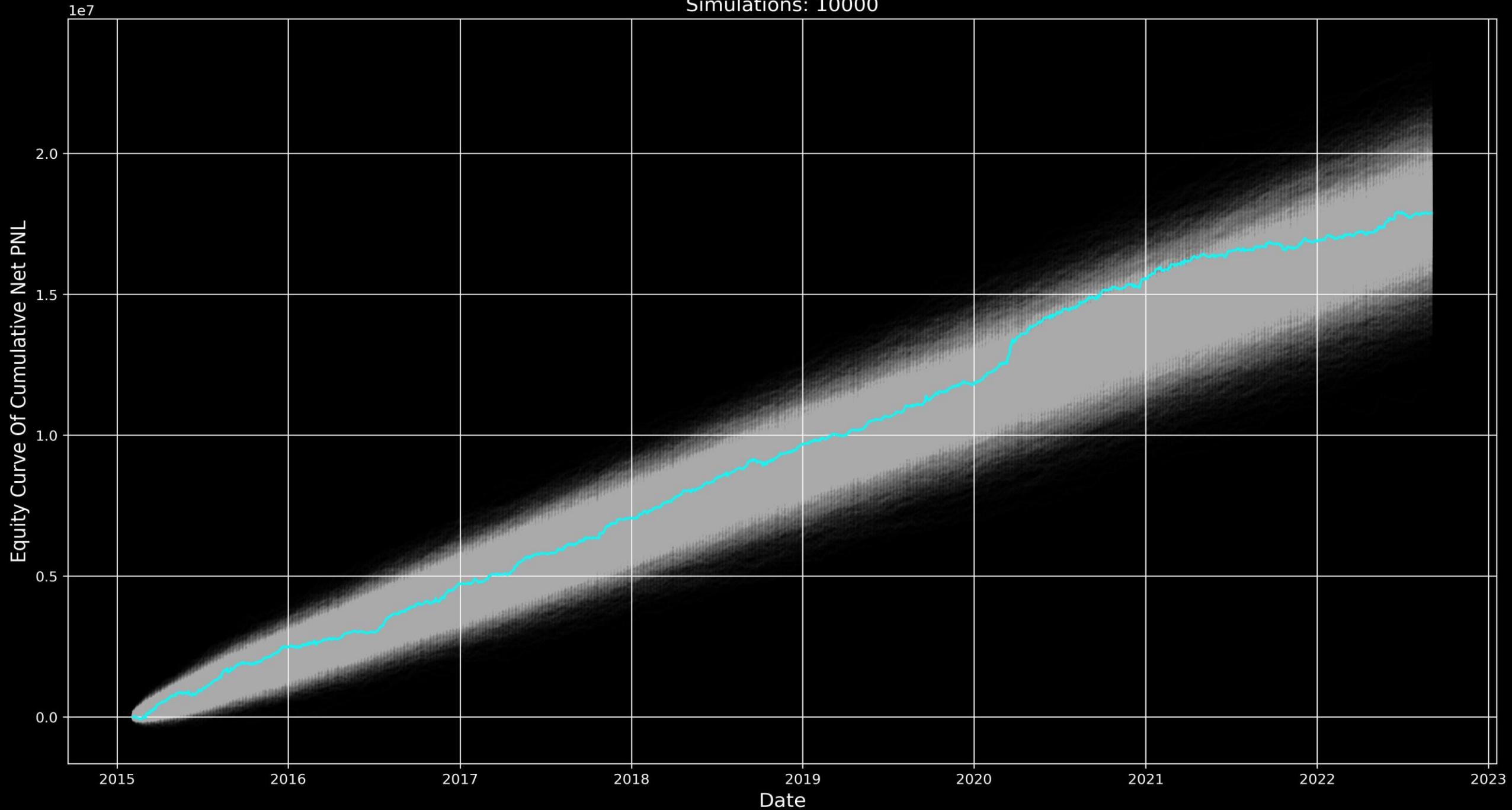
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis
Valley To Peak Drawdown Scatter Plot
Simulations: 100000



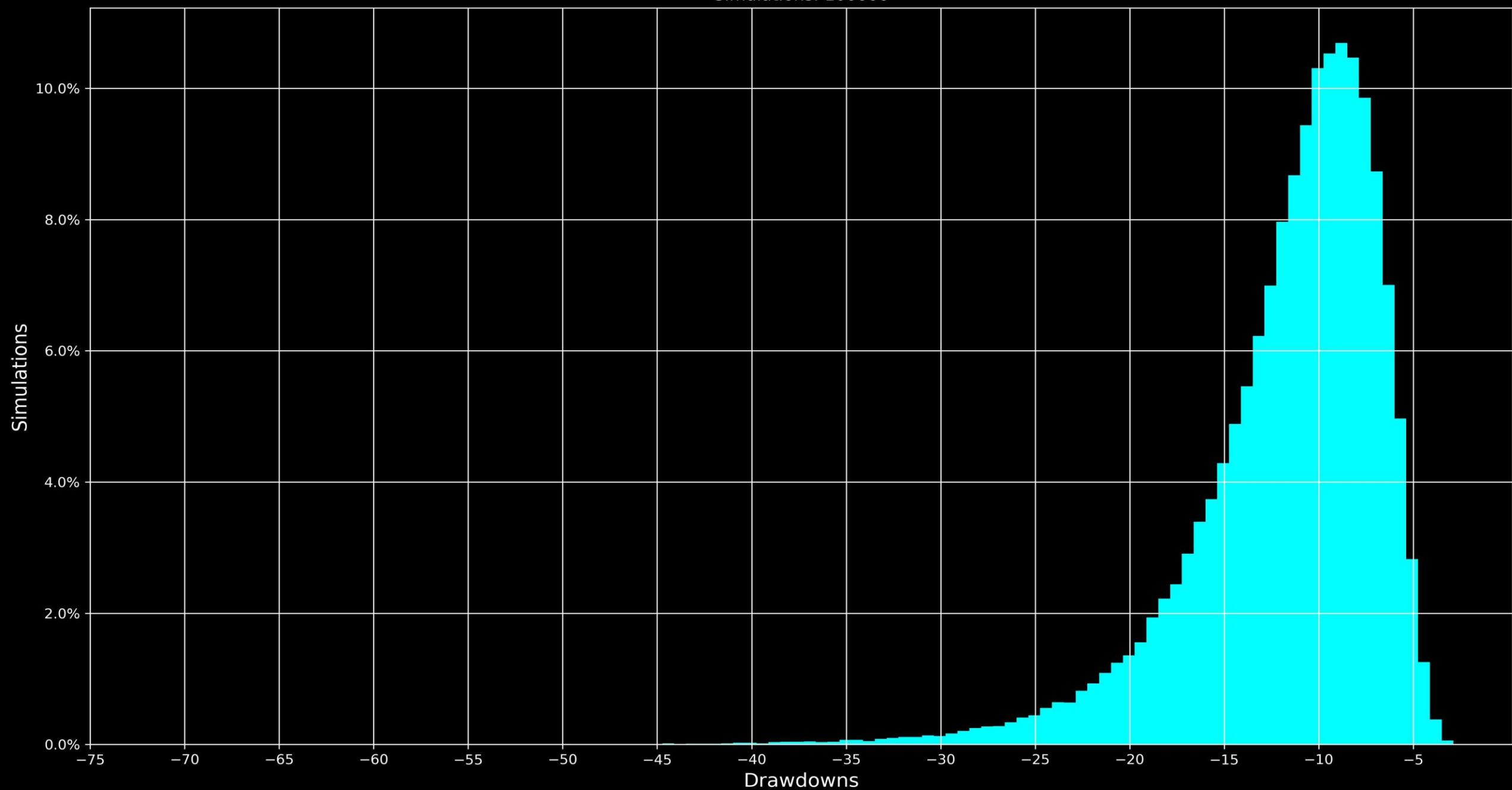
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis
Valley To Base Drawdown Scatter Plot
Simulations: 100000



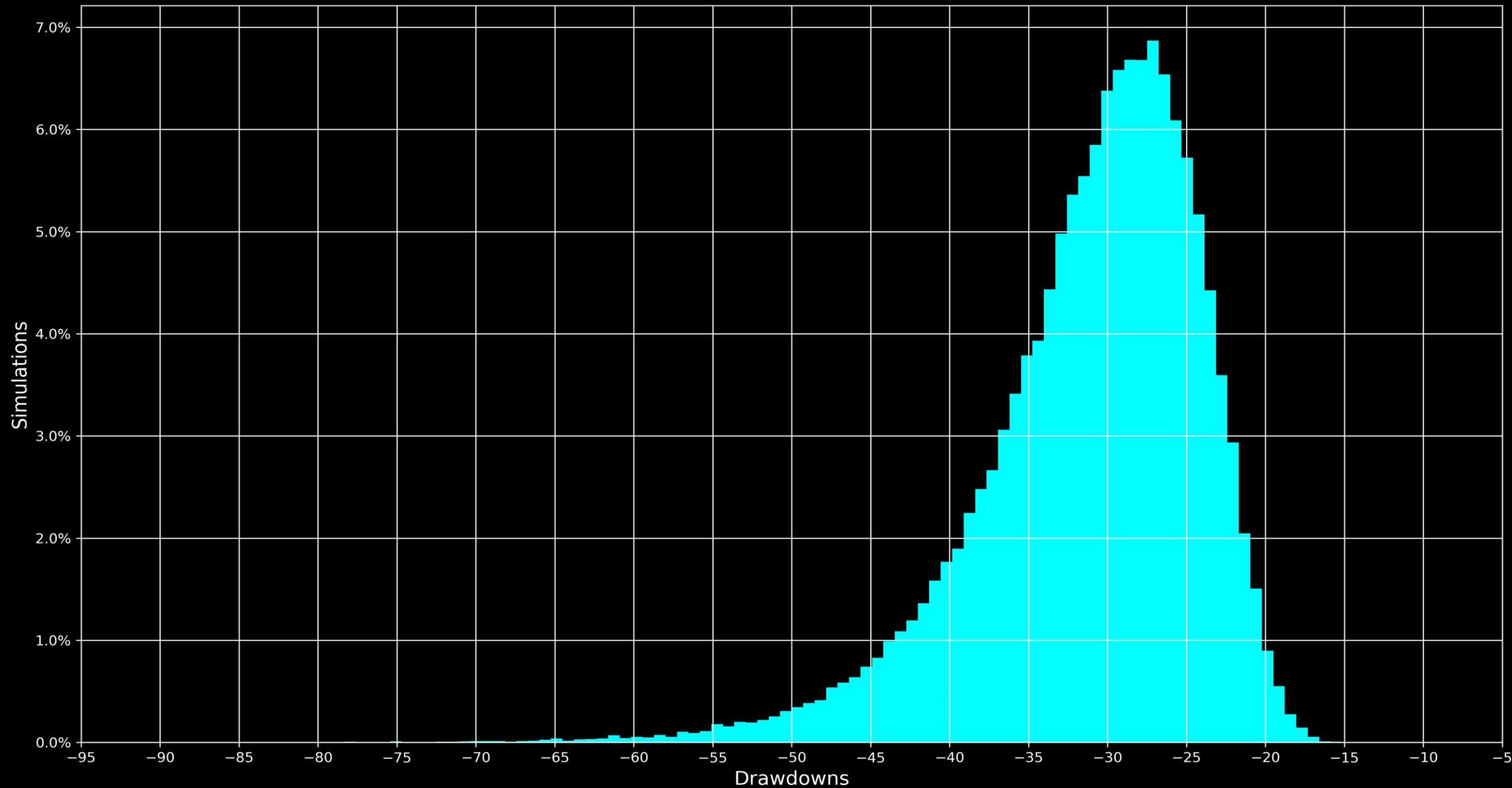
Monte Carlo Simulation (Re-sample)
Simulations: 10000



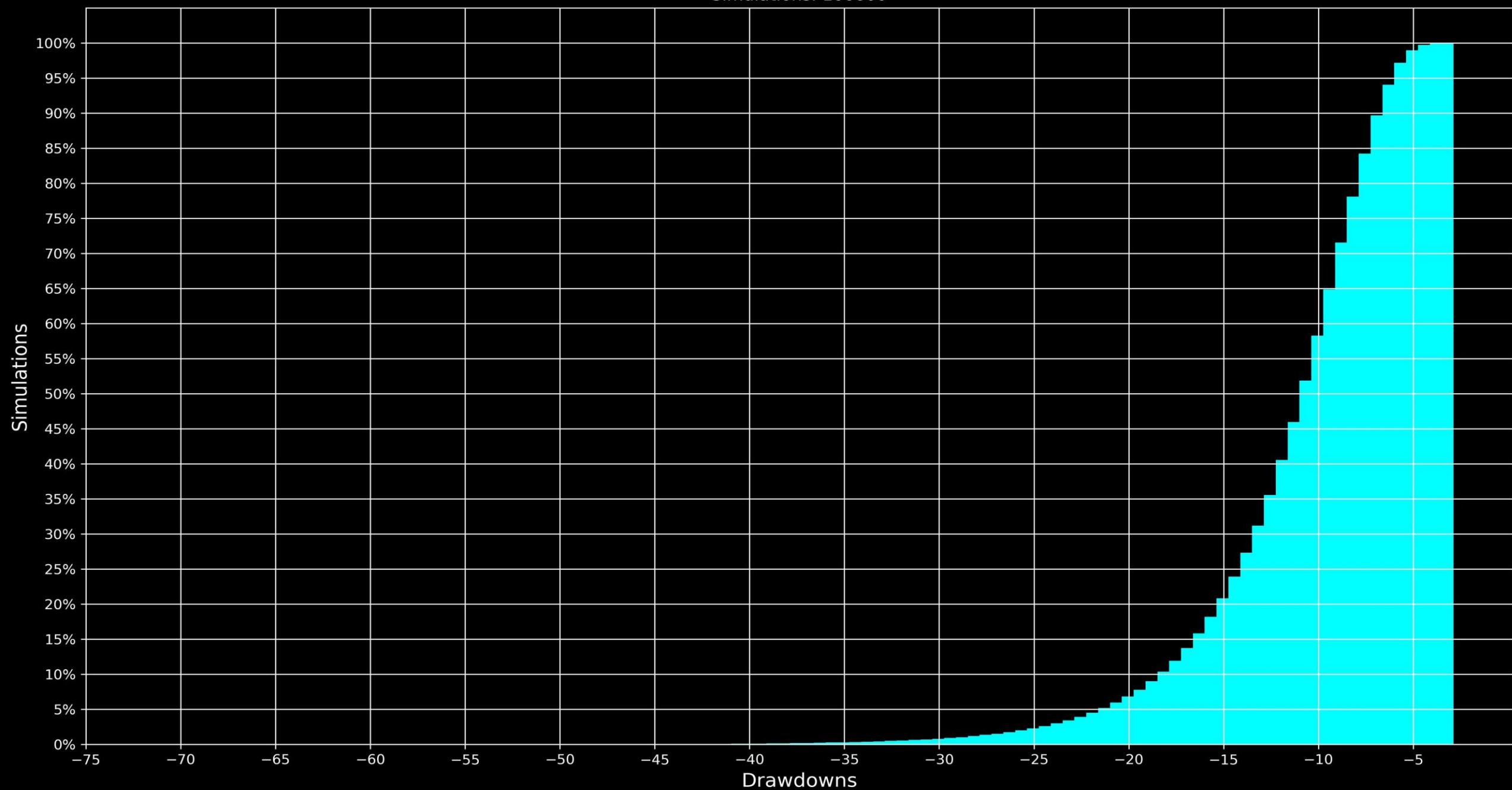
Monte Carlo Simulation (Re-sample) Drawdown Analysis
Valley To Peak Drawdown Histogram
Simulations: 100000



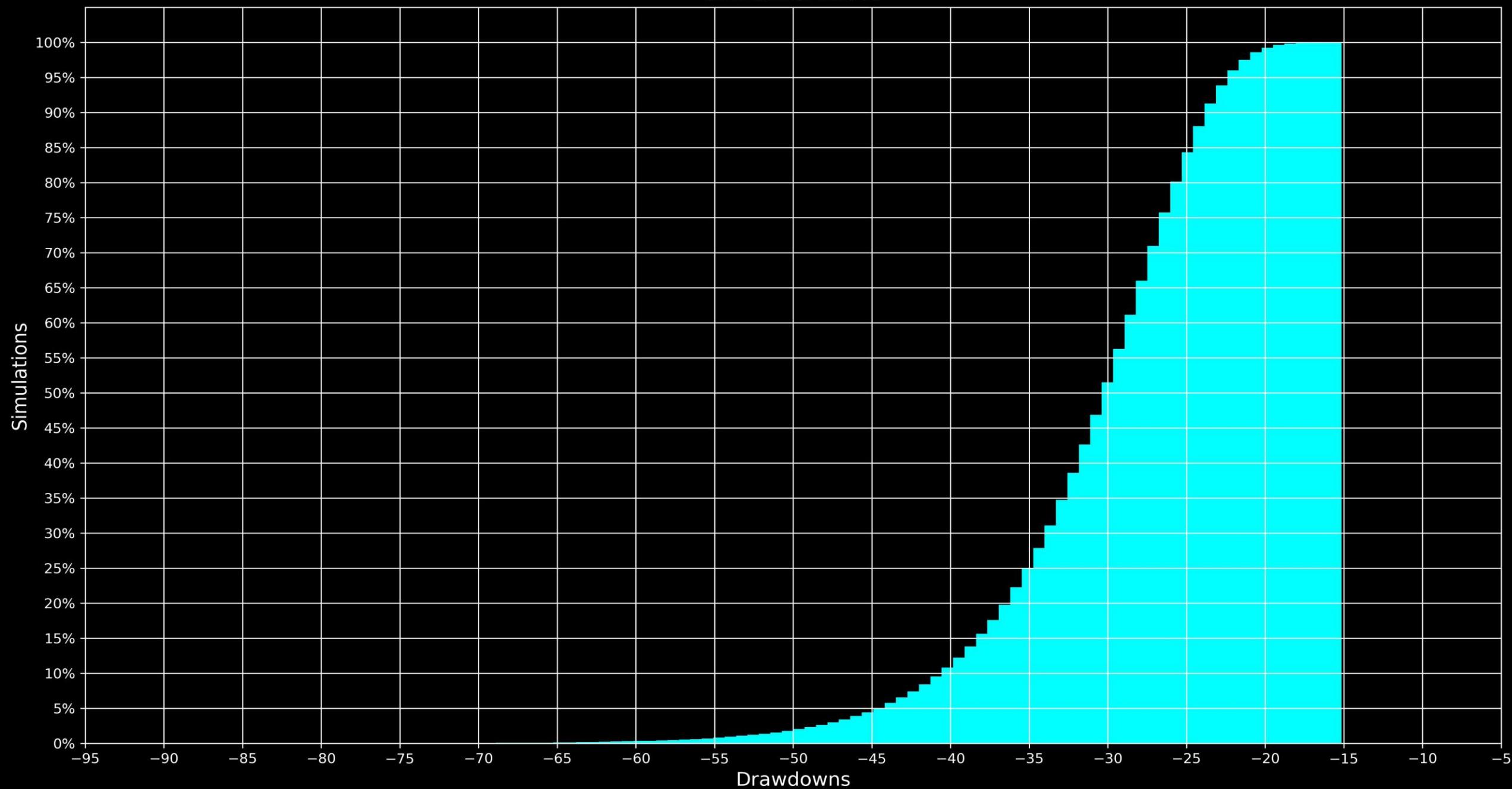
Monte Carlo Simulation (Re-sample) Drawdown Analysis
Valley To Base Drawdown Histogram
Simulations: 100000



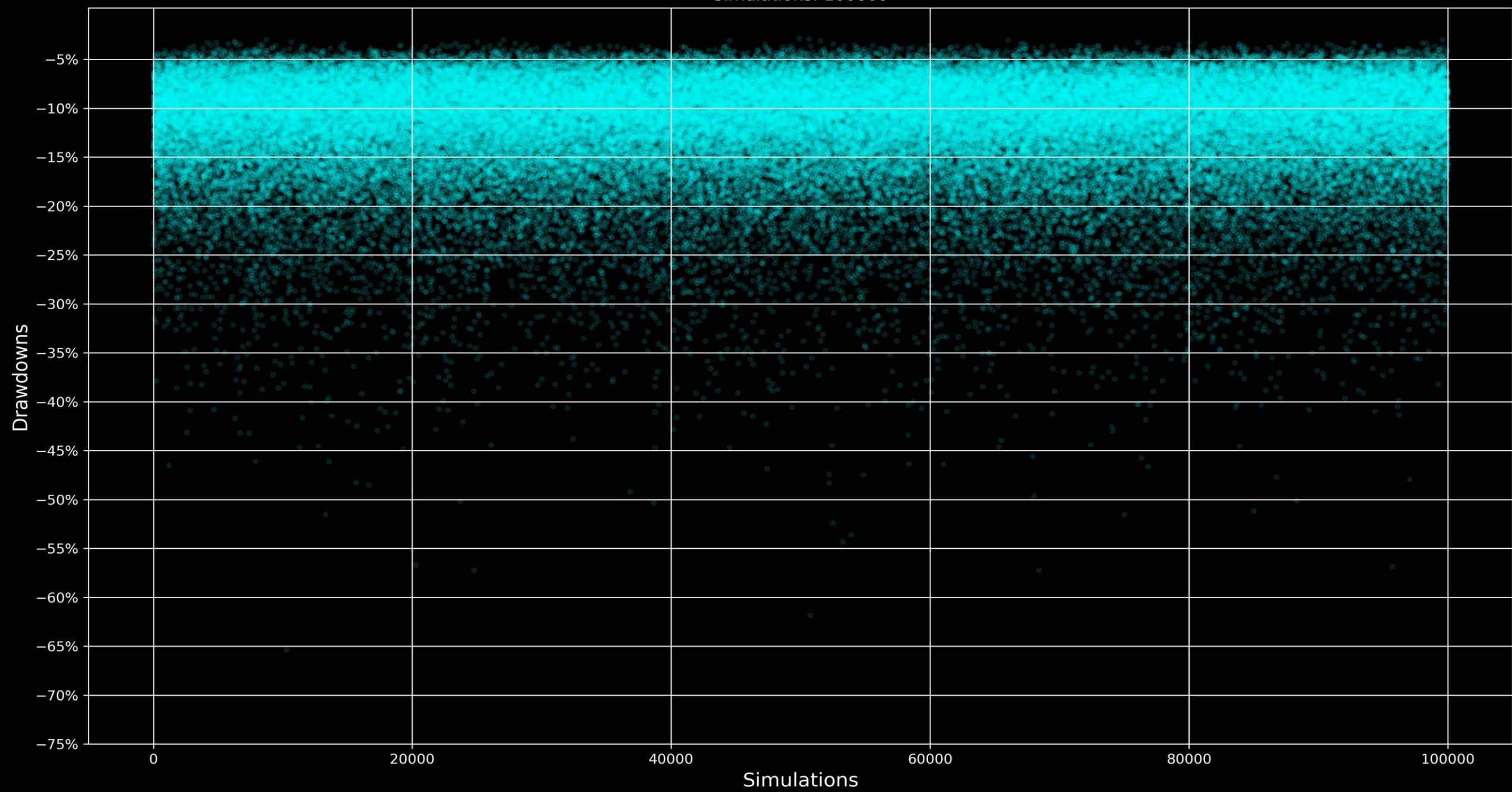
Monte Carlo Simulation (Re-sample) Drawdown Analysis
Valley To Peak Drawdown Histogram (Cumulative)
Simulations: 100000



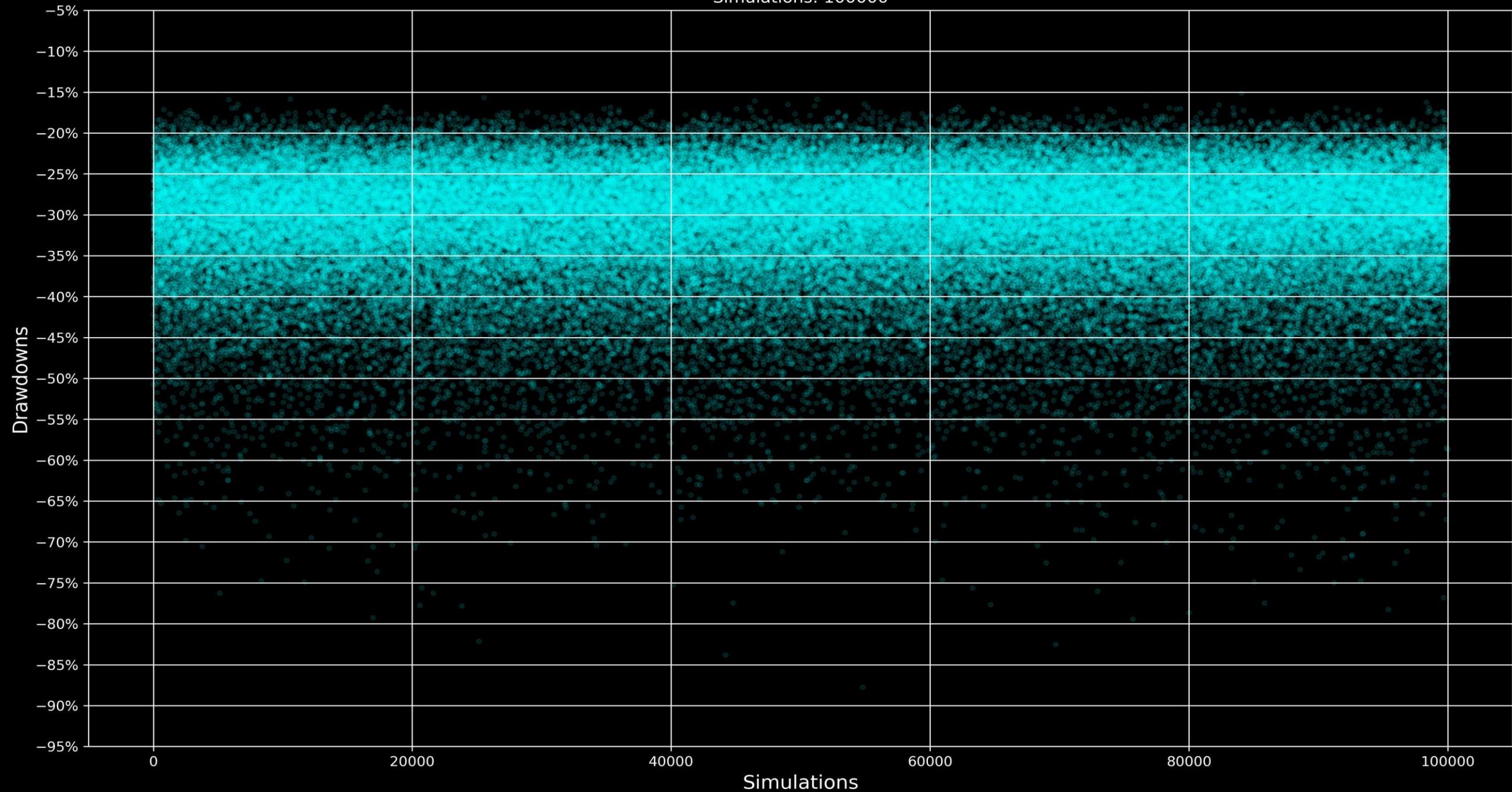
Monte Carlo Simulation (Re-sample) Drawdown Analysis
Valley To Base Drawdown Histogram (Cumulative)
Simulations: 100000



Monte Carlo Simulation (Re-sample) Drawdown Analysis
Valley To Peak Drawdown Scatter Plot
Simulations: 100000

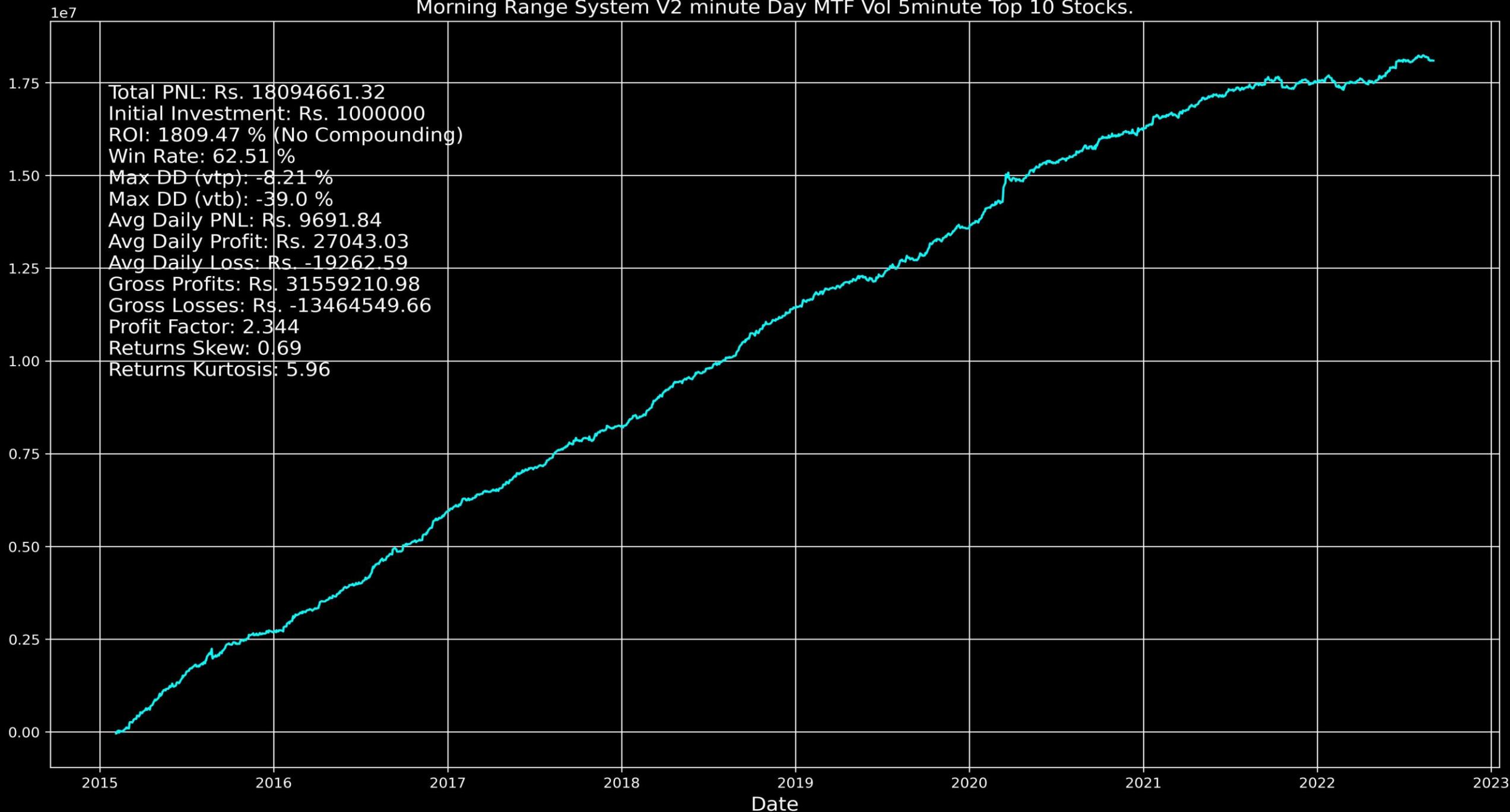


Monte Carlo Simulation (Re-sample) Drawdown Analysis
Valley To Base Drawdown Scatter Plot
Simulations: 100000

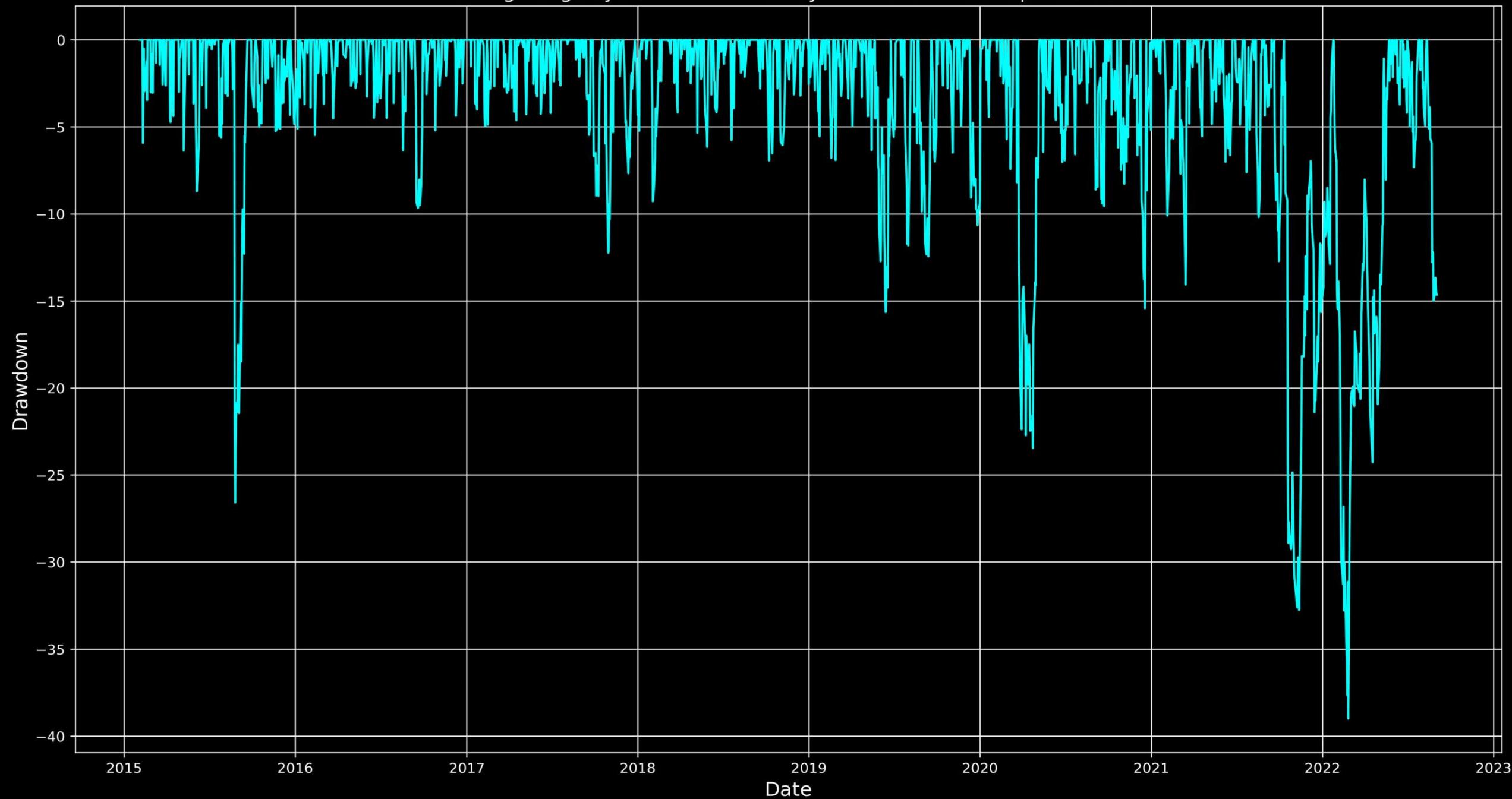


FNO Universe Ranked Dynamic Basket (ORB Core Block)

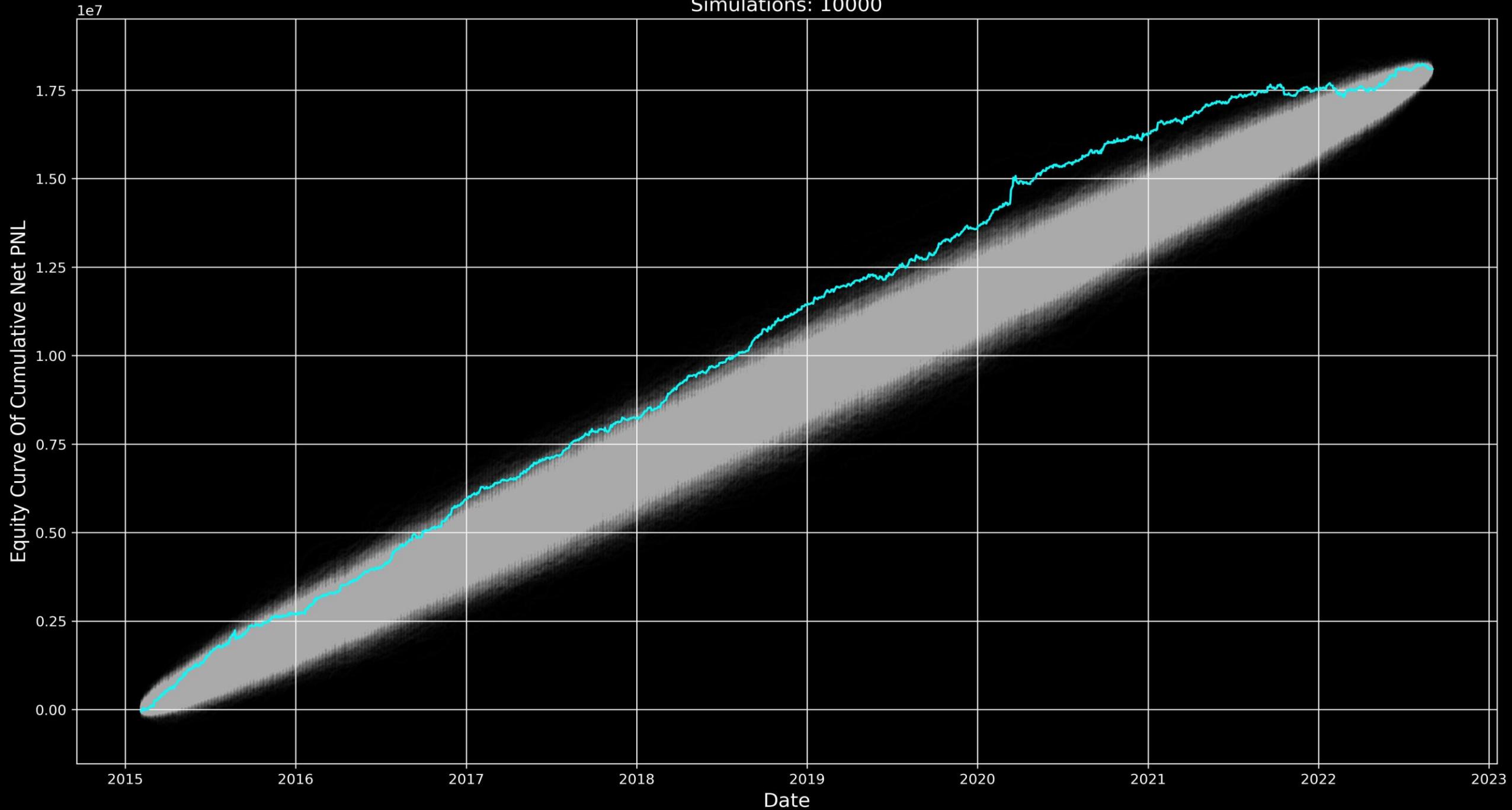
Ranked Universe System Performance (Day-wise)
Morning Range System V2 minute Day MTF Vol 5minute Top 10 Stocks.



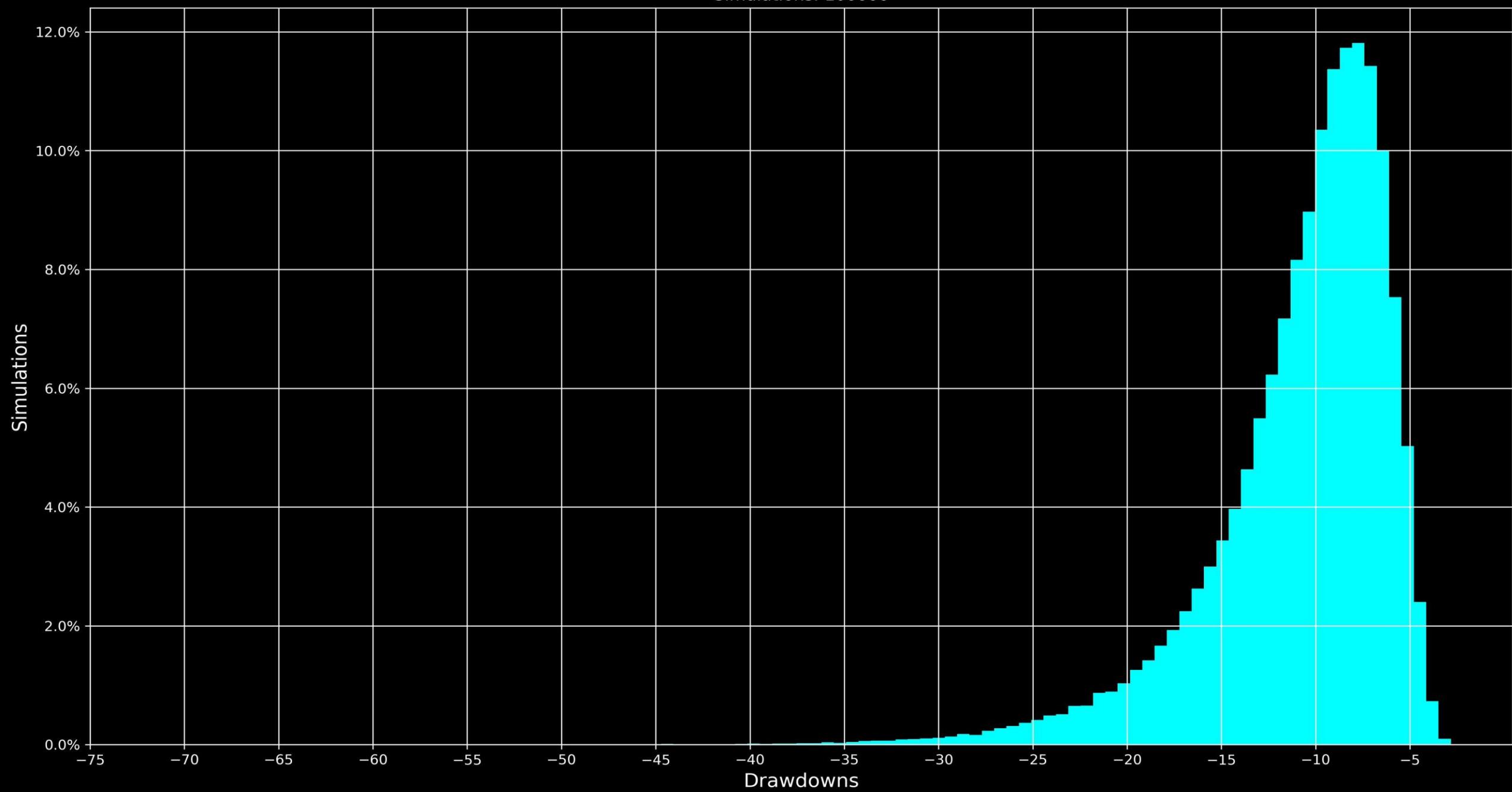
Draw-down Underwater Curve (vtb)
Morning Range System V2 minute Day MTF Vol 5minute Top 10 Stocks.



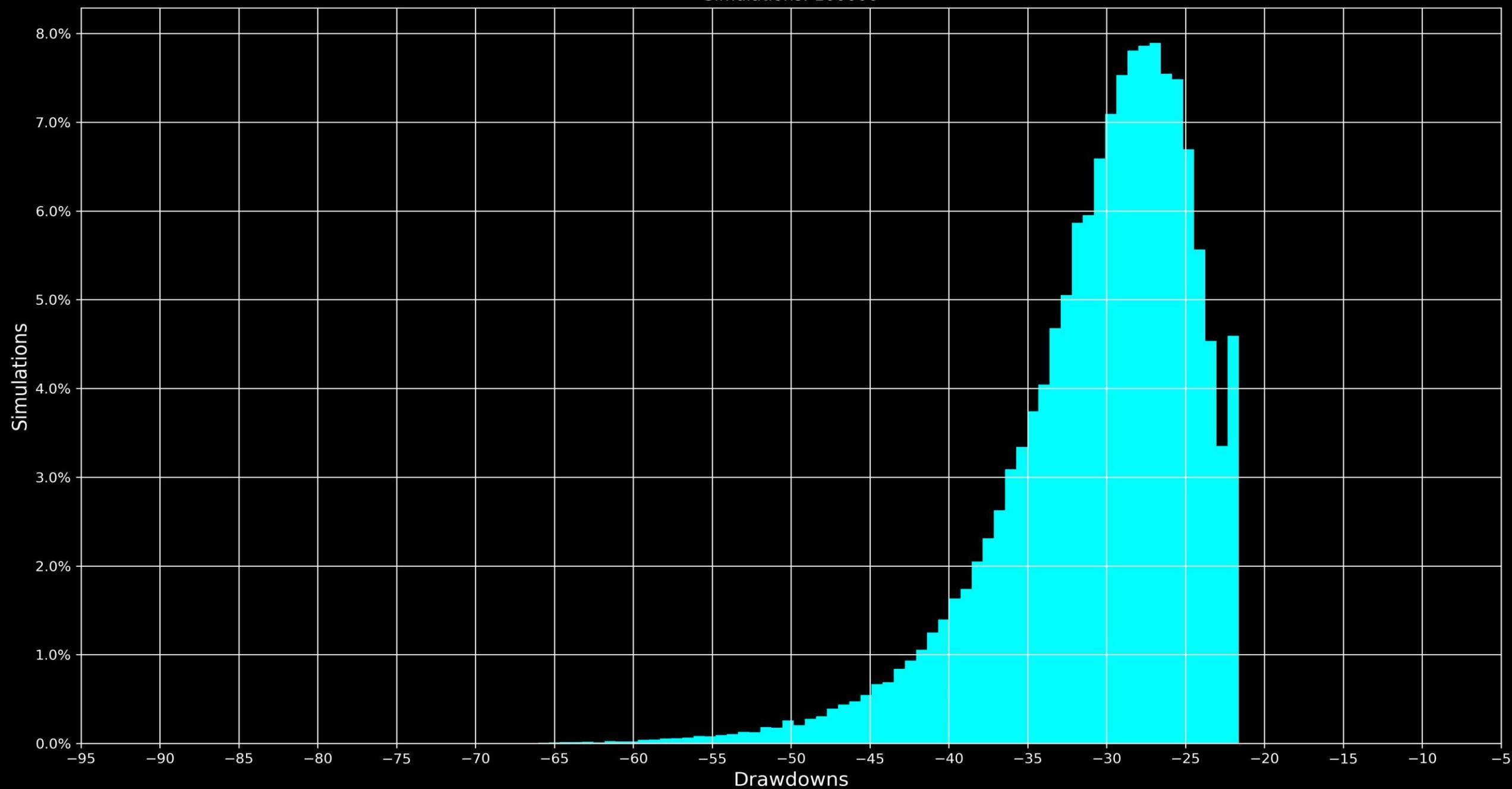
Monte Carlo Simulation (Re-shuffle)
Simulations: 10000



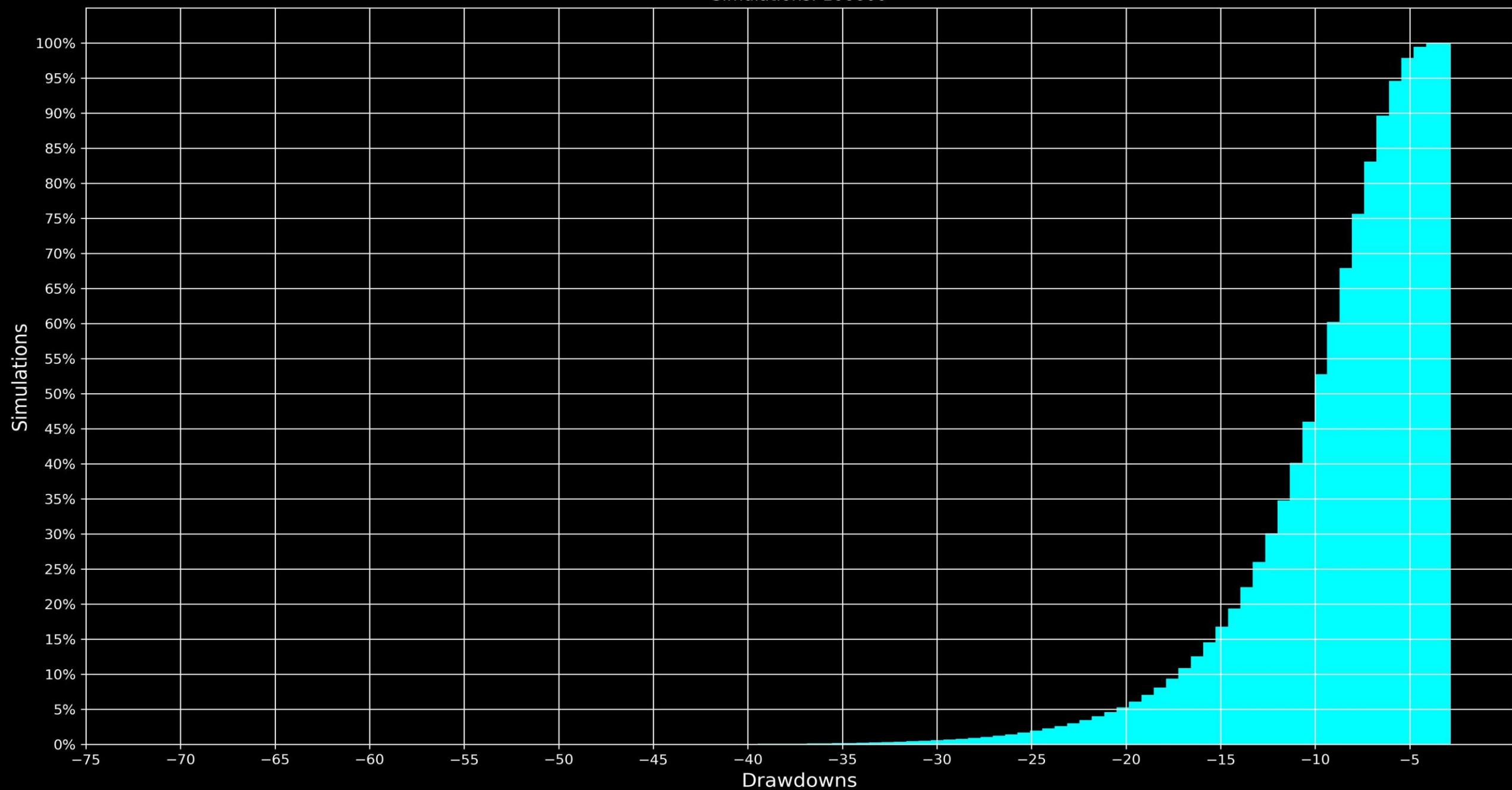
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis
Valley To Peak Drawdown Histogram
Simulations: 100000



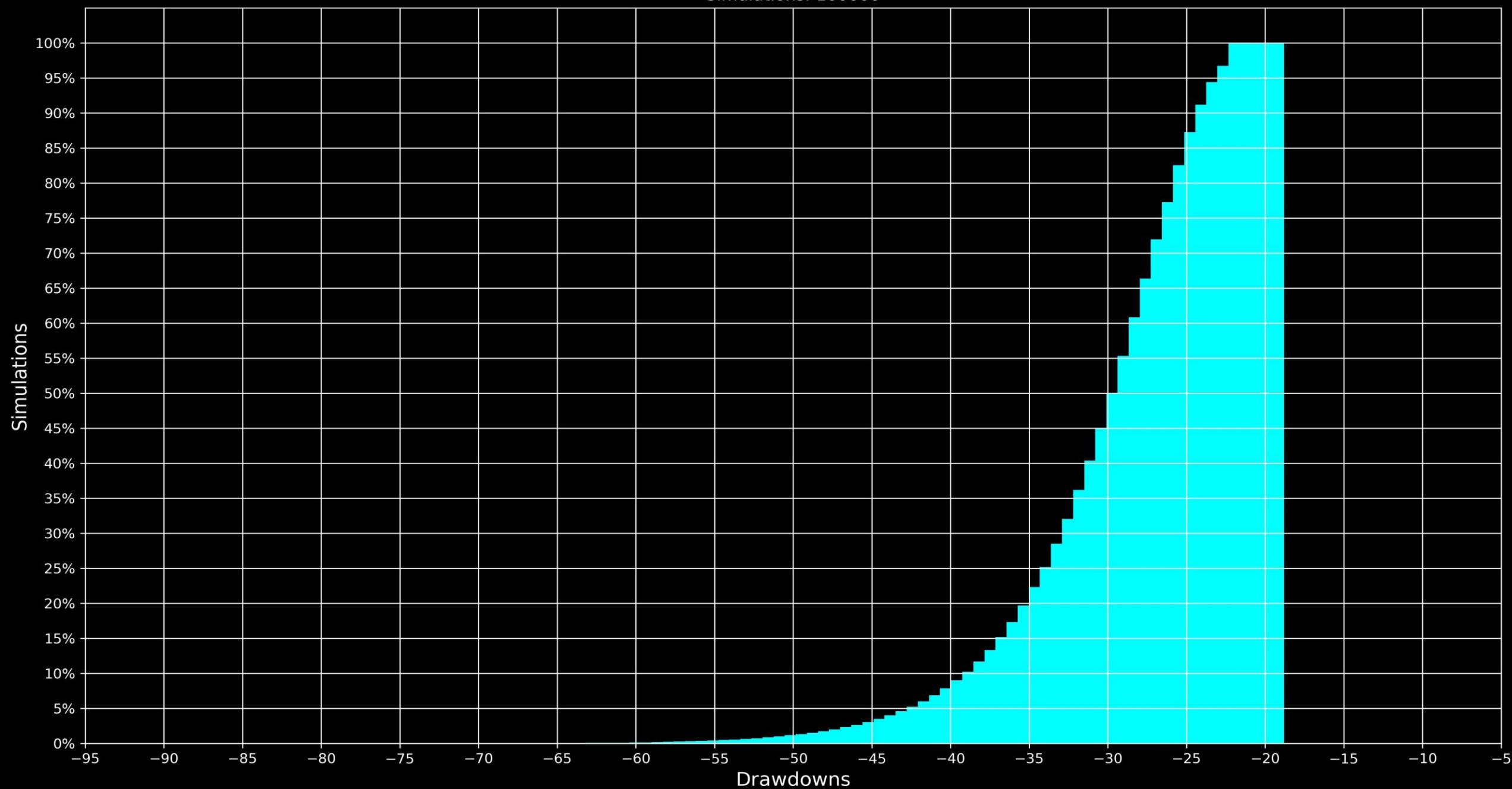
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis
Valley To Base Drawdown Histogram
Simulations: 100000



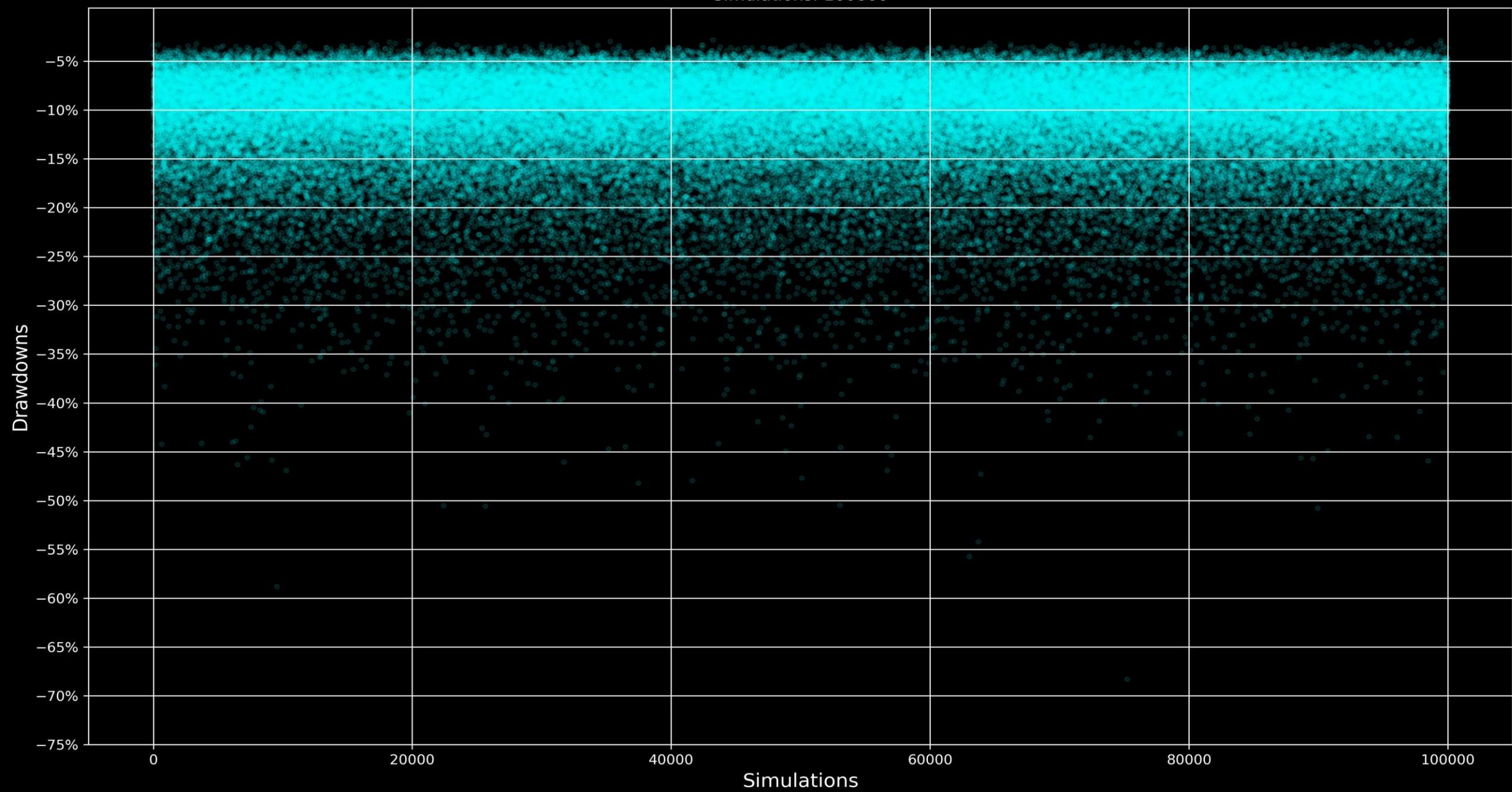
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis
Valley To Peak Drawdown Histogram (Cumulative)
Simulations: 100000



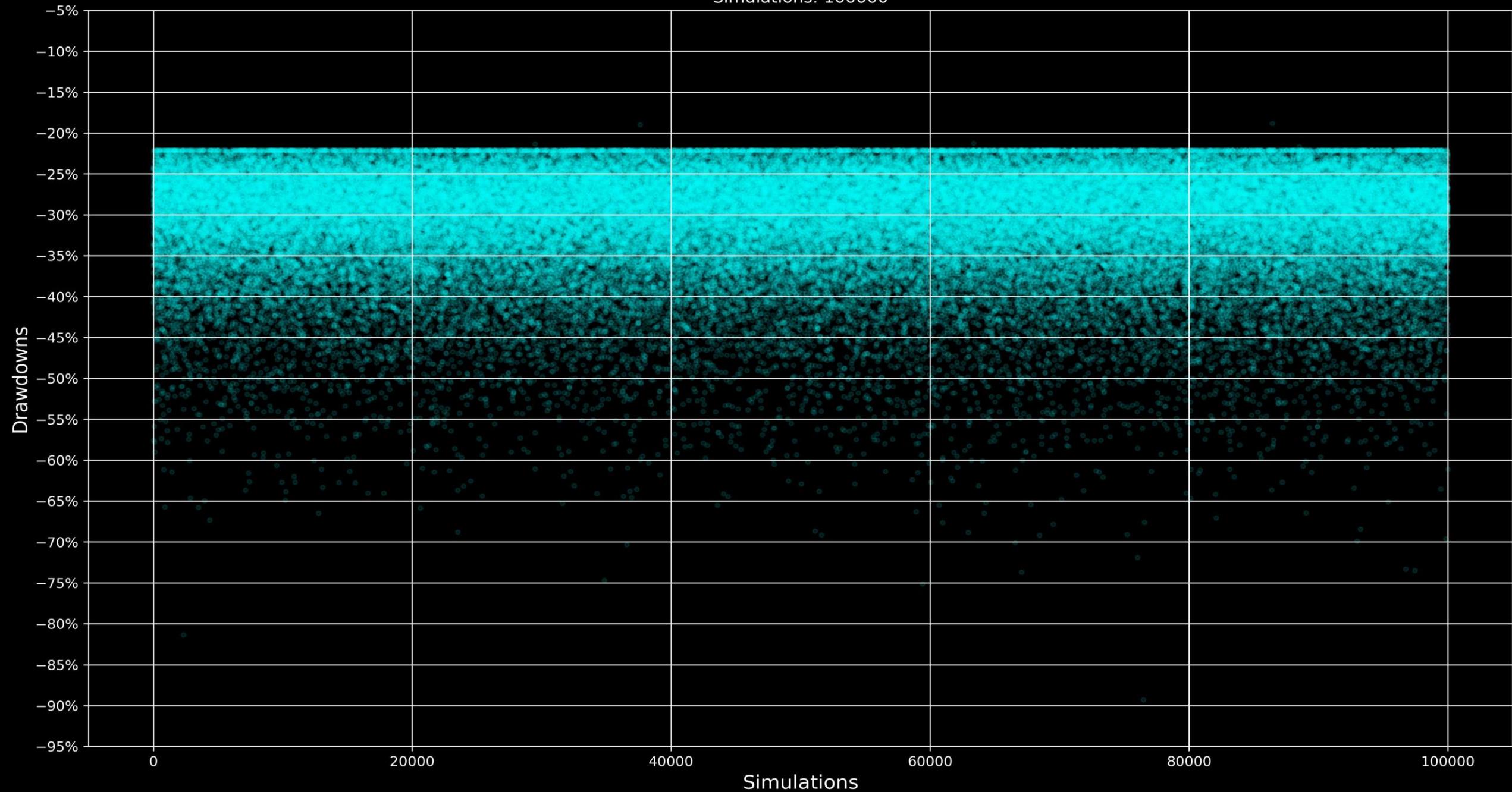
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis
Valley To Base Drawdown Histogram (Cumulative)
Simulations: 100000



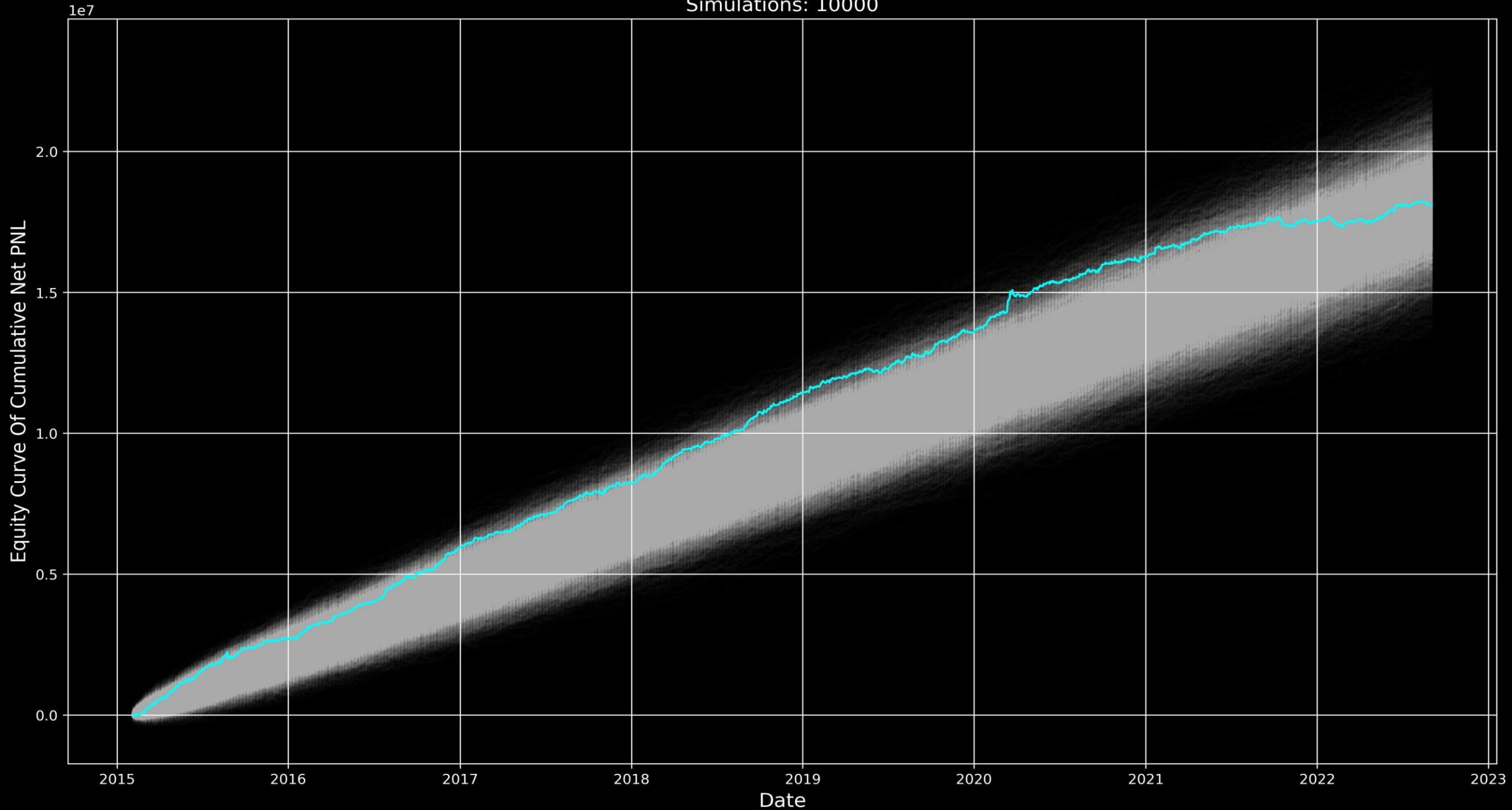
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis
Valley To Peak Drawdown Scatter Plot
Simulations: 100000



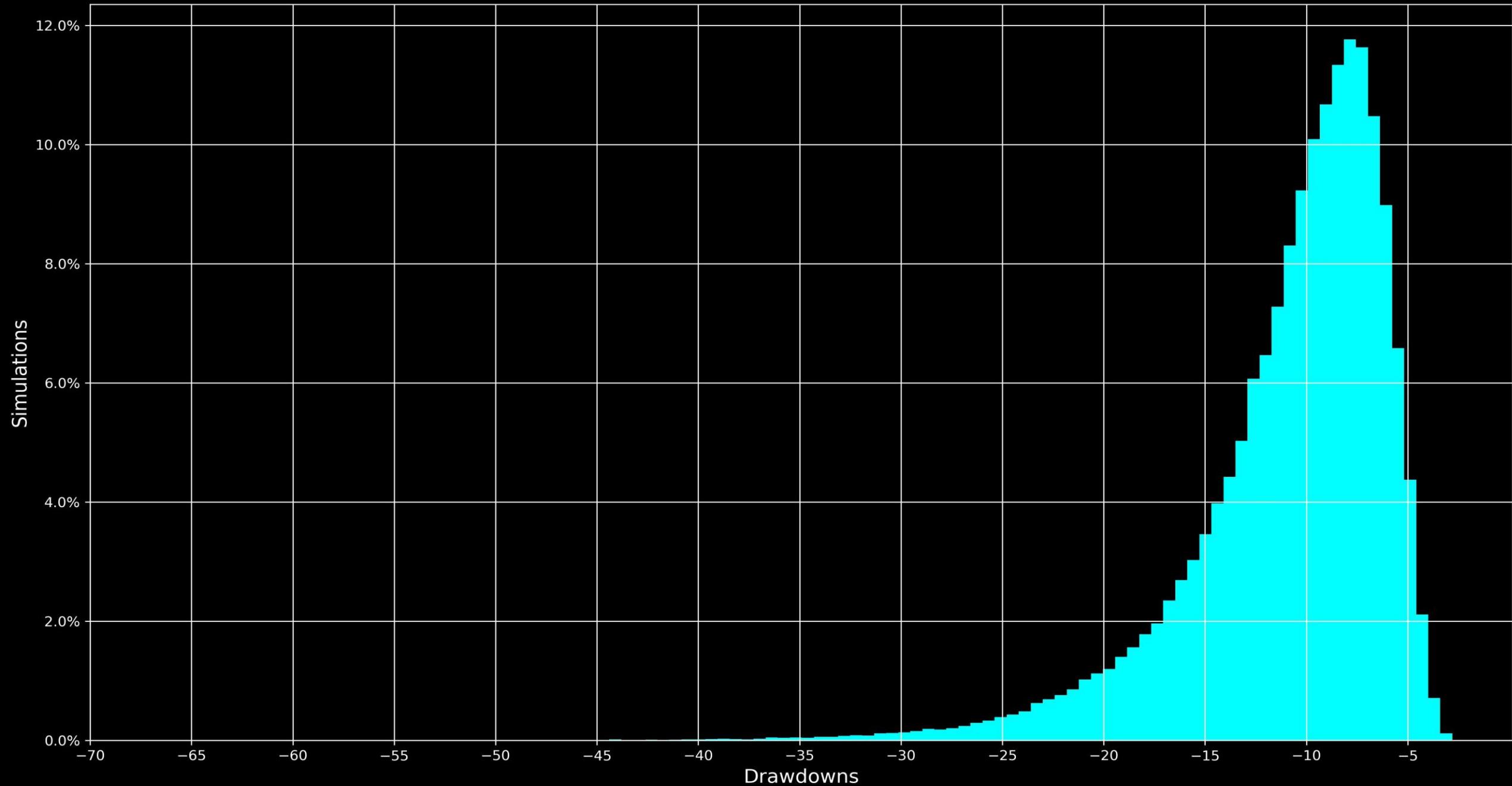
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis
Valley To Base Drawdown Scatter Plot
Simulations: 100000



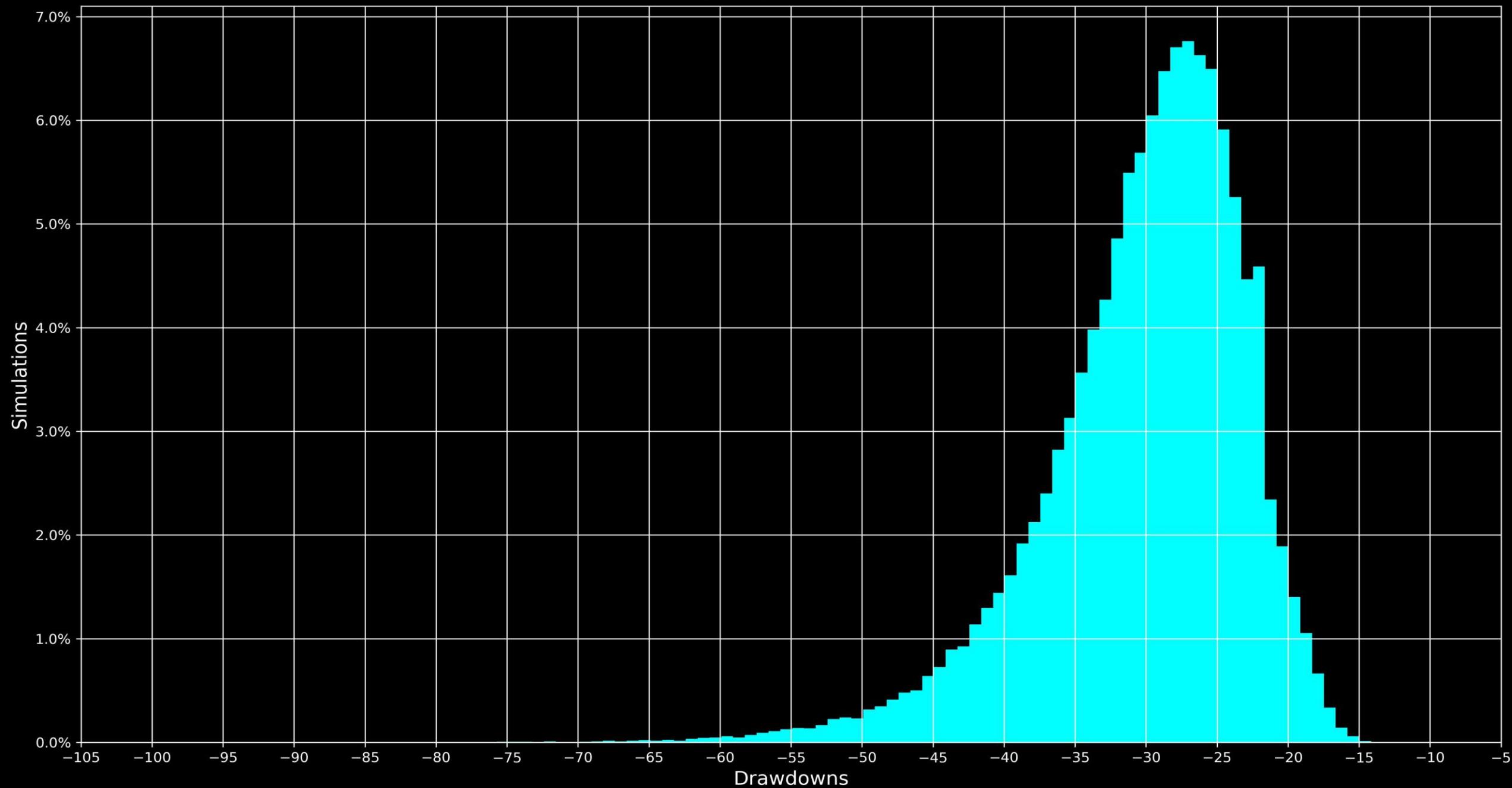
Monte Carlo Simulation (Re-sample)
Simulations: 10000



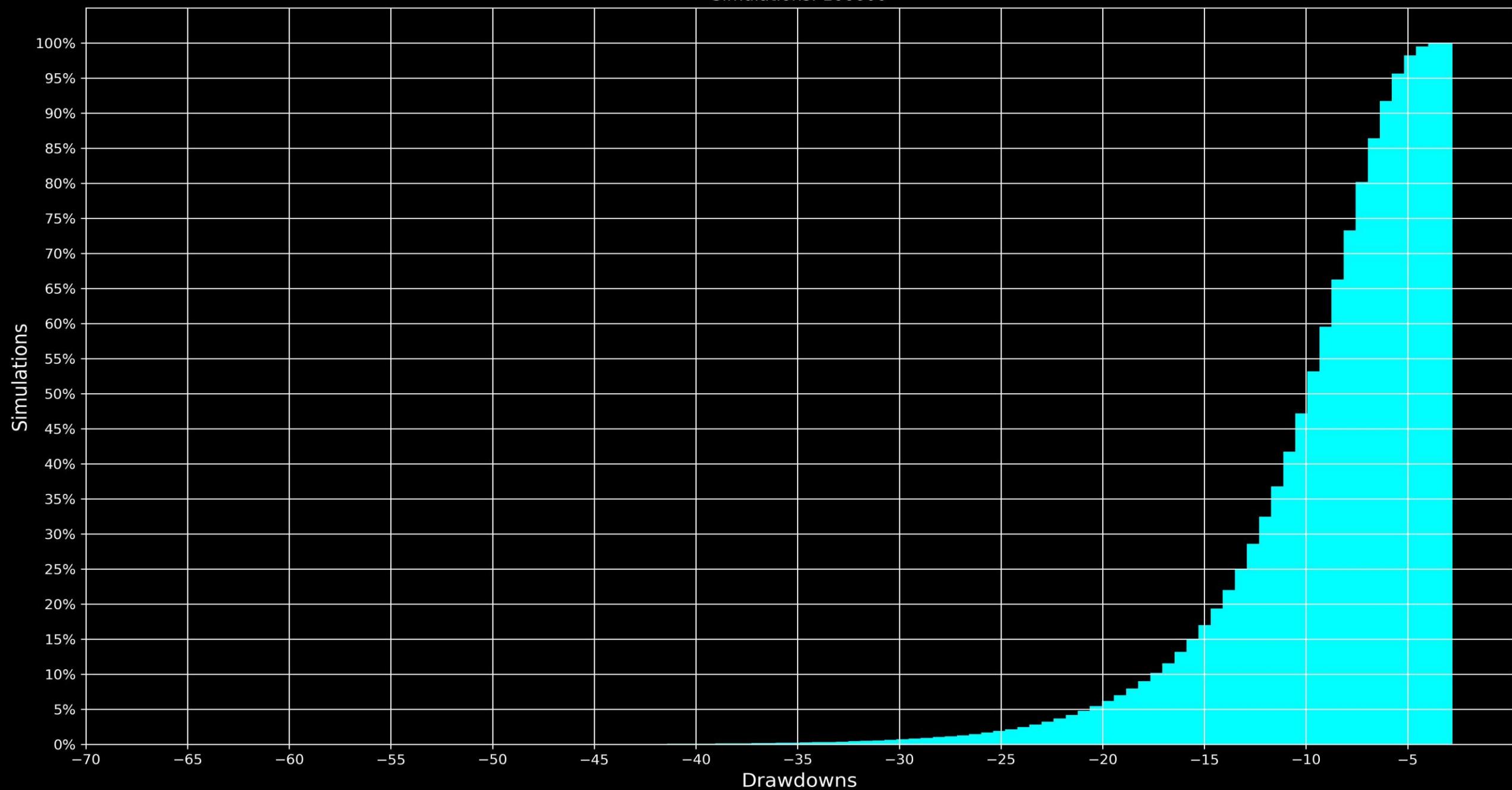
Monte Carlo Simulation (Re-sample) Drawdown Analysis
Valley To Peak Drawdown Histogram
Simulations: 100000



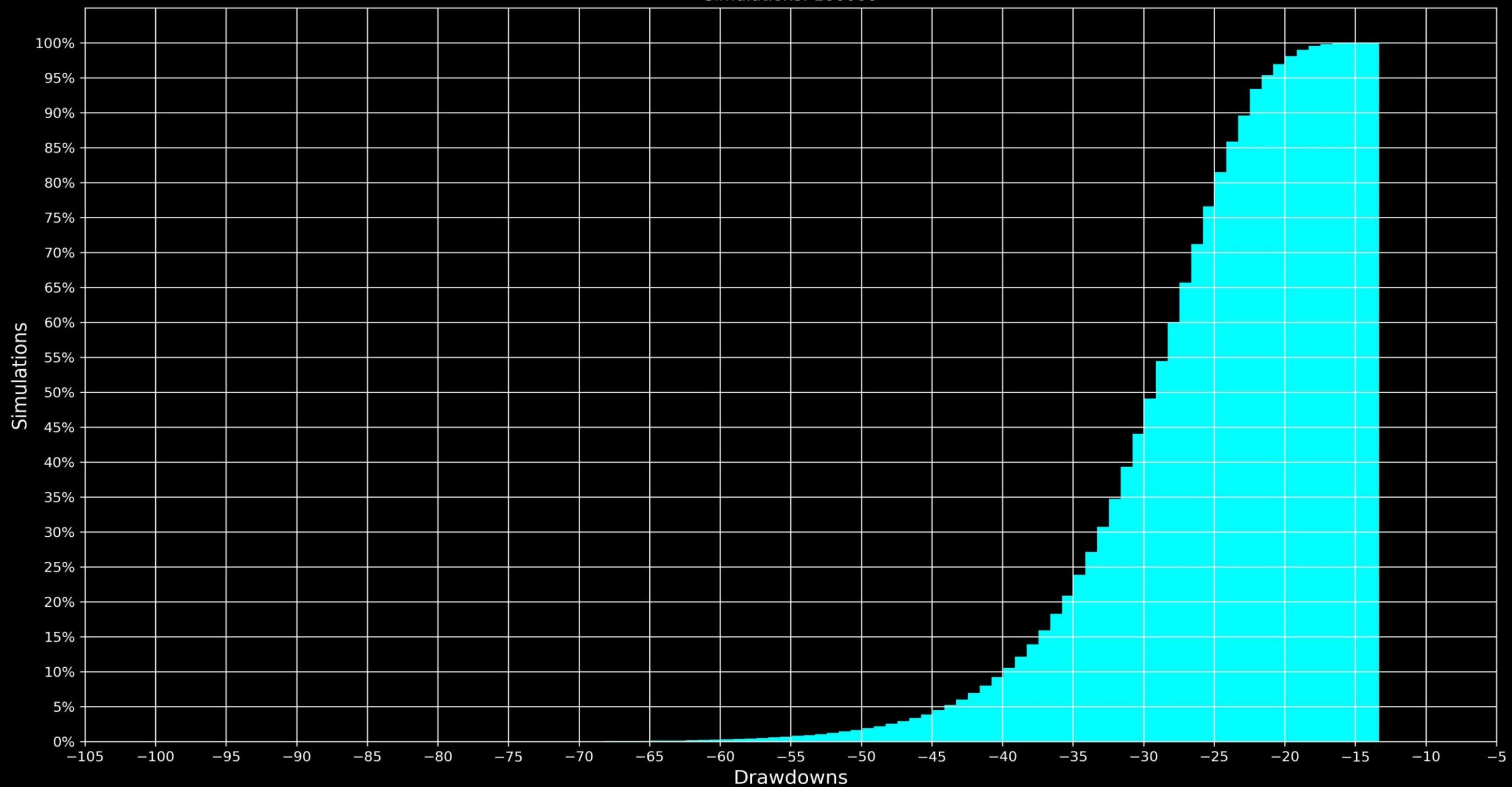
Monte Carlo Simulation (Re-sample) Drawdown Analysis Valley To Base Drawdown Histogram Simulations: 100000



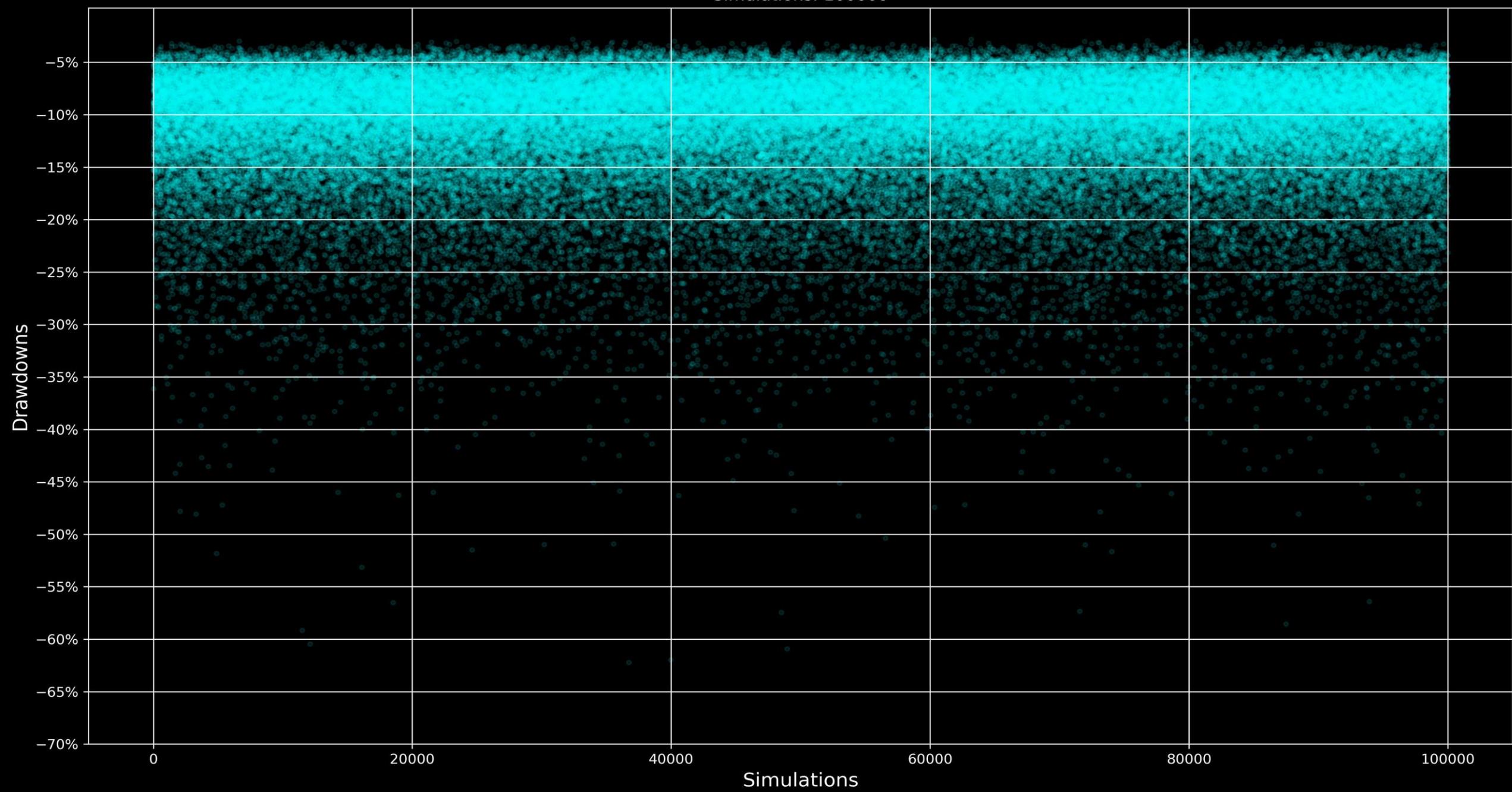
Monte Carlo Simulation (Re-sample) Drawdown Analysis
Valley To Peak Drawdown Histogram (Cumulative)
Simulations: 100000



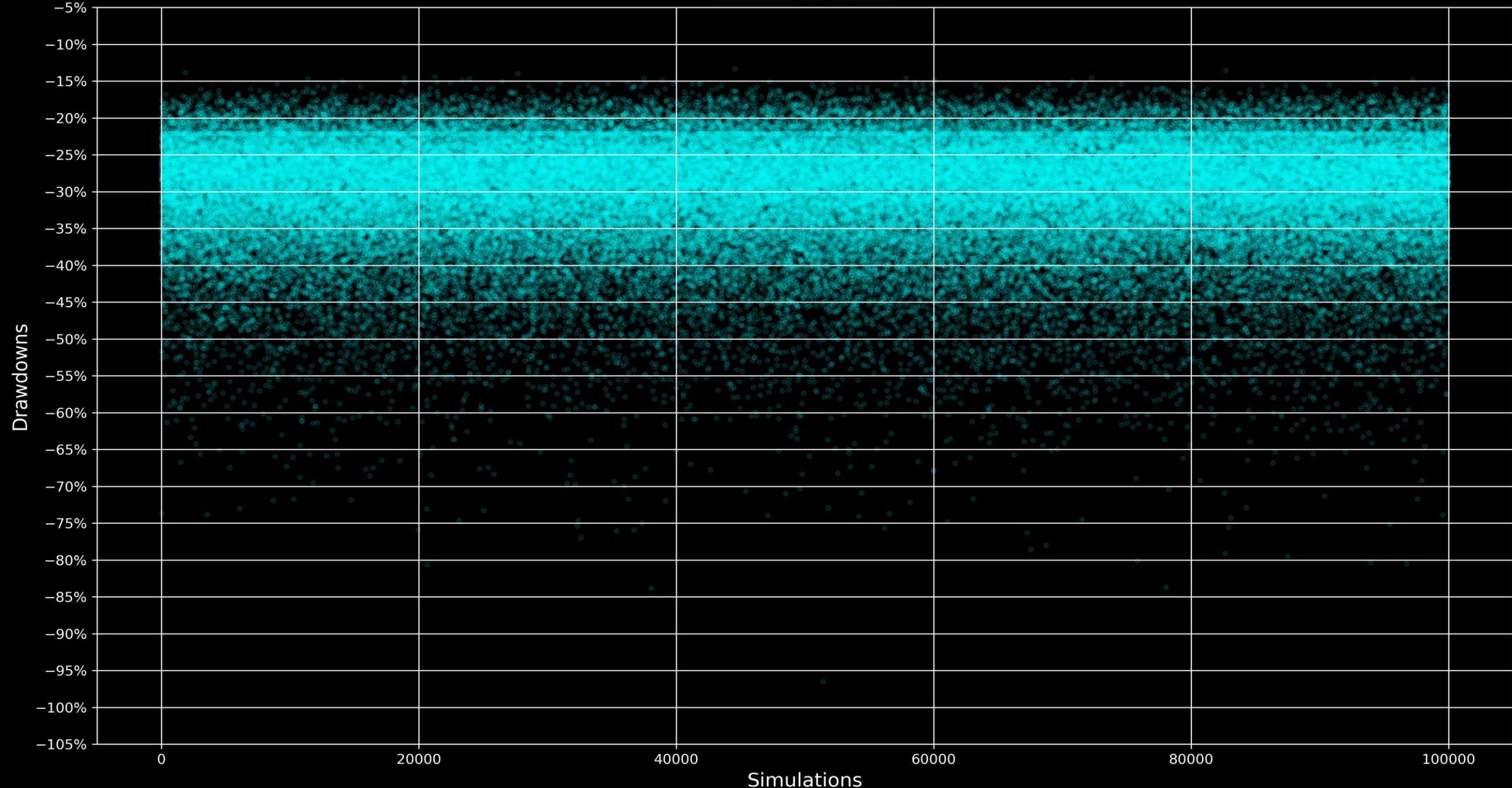
Monte Carlo Simulation (Re-sample) Drawdown Analysis
Valley To Base Drawdown Histogram (Cumulative)
Simulations: 100000



Monte Carlo Simulation (Re-sample) Drawdown Analysis
Valley To Peak Drawdown Scatter Plot
Simulations: 100000



Monte Carlo Simulation (Re-sample) Drawdown Analysis
Valley To Base Drawdown Scatter Plot
Simulations: 100000



Disclaimer

- All graphs displayed in this document represent simulated performance of the algorithms in the past. Past results do not imply future performance.
- All back-tests are inclusive of transaction costs to the second decimal place.
- Order fill prices for signals that form on candle close are taken as the open of the next candle.
- Stop-losses and targets that may occur intra-bar are assumed to be filled at the value of the stop/tgt.
- Great care has been taken to ensure that there is no look ahead bias in the back-tests.
- Results have been checked multiple times for any errors in processing.
- Slippage is not accounted for in the back-tests.
- Core blocks use very few indicators and are intended to be simple, logical and robust.
- There is no compounding of returns in the back-tests.

“I shall be telling this with a sigh
Somewhere ages and ages hence:
Two roads diverged in a wood, and I—
 I took the one less traveled by,
And that has made all the difference.”

The Road Not Taken – Robert Frost