

# 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

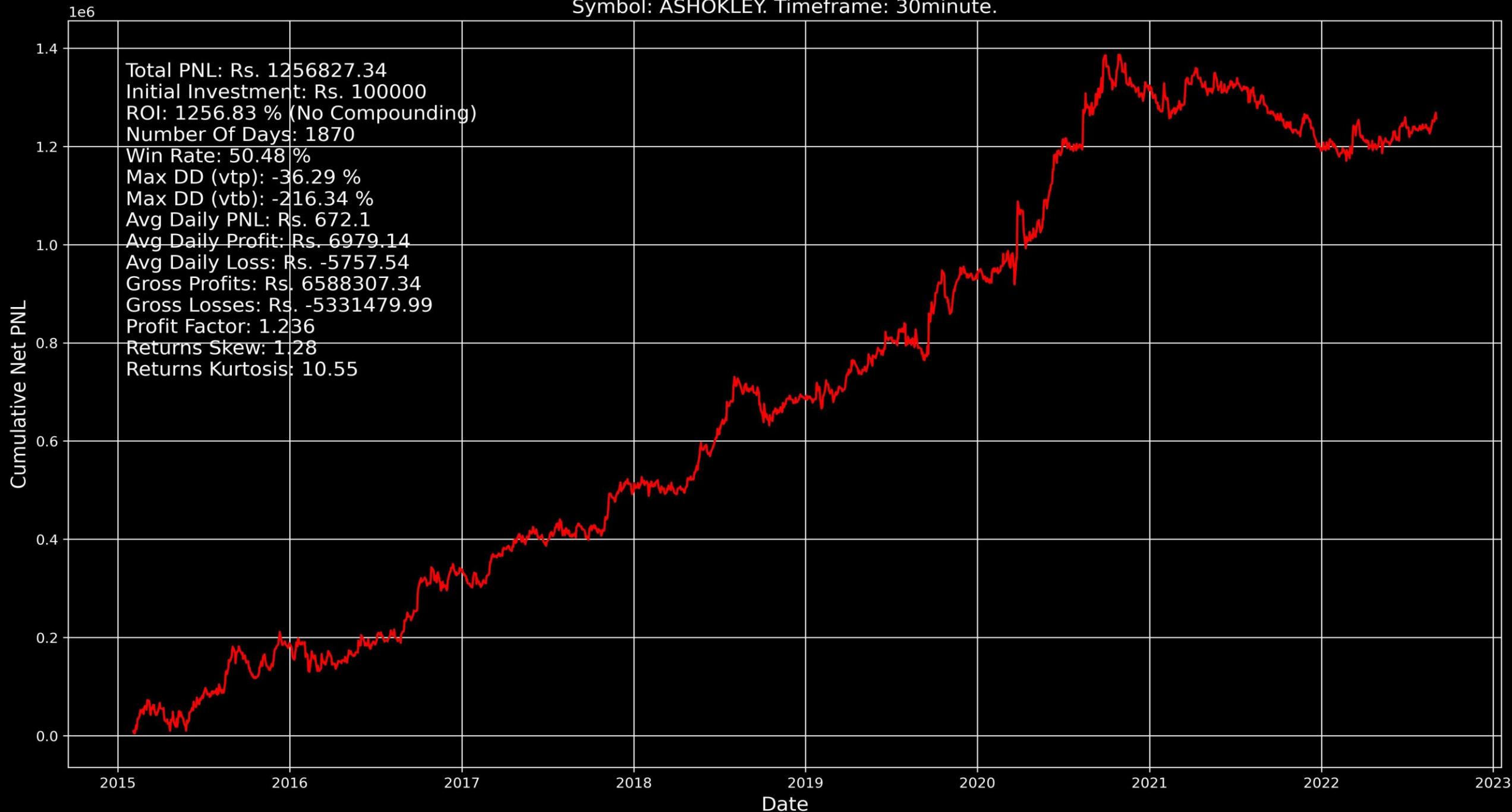


# Core Block 1

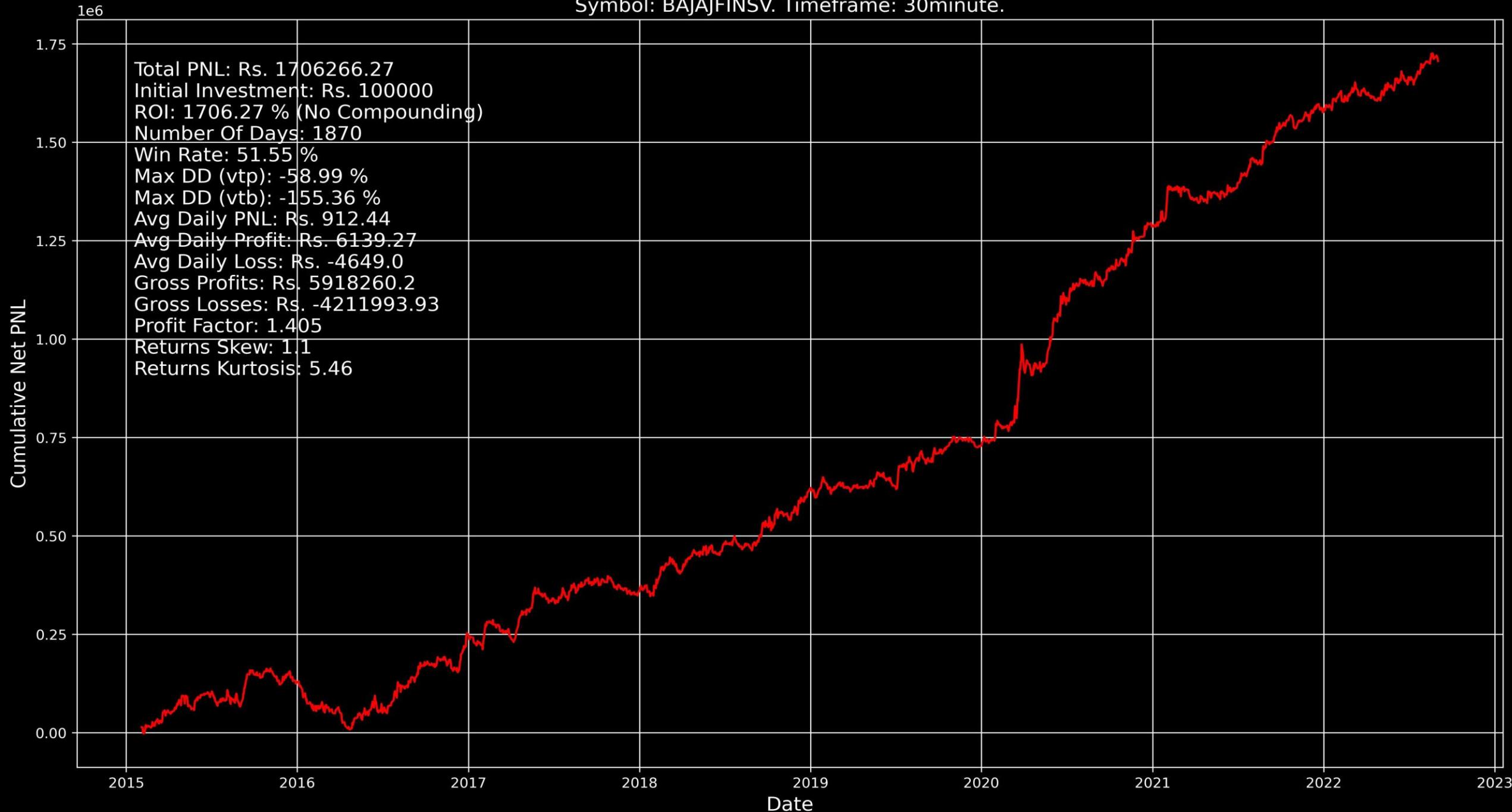
VWAP Based Intraday Trend Following System

# Individual Symbol-wise Performance

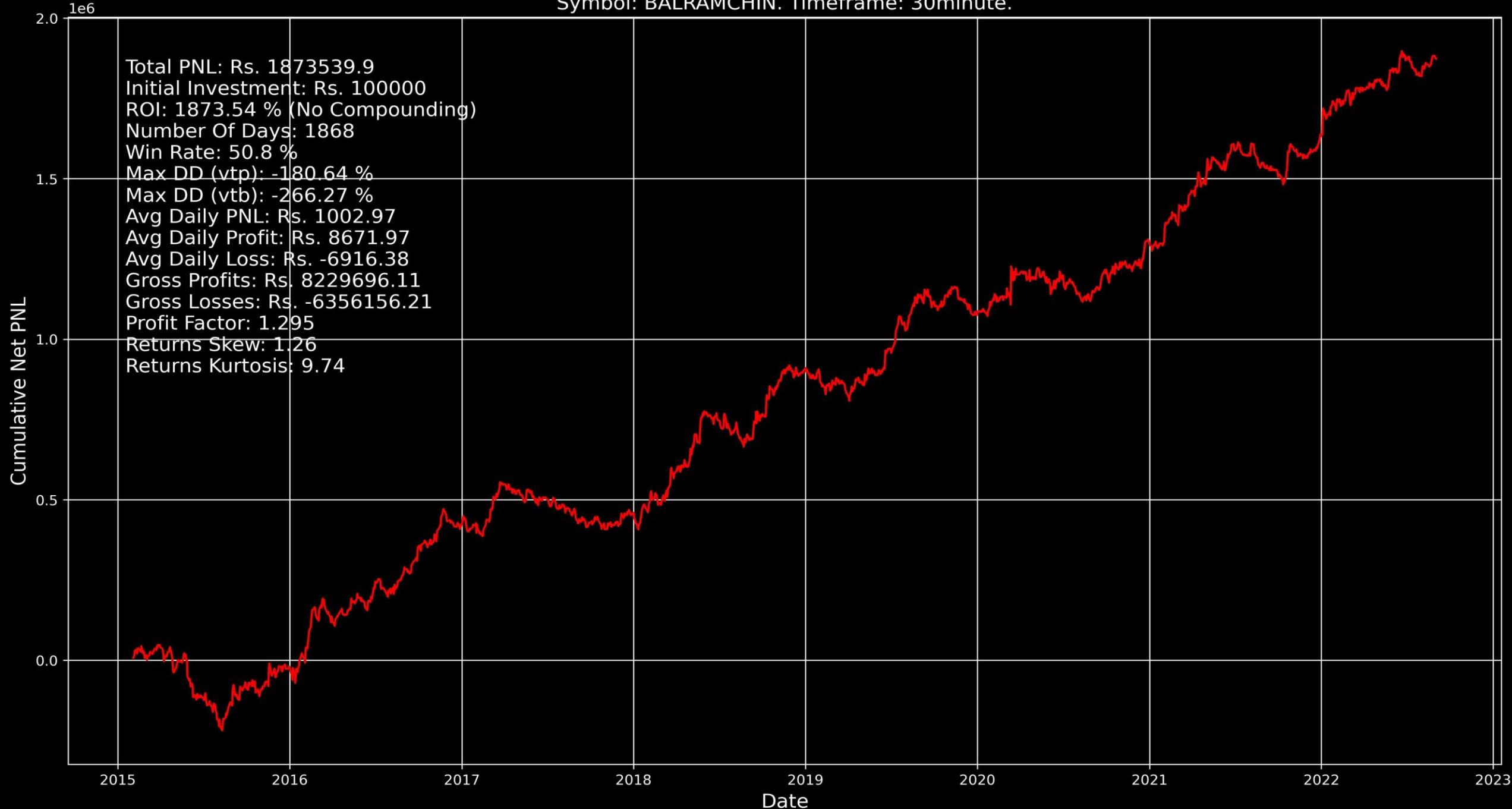
VWAP System Performance (Day-wise)  
Symbol: ASHOKLEY. Timeframe: 30minute.



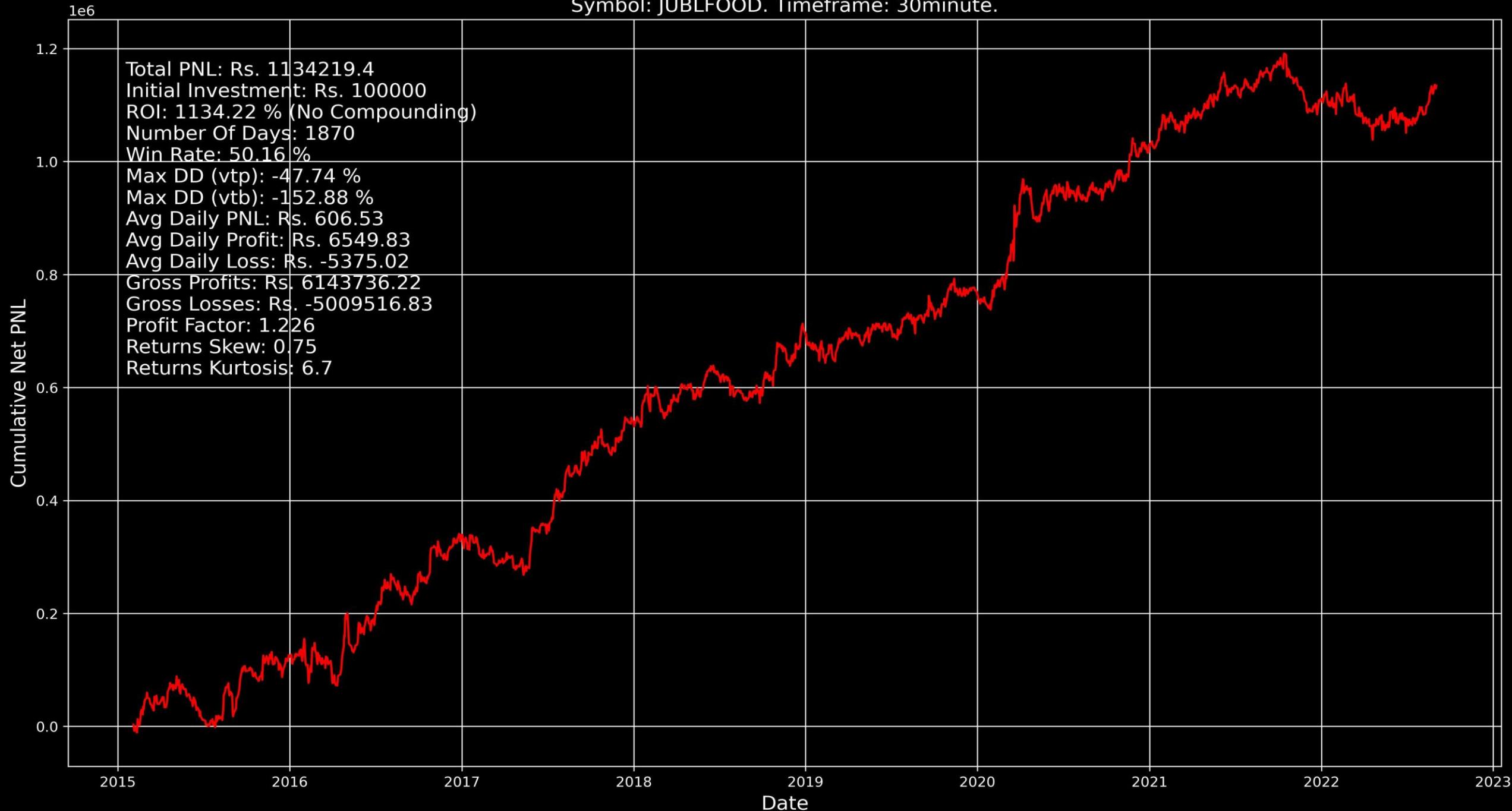
VWAP System Performance (Day-wise)  
Symbol: BAJAJFINSV. Timeframe: 30minute.



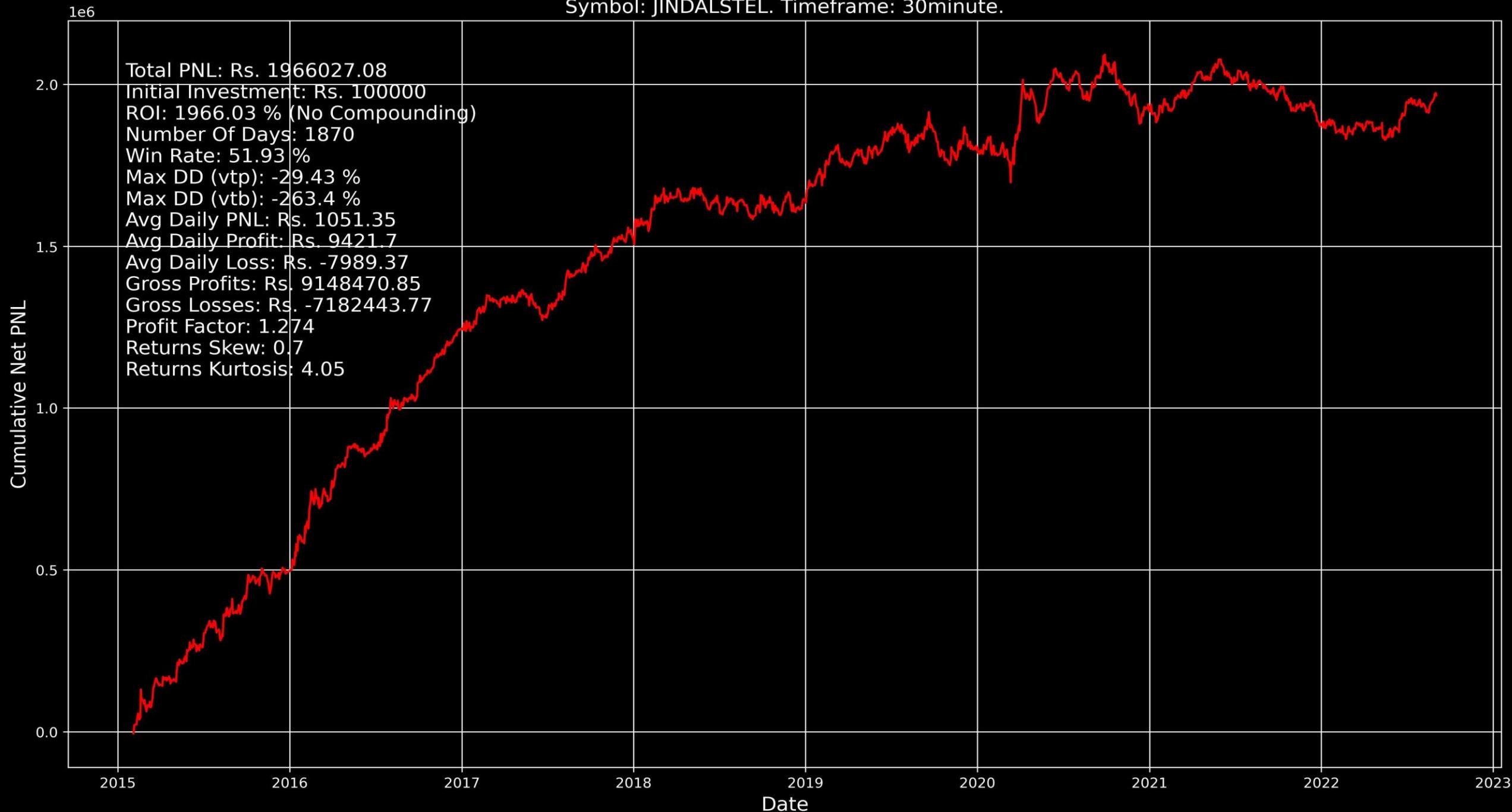
VWAP System Performance (Day-wise)  
Symbol: BALRAMCHIN. Timeframe: 30minute.



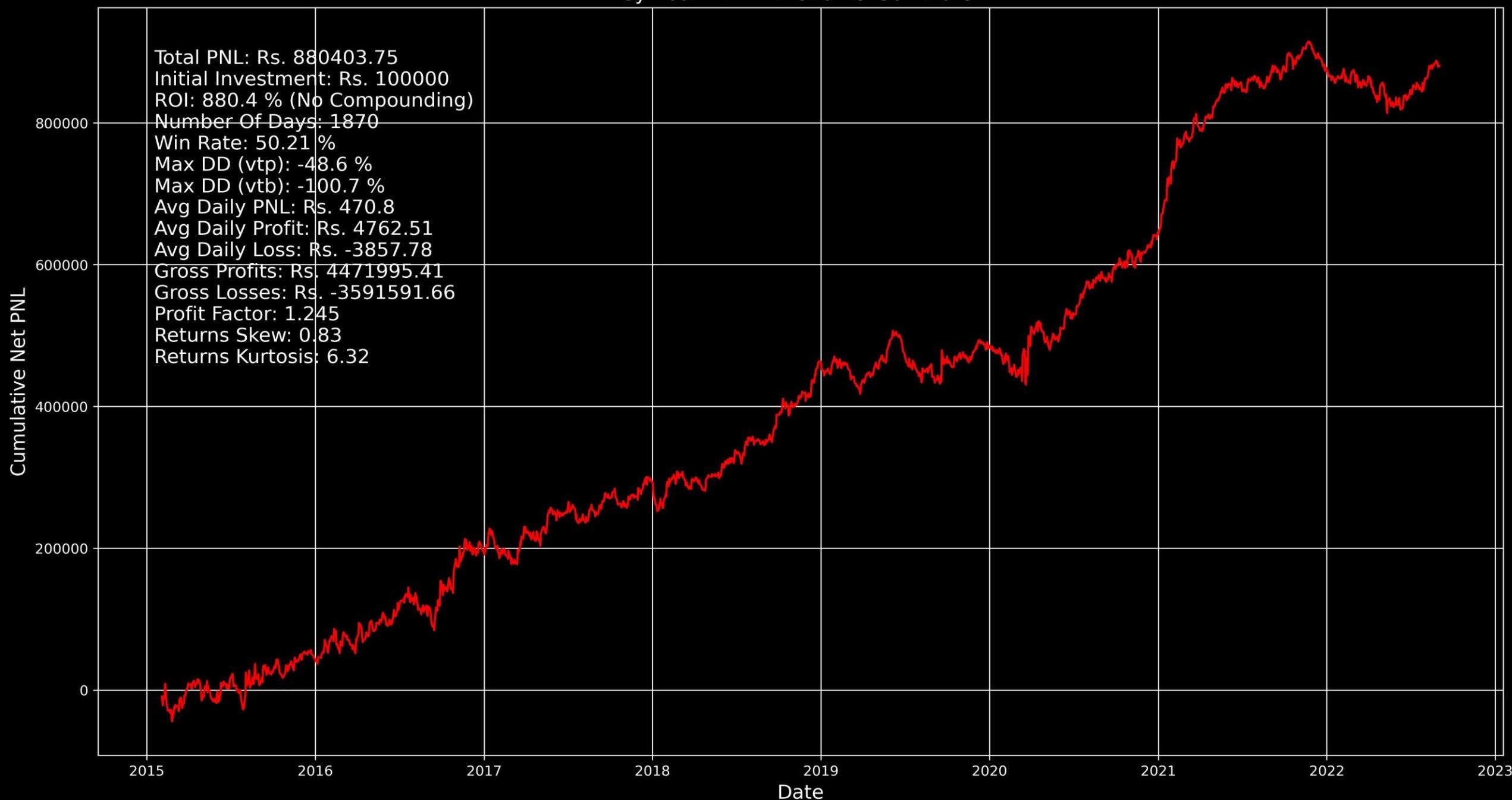
VWAP System Performance (Day-wise)  
Symbol: JUBLFOOD. Timeframe: 30minute.



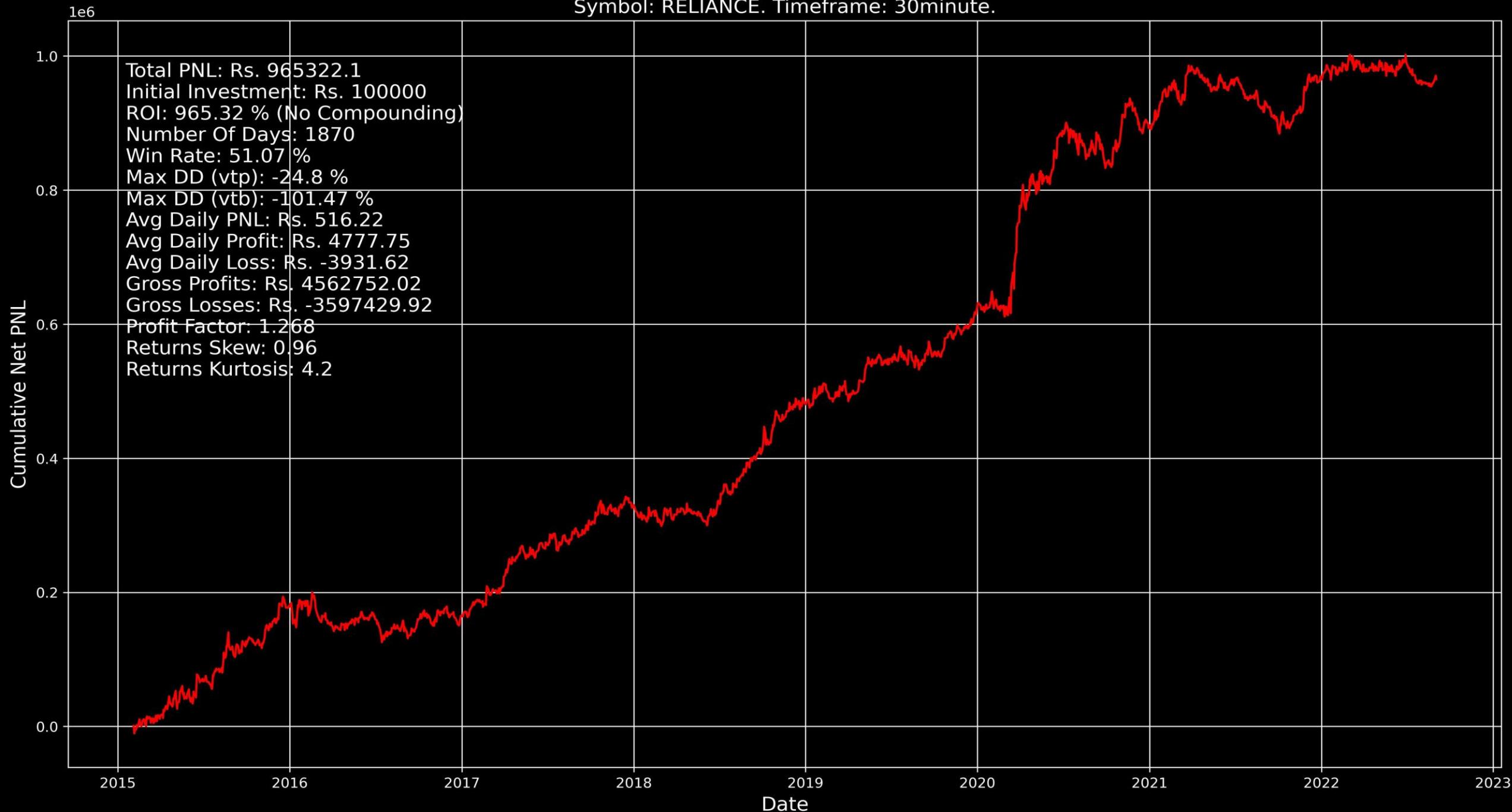
VWAP System Performance (Day-wise)  
Symbol: JINDALSTEL. Timeframe: 30minute.



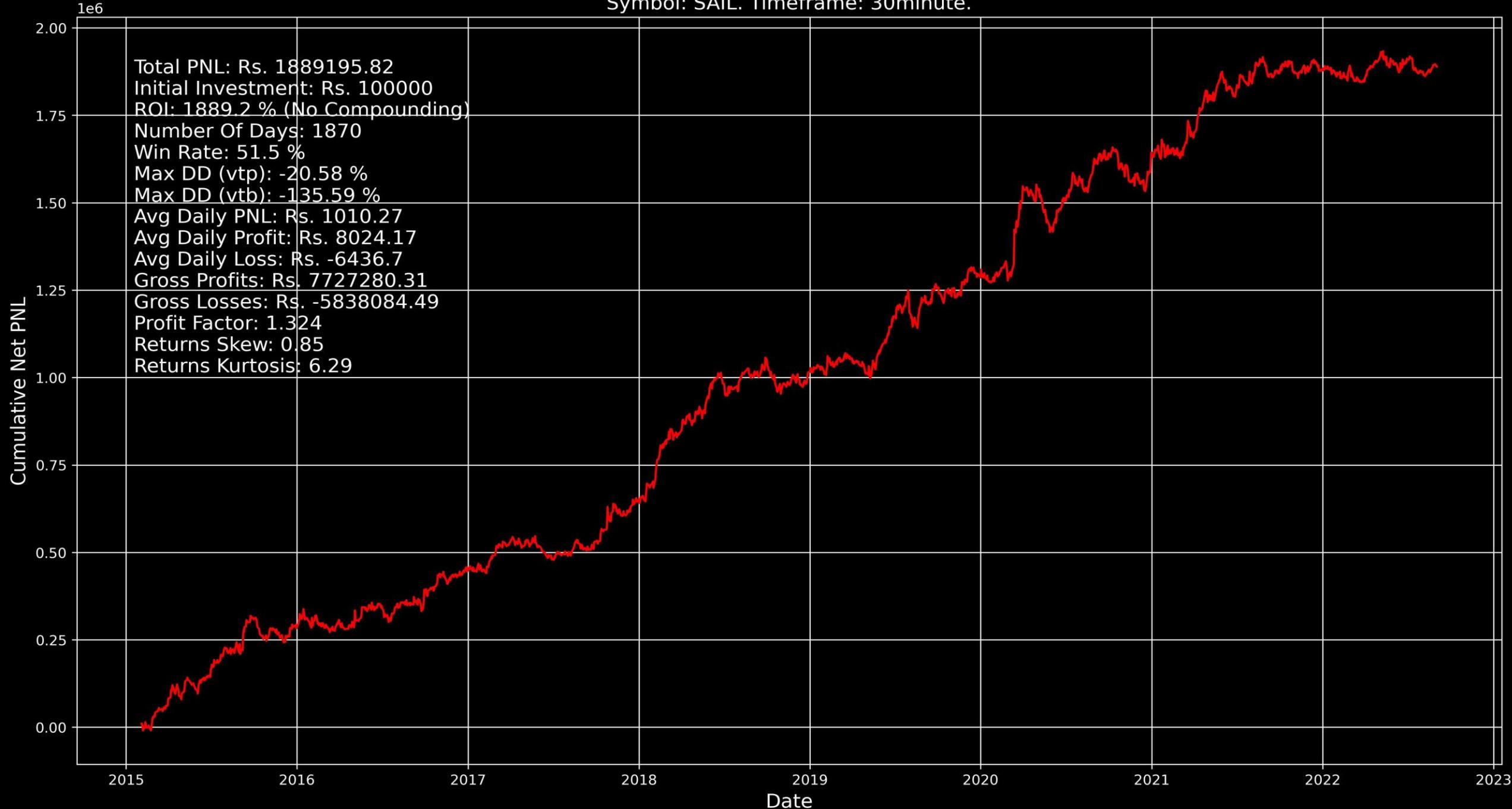
VWAP System Performance (Day-wise)  
Symbol: MRF. Timeframe: 30minute.



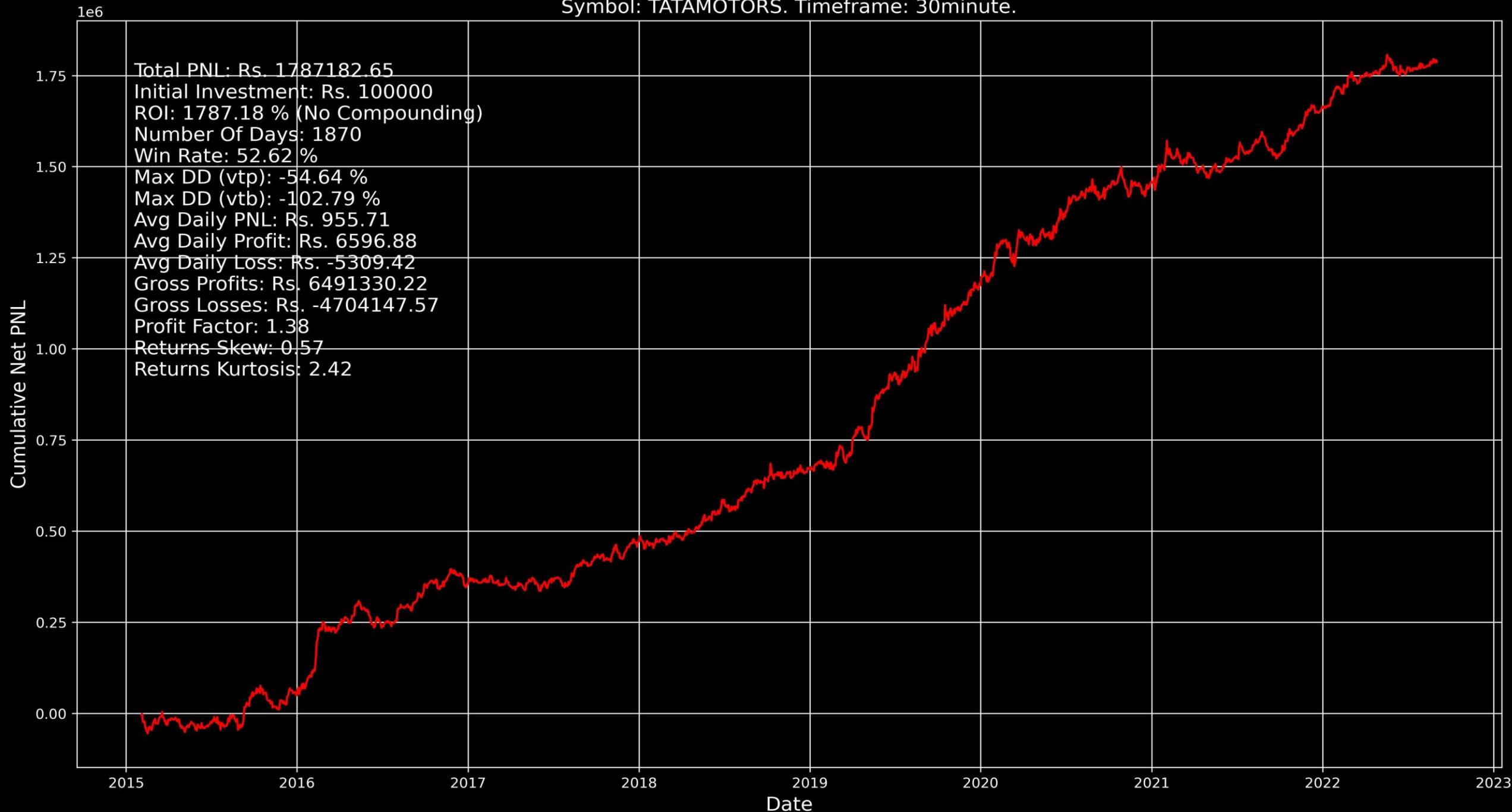
VWAP System Performance (Day-wise)  
Symbol: RELIANCE. Timeframe: 30minute.



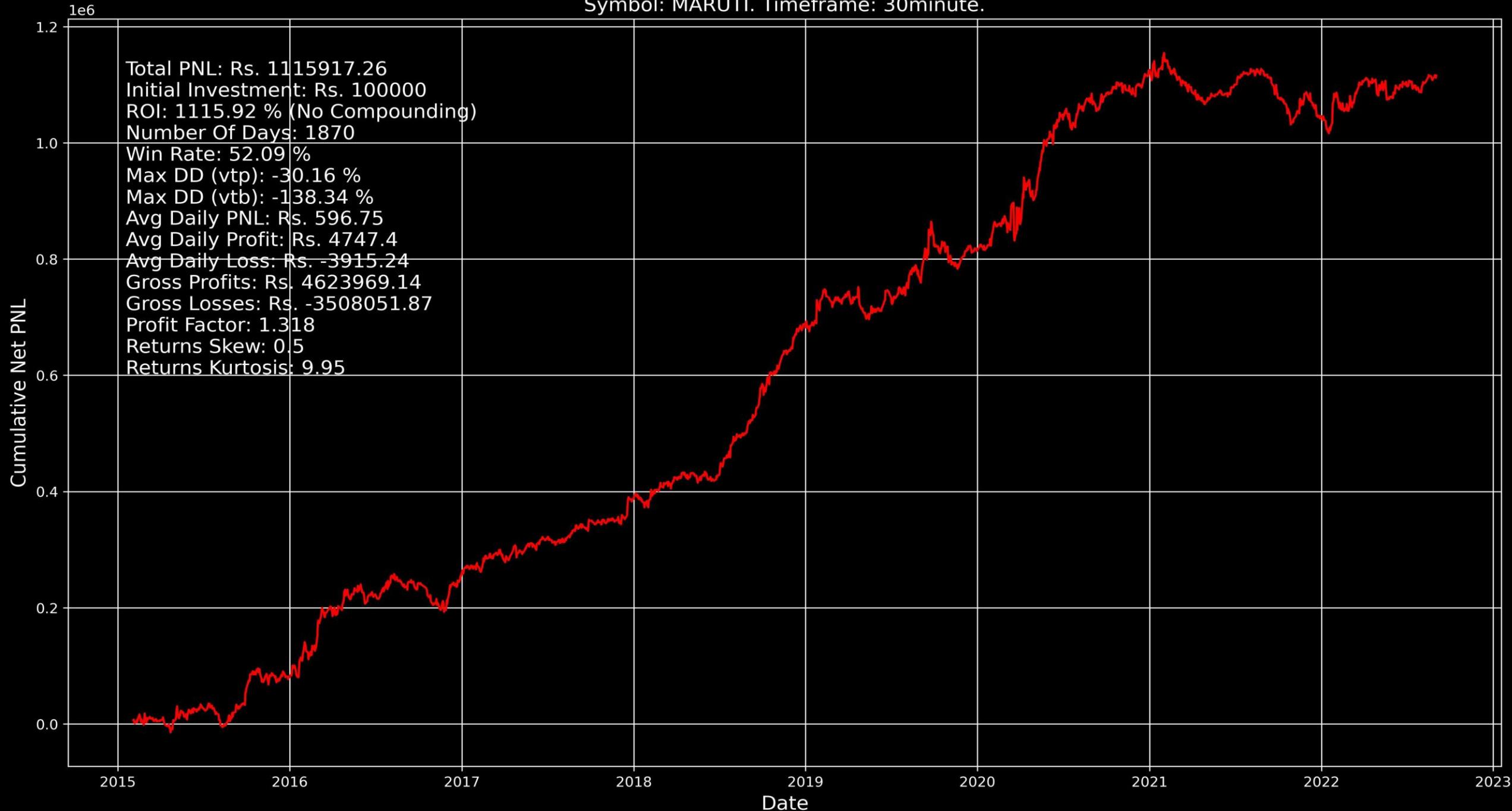
VWAP System Performance (Day-wise)  
Symbol: SAIL. Timeframe: 30minute.



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



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

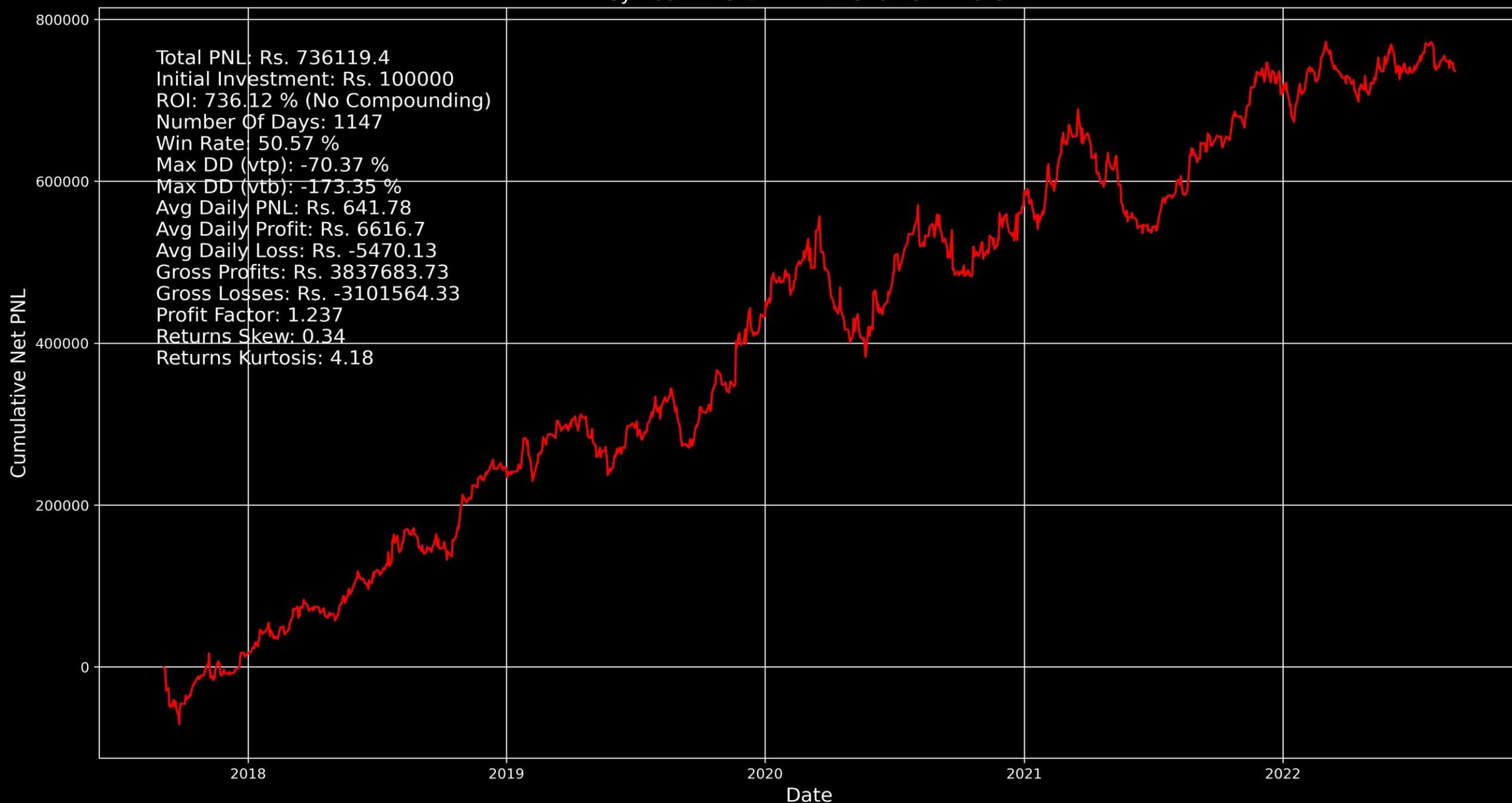


# Core Block 2

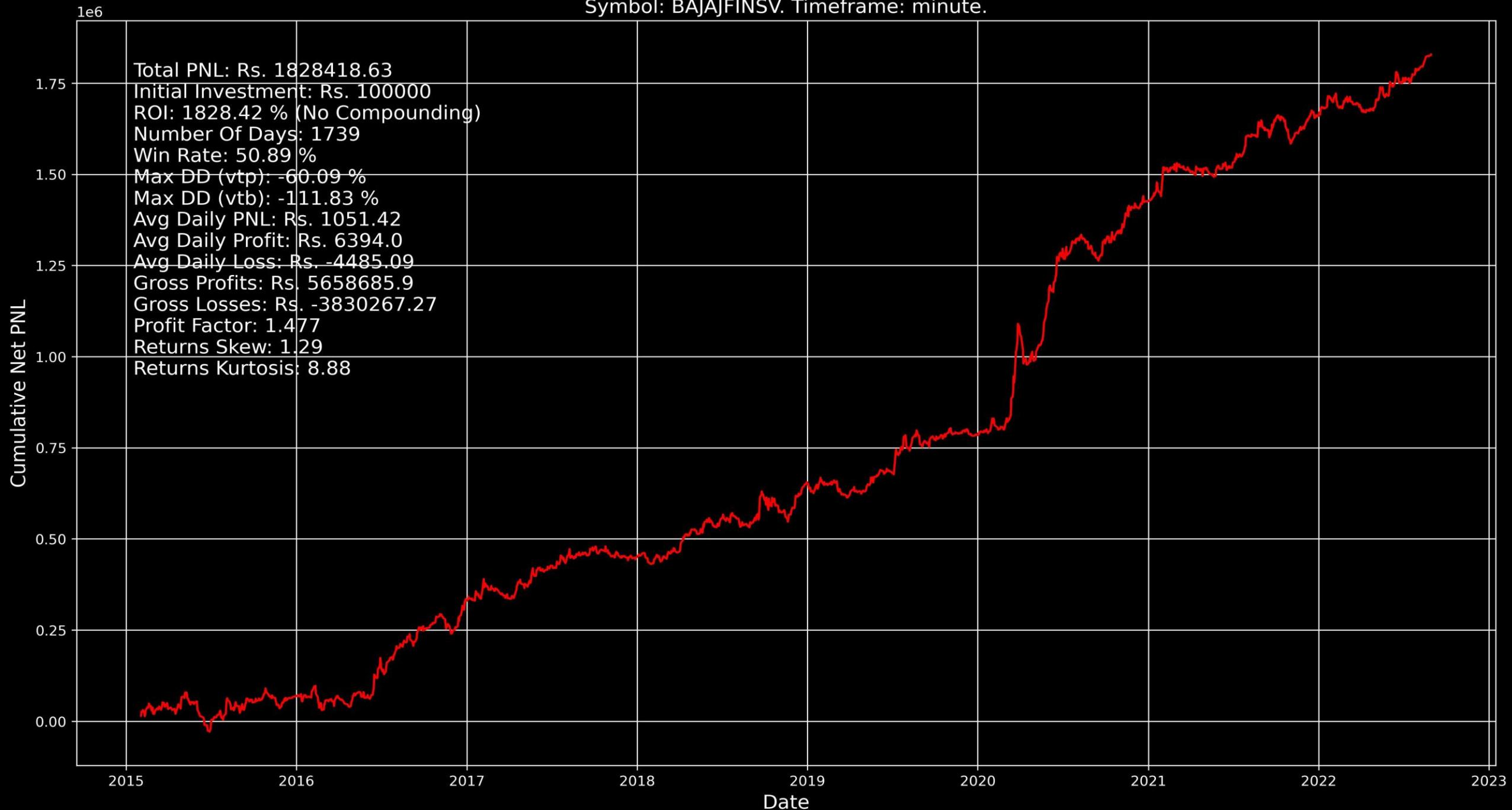
Opening Range Breakout(ORB) Based Intraday Trend  
Following System

# Individual Symbol-wise Performance

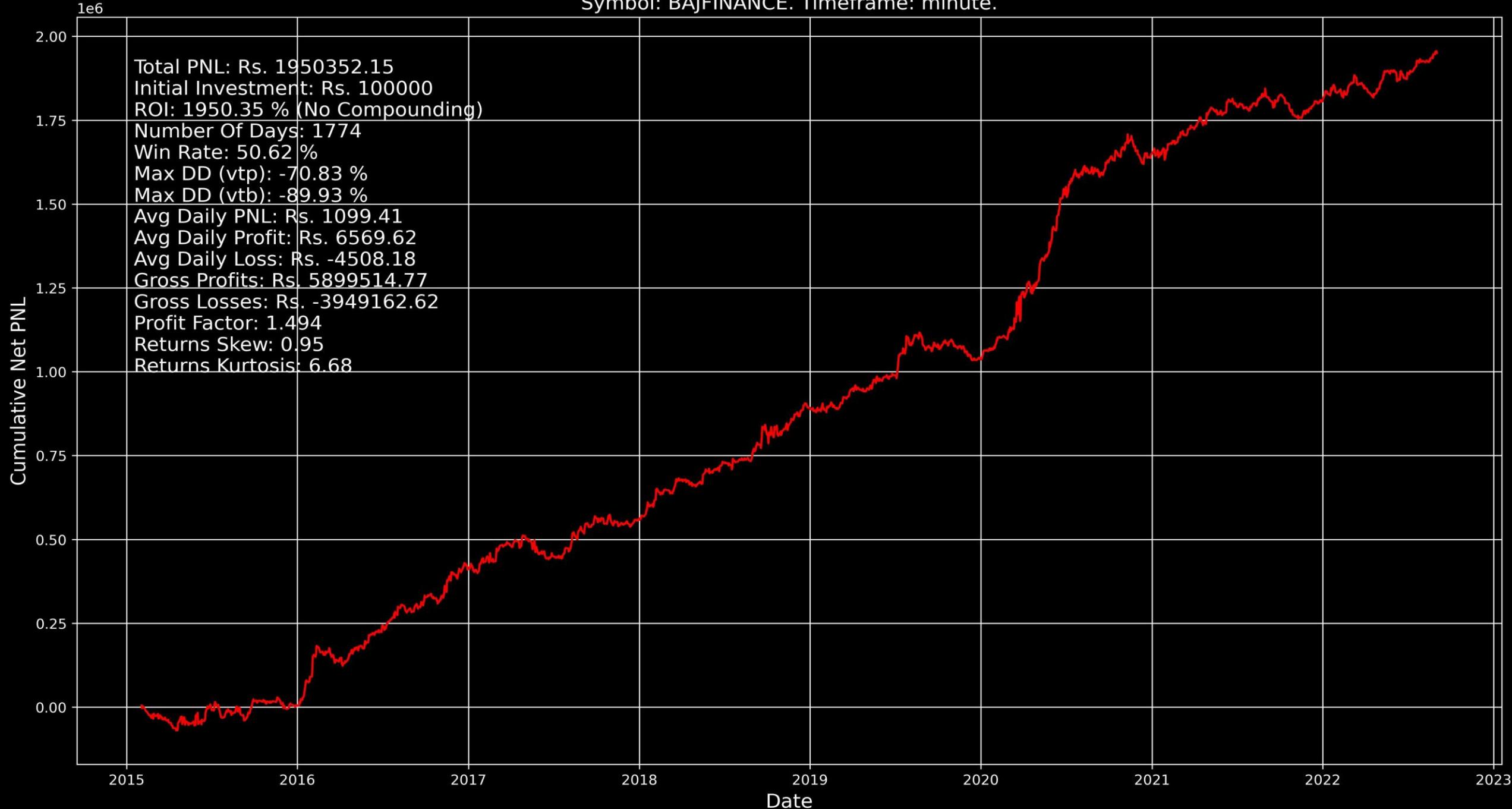
MORNING RANGE V2 System Performance (Day-wise)  
Symbol: ABCAPITAL. Timeframe: minute.



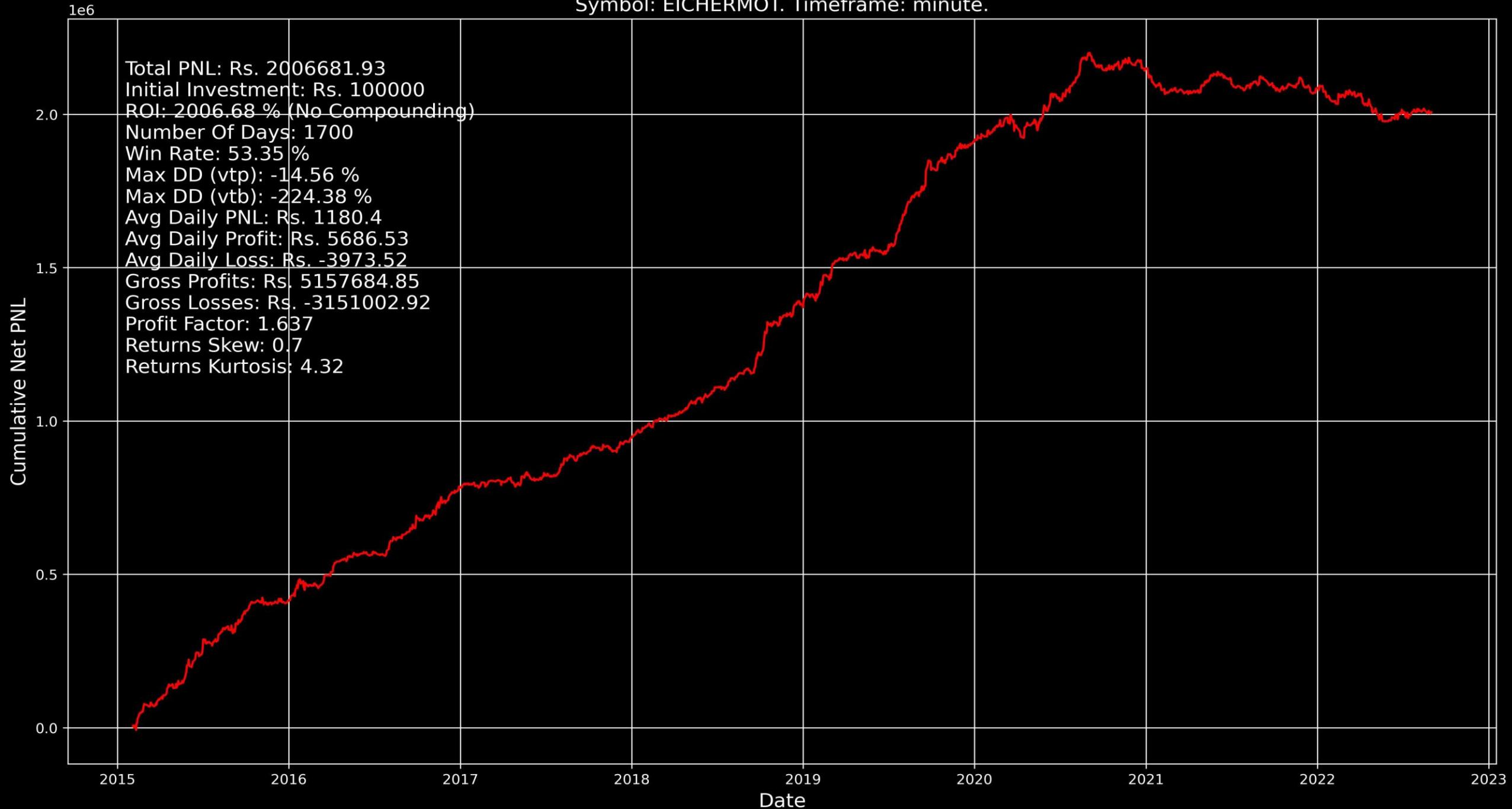
MORNING RANGE V2 System Performance (Day-wise)  
Symbol: BAJAJFINSV. Timeframe: minute.



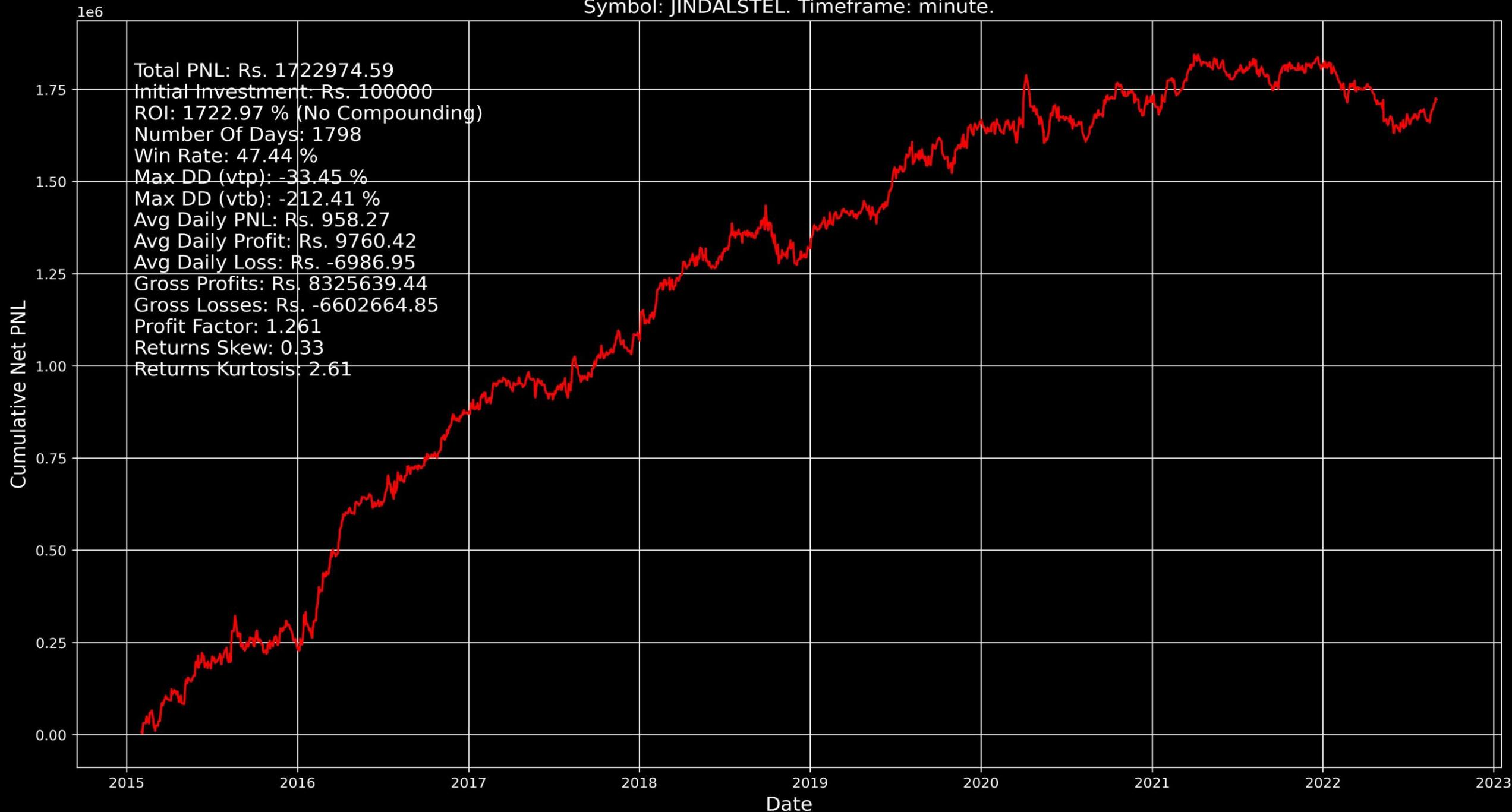
MORNING RANGE V2 System Performance (Day-wise)  
Symbol: BAJFINANCE. Timeframe: minute.



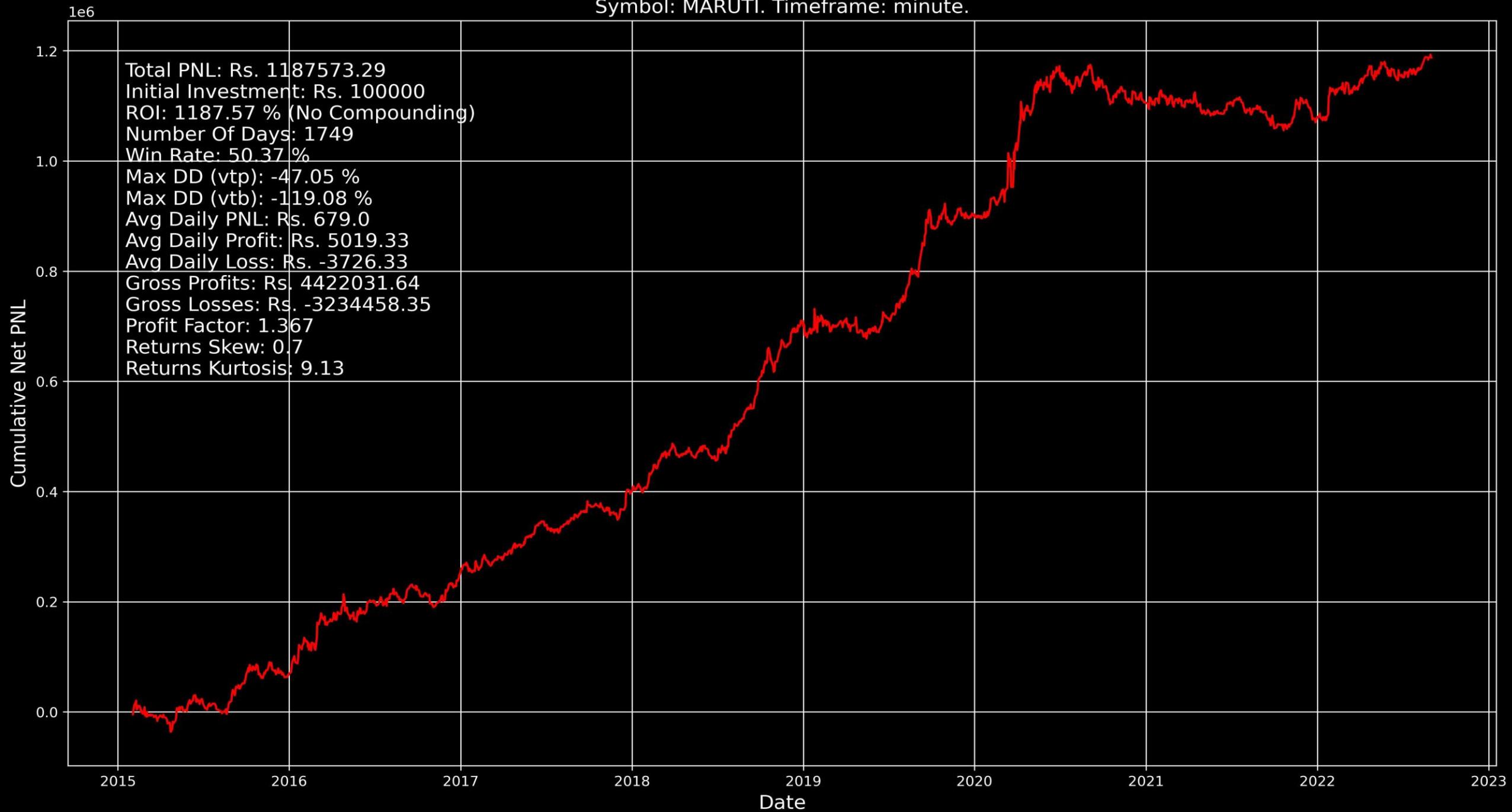
MORNING RANGE V2 System Performance (Day-wise)  
Symbol: EICHERMOT. Timeframe: minute.



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

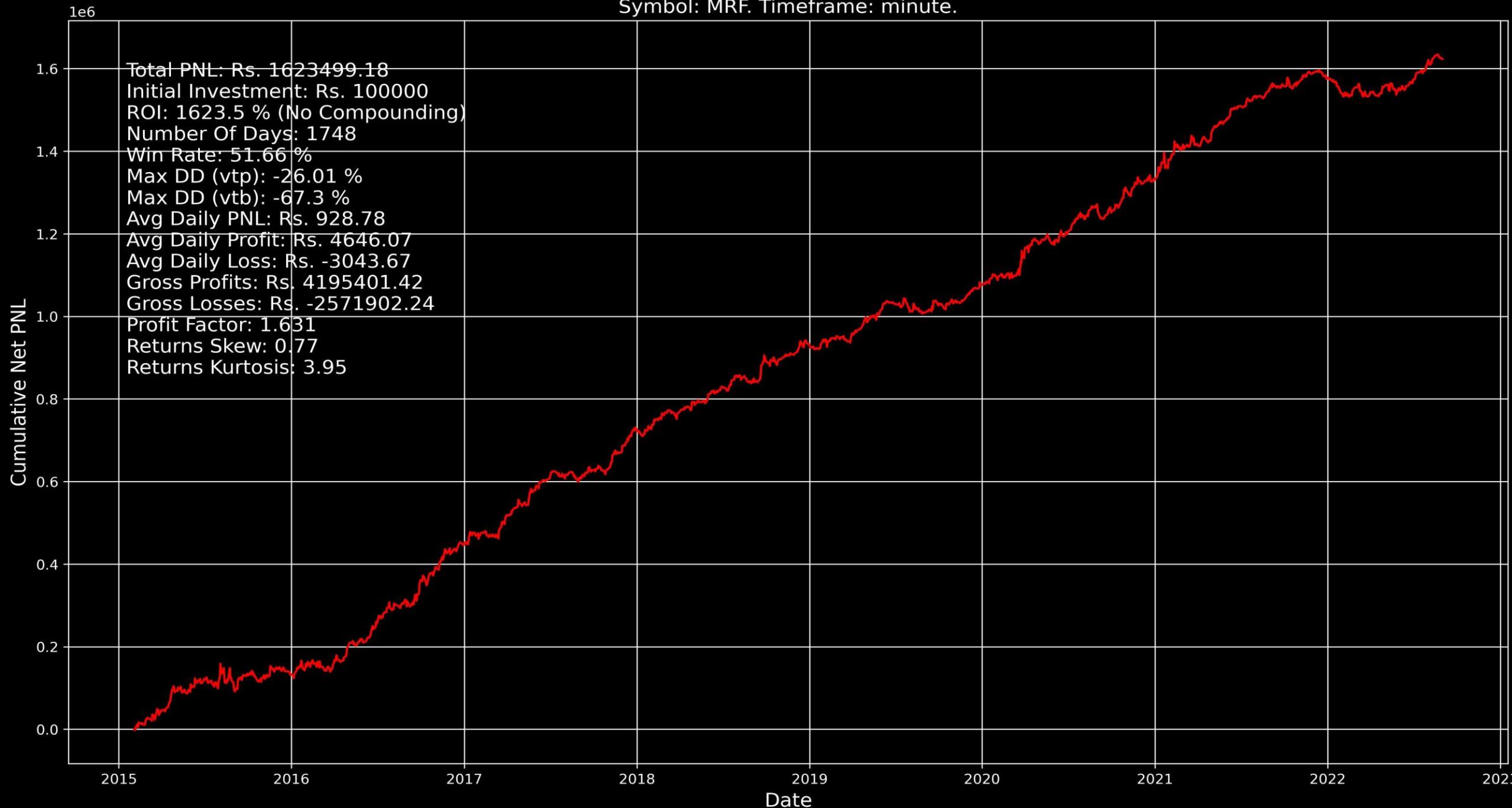


MORNING RANGE V2 System Performance (Day-wise)  
Symbol: MARUTI. Timeframe: minute.

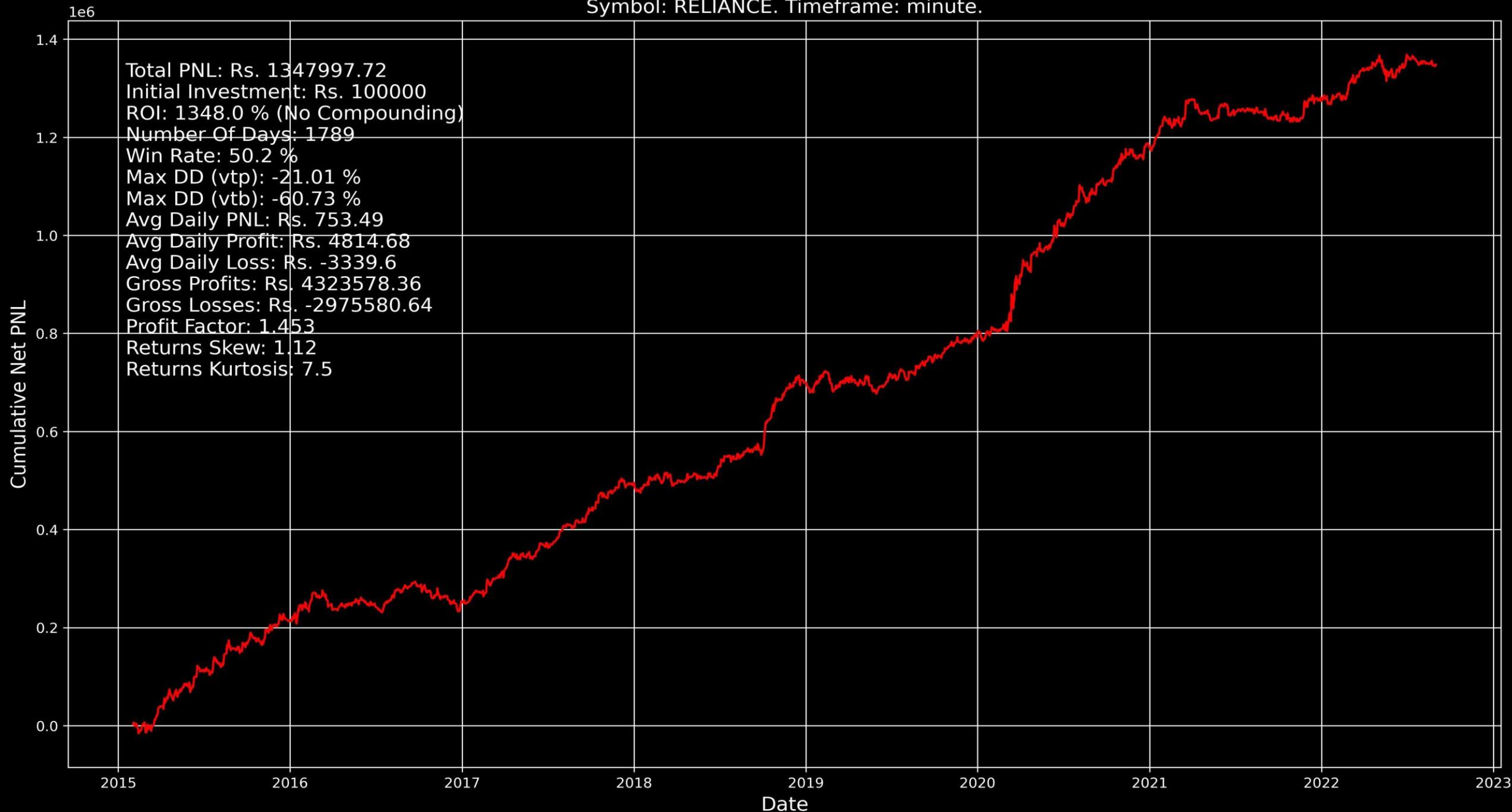


# MORNING RANGE V2 System Performance (Day-wise)

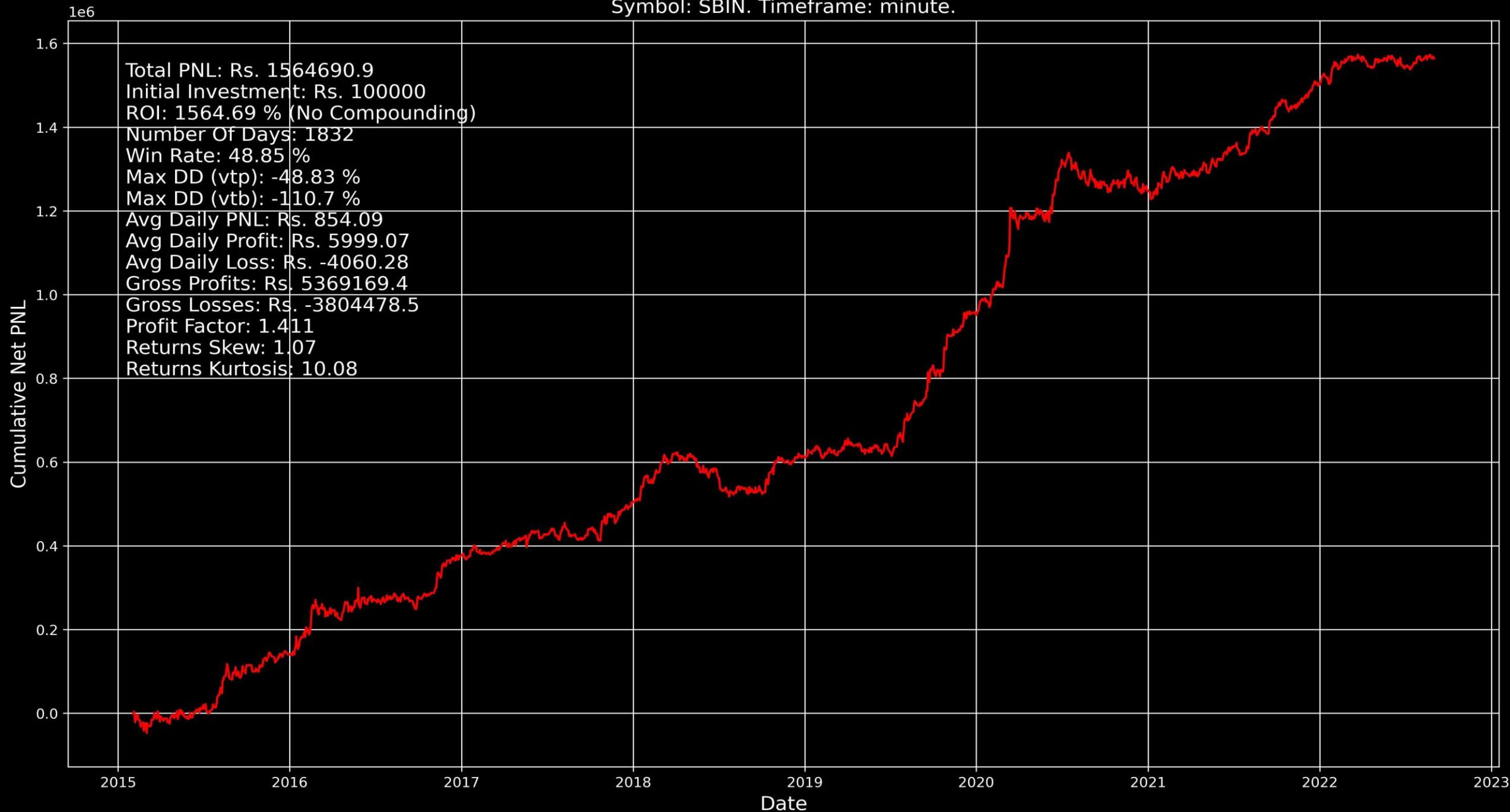
Symbol: MRF. Timeframe: minute.



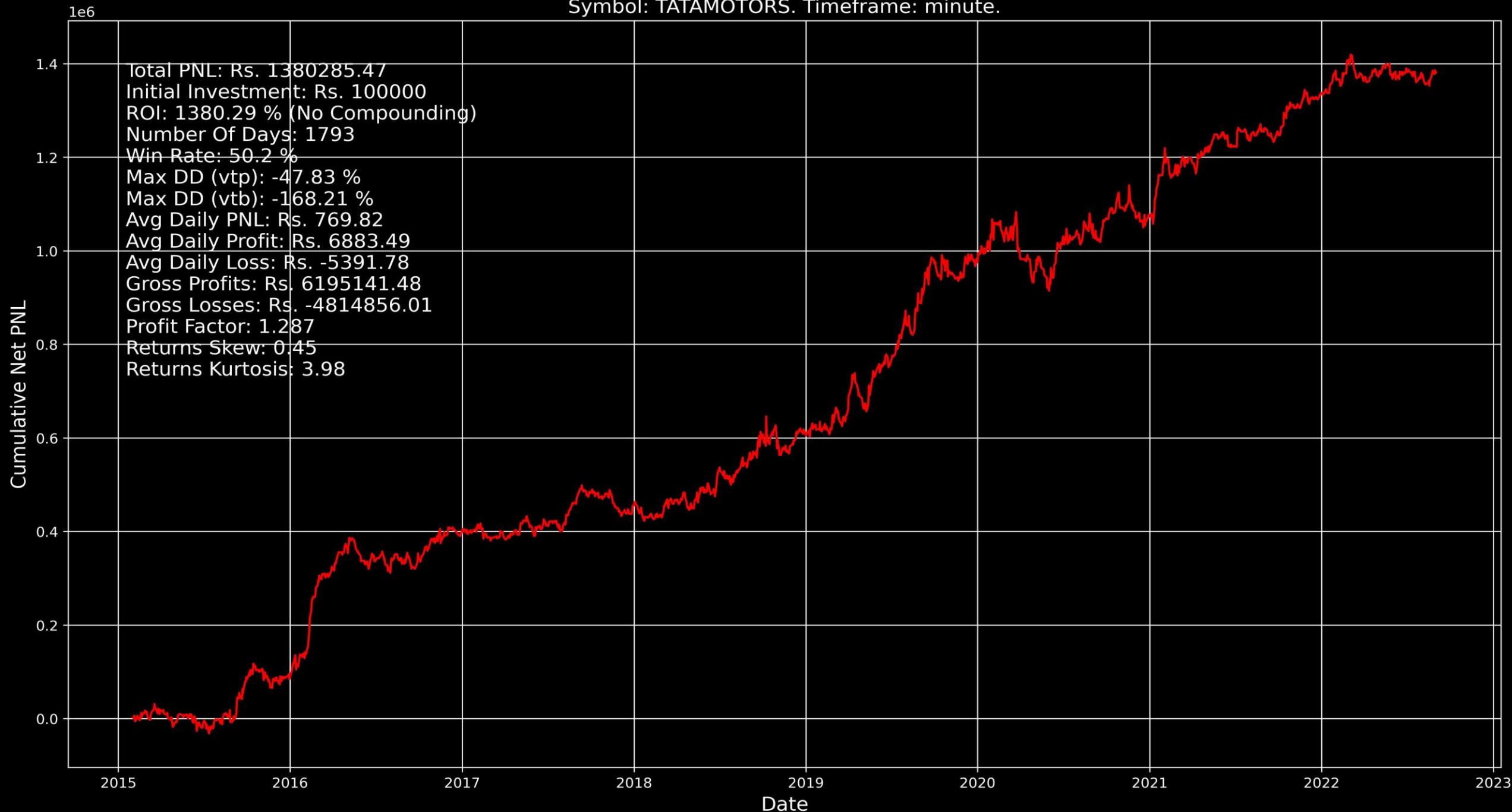
MORNING RANGE V2 System Performance (Day-wise)  
Symbol: RELIANCE. Timeframe: minute.



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



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



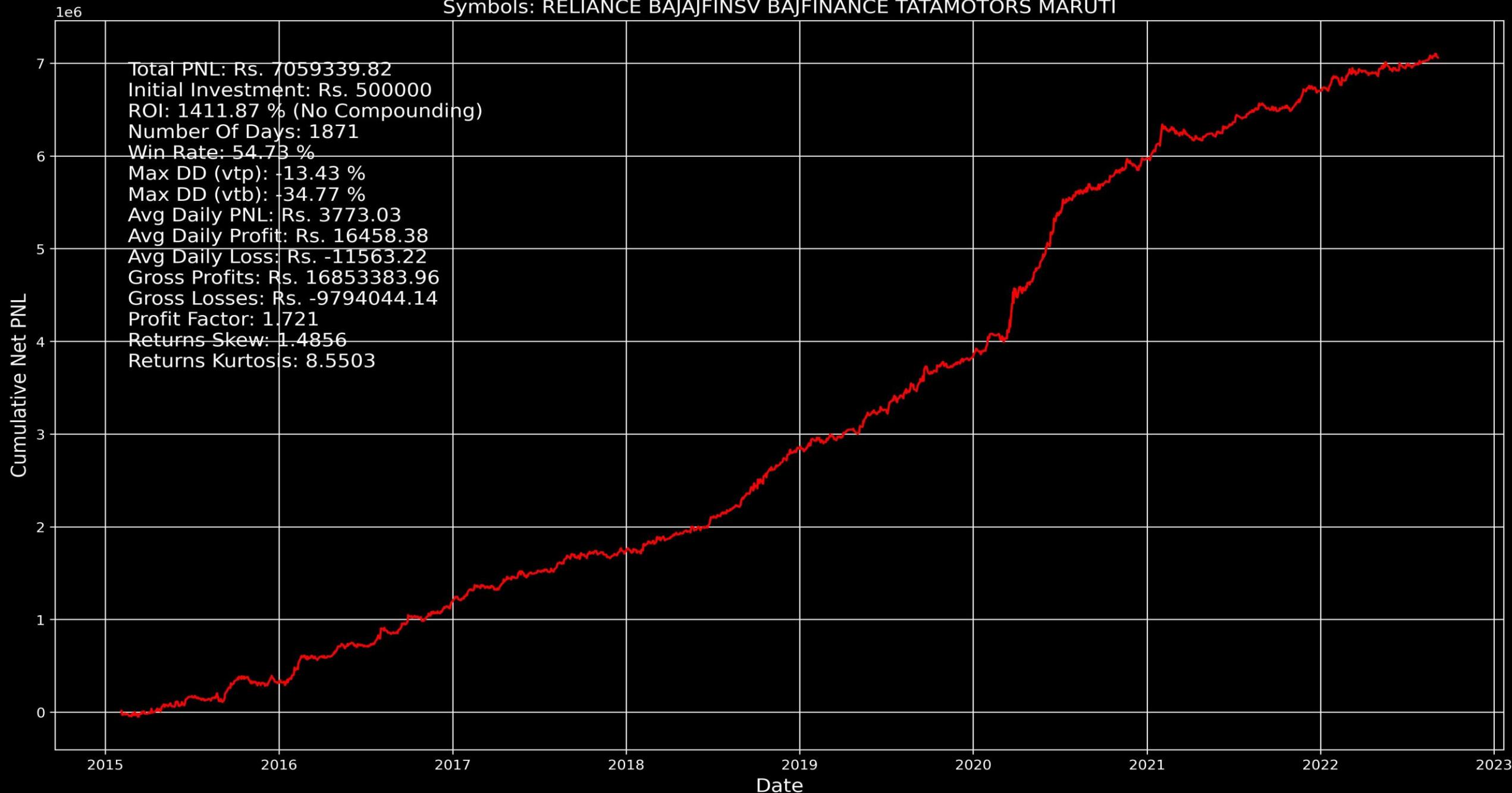
# Diversification Methods

Eliminating Symbol dependent Systemic Risk

# Fixed Symbol Basket (VWAP Core Block)

Basket Performance  
System: VWAP System

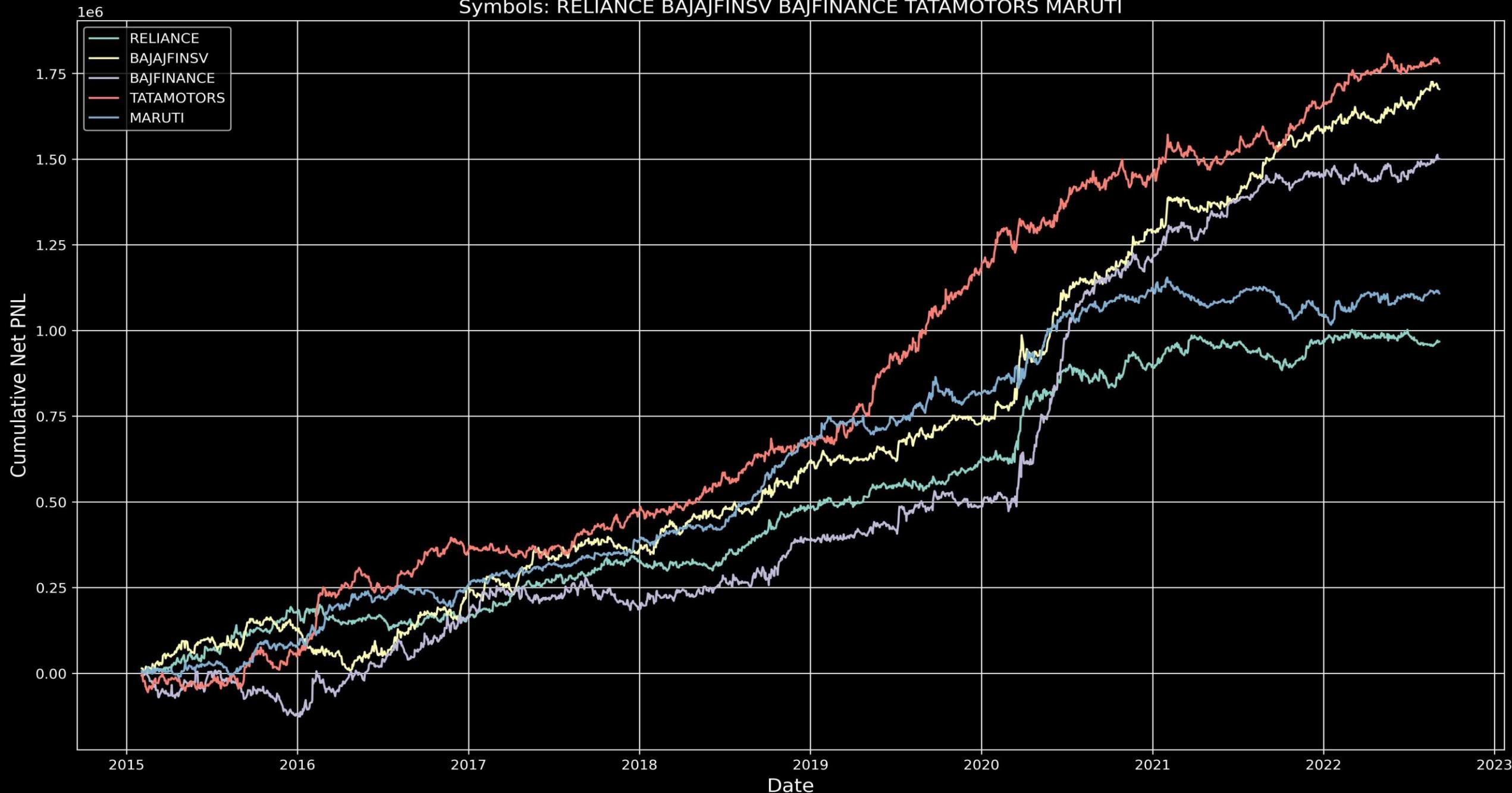
Symbols: RELIANCE BAJAJFINSV BAJFINANCE TATAMOTORS MARUTI



## Symbol-wise Performance Of Basket

System: VWAP System

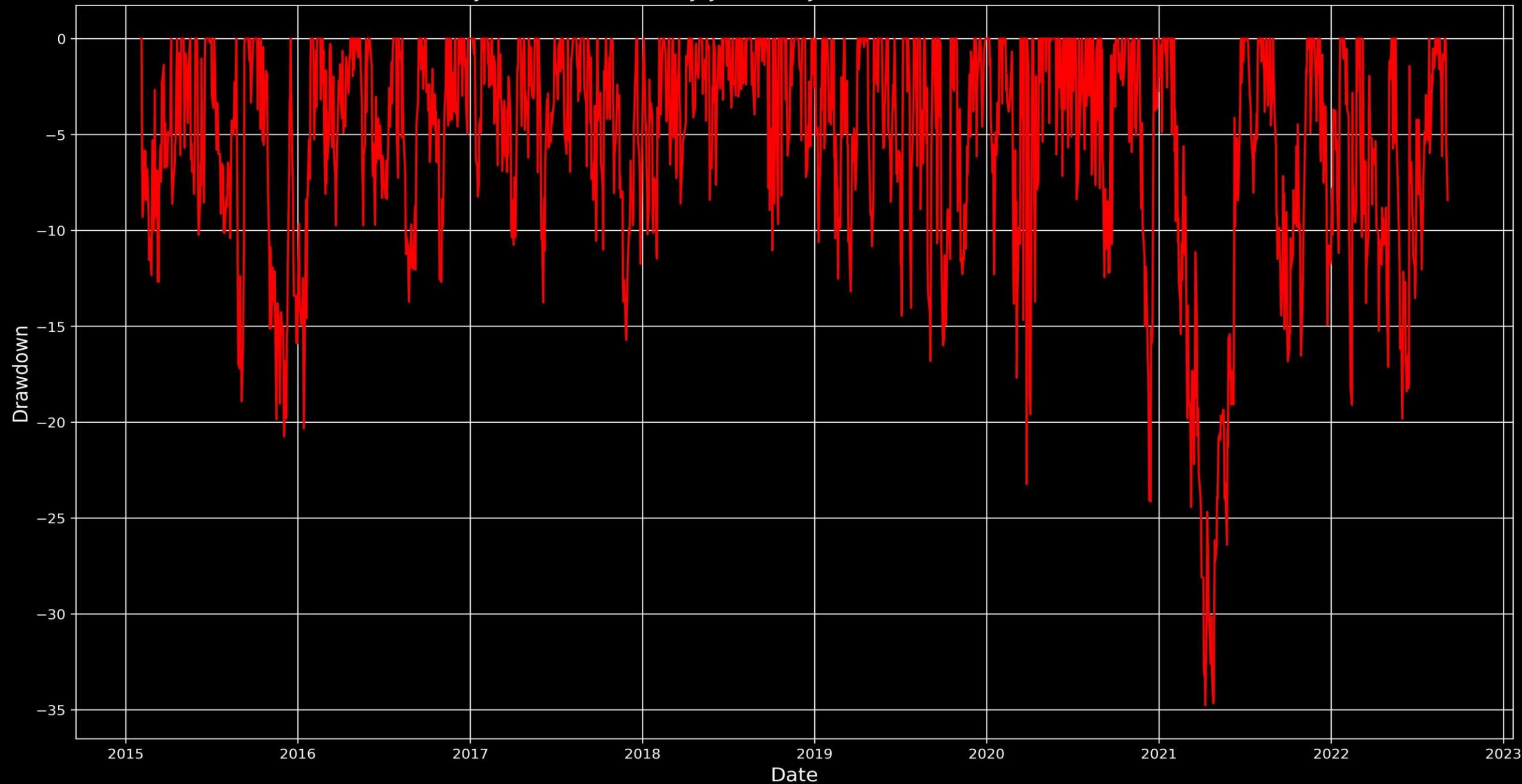
Symbols: RELIANCE BAJAJFINSV BAJFINANCE TATAMOTORS MARUTI



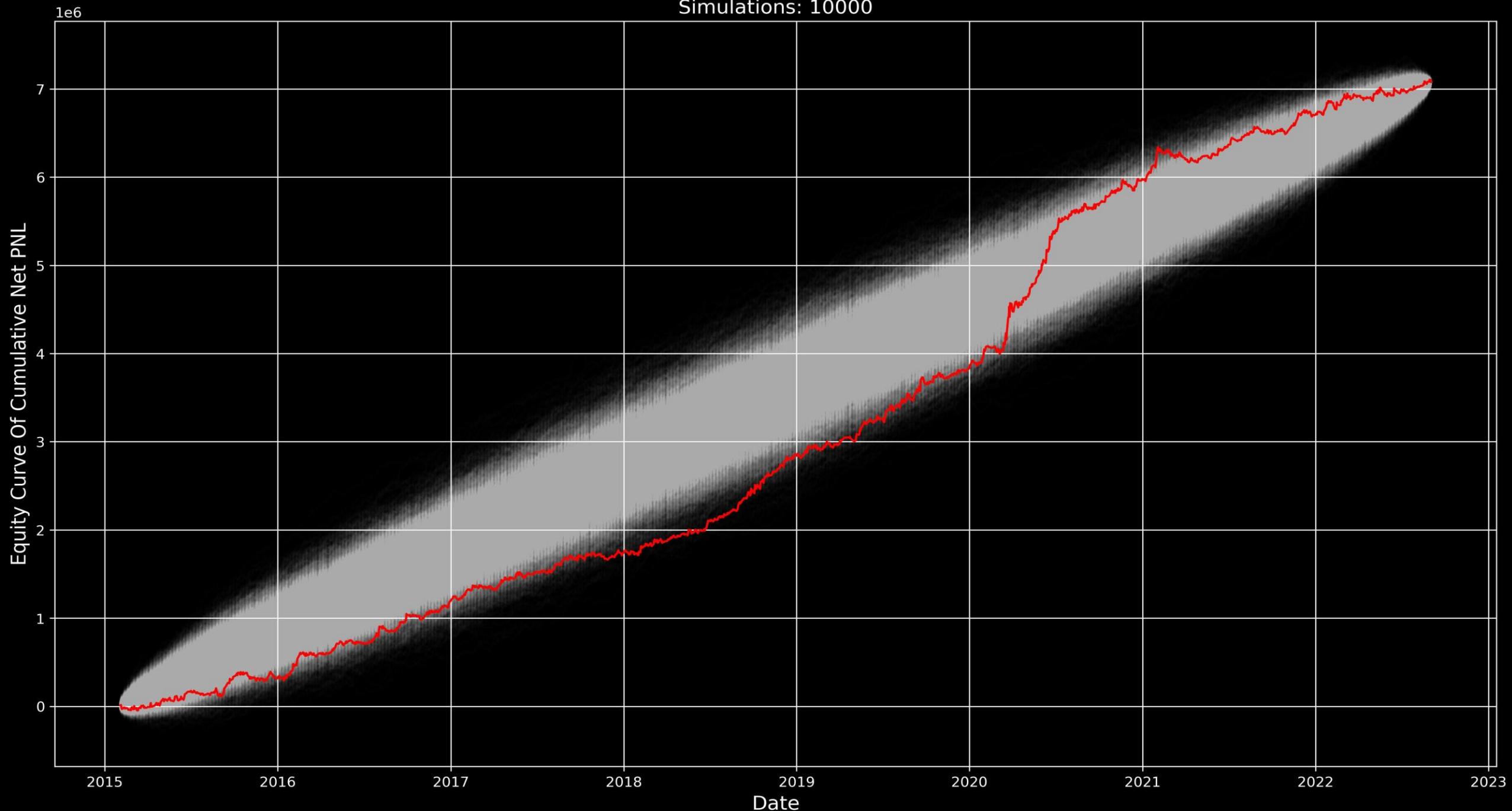
# Basket Draw-down Underwater Curve (vtb)

System: VWAP System

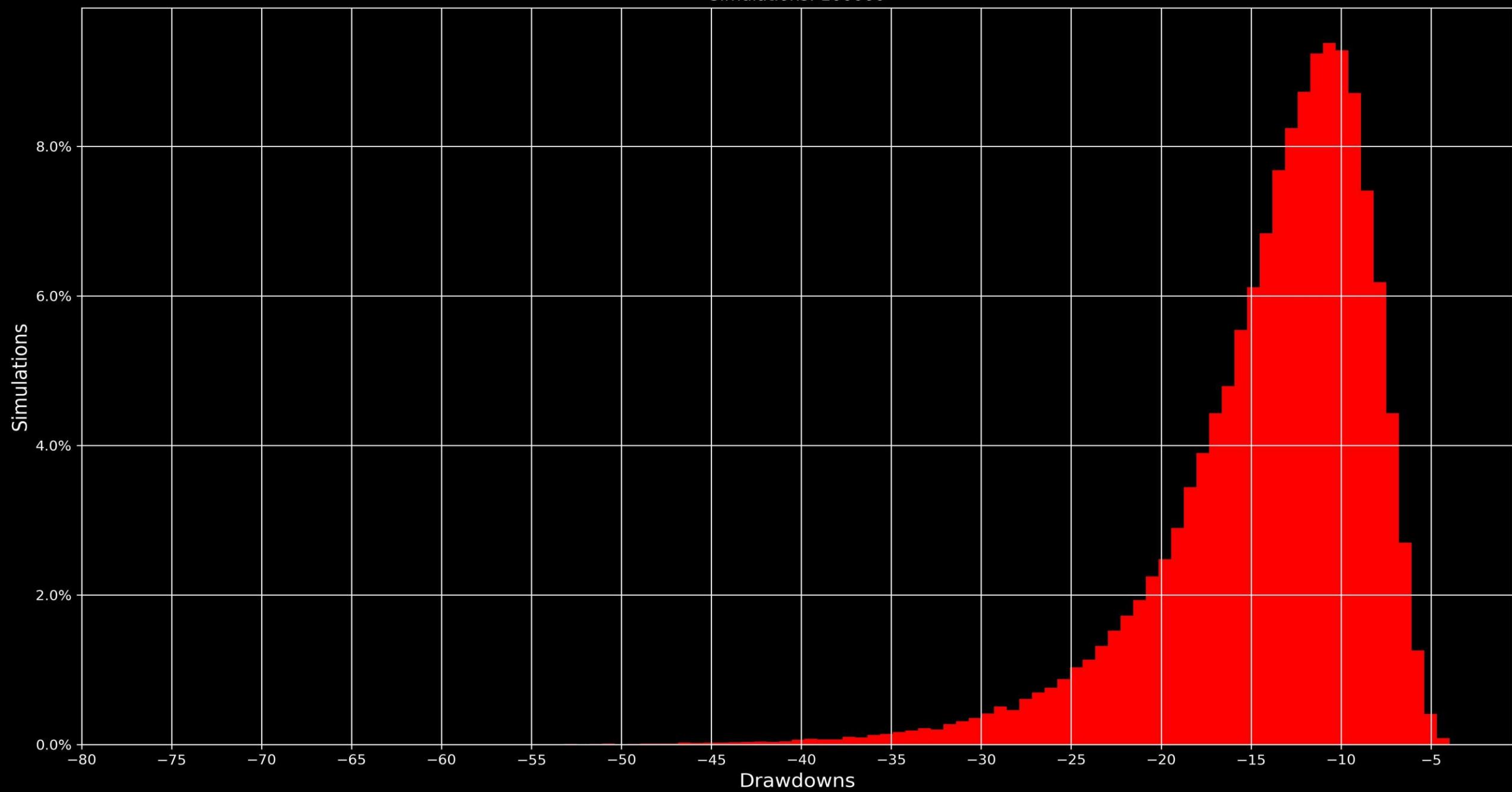
Symbols: RELIANCE BAJAJFINSV BAJFINANCE TATAMOTORS MARUTI



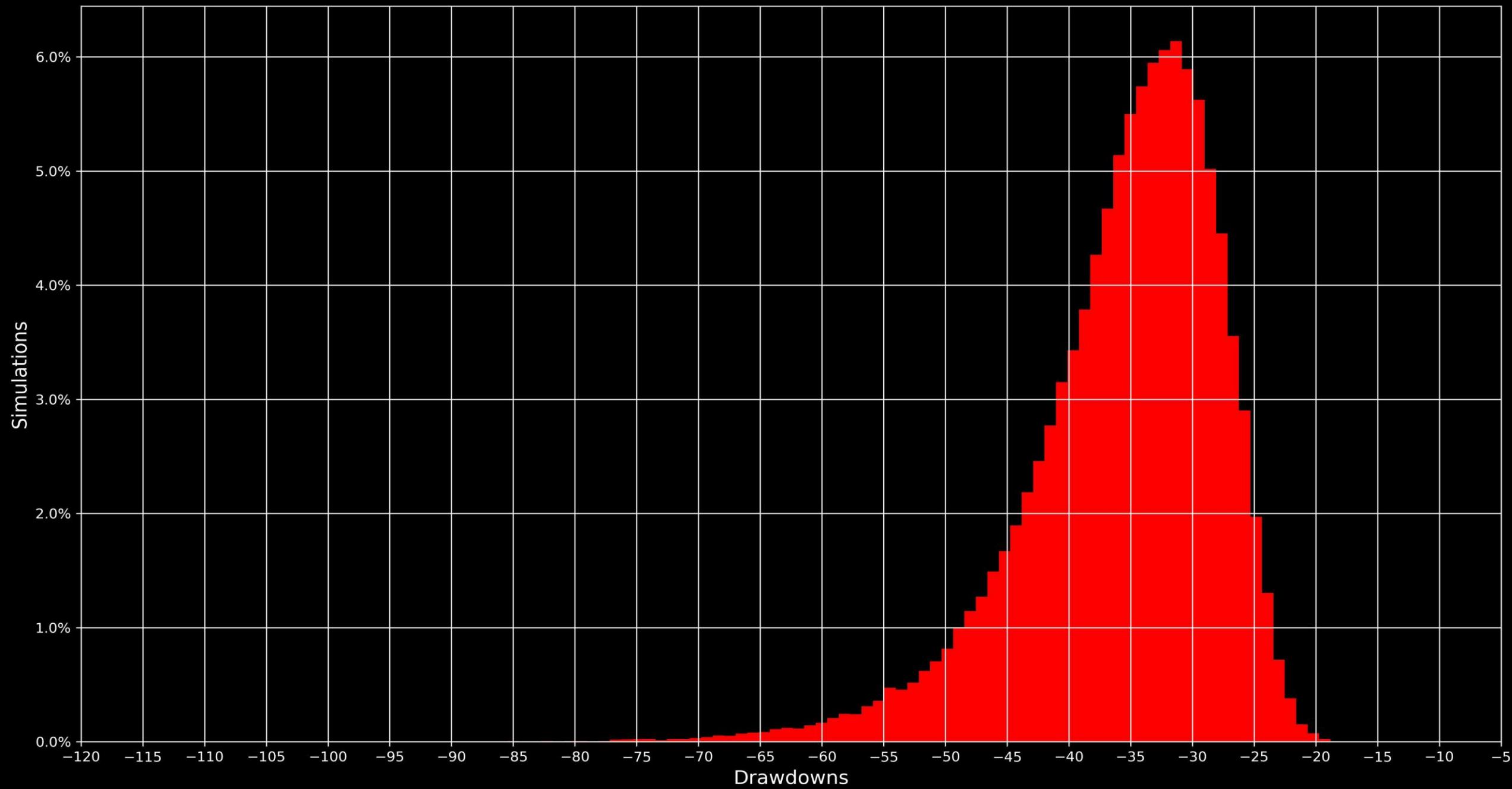
Monte Carlo Simulation (Re-shuffle)  
Simulations: 10000



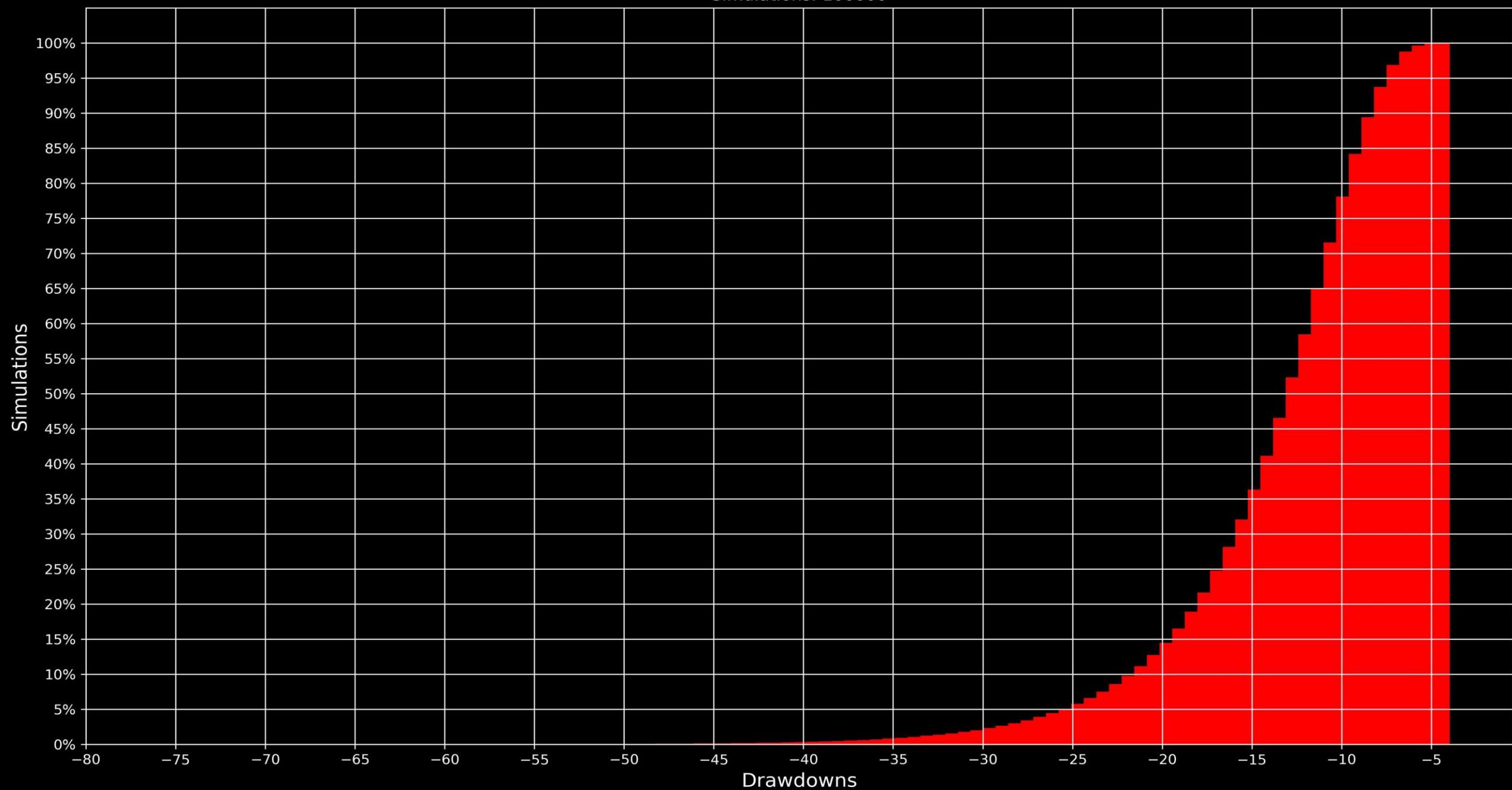
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis  
Valley To Peak Drawdown Histogram  
Simulations: 100000



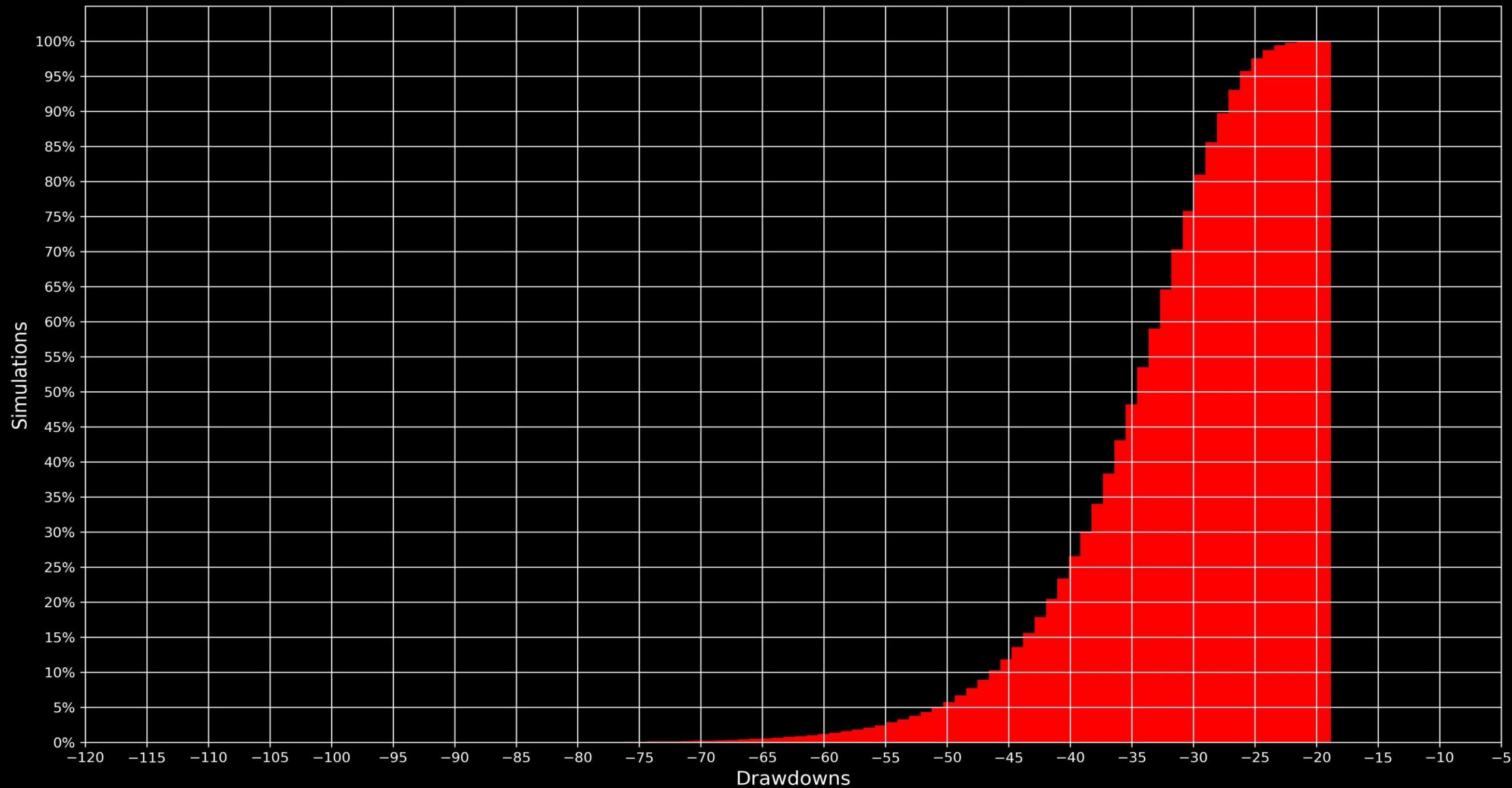
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis  
Valley To Base Drawdown Histogram  
Simulations: 100000



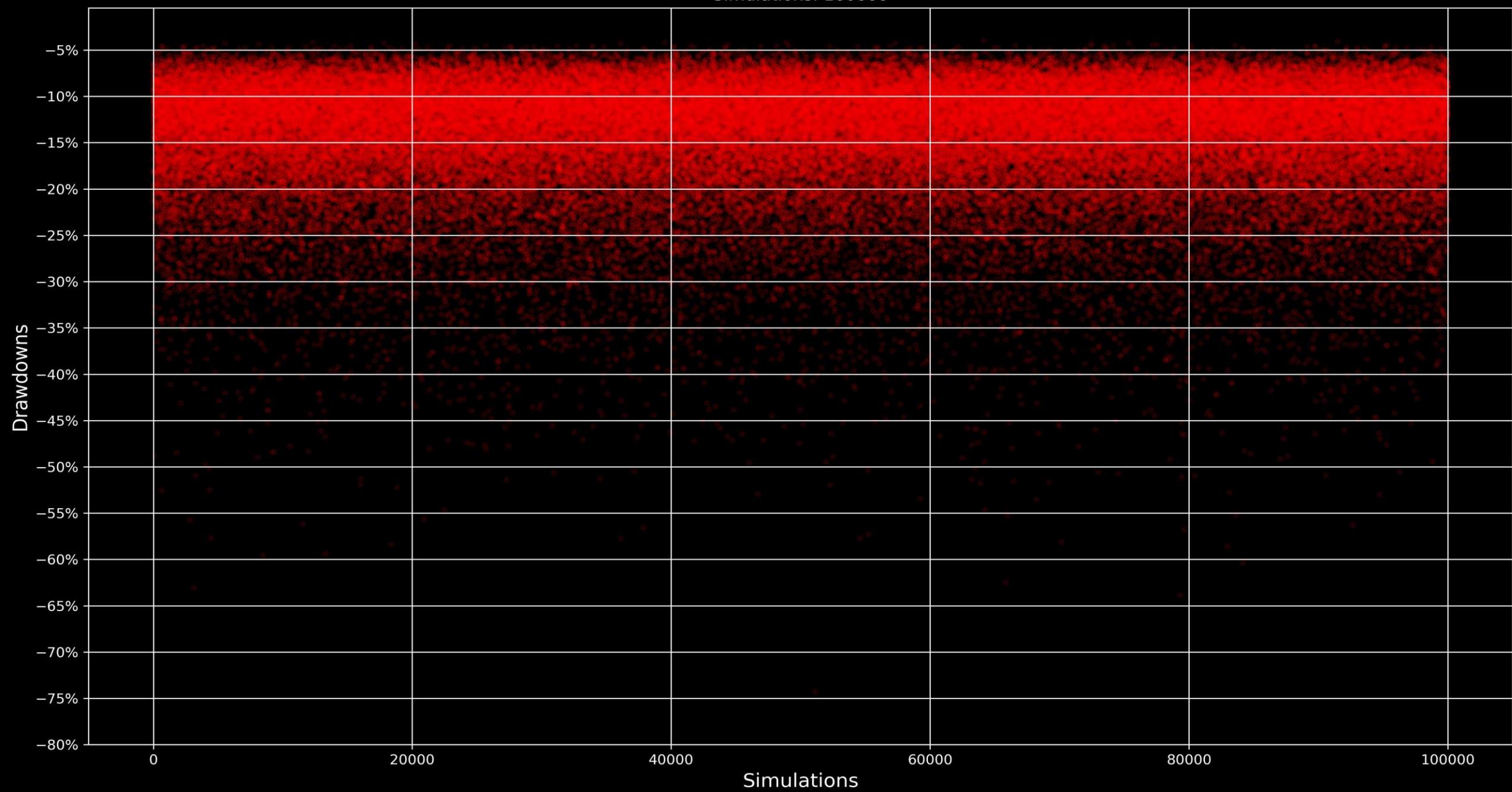
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis  
Valley To Peak Drawdown Histogram (Cumulative)  
Simulations: 100000



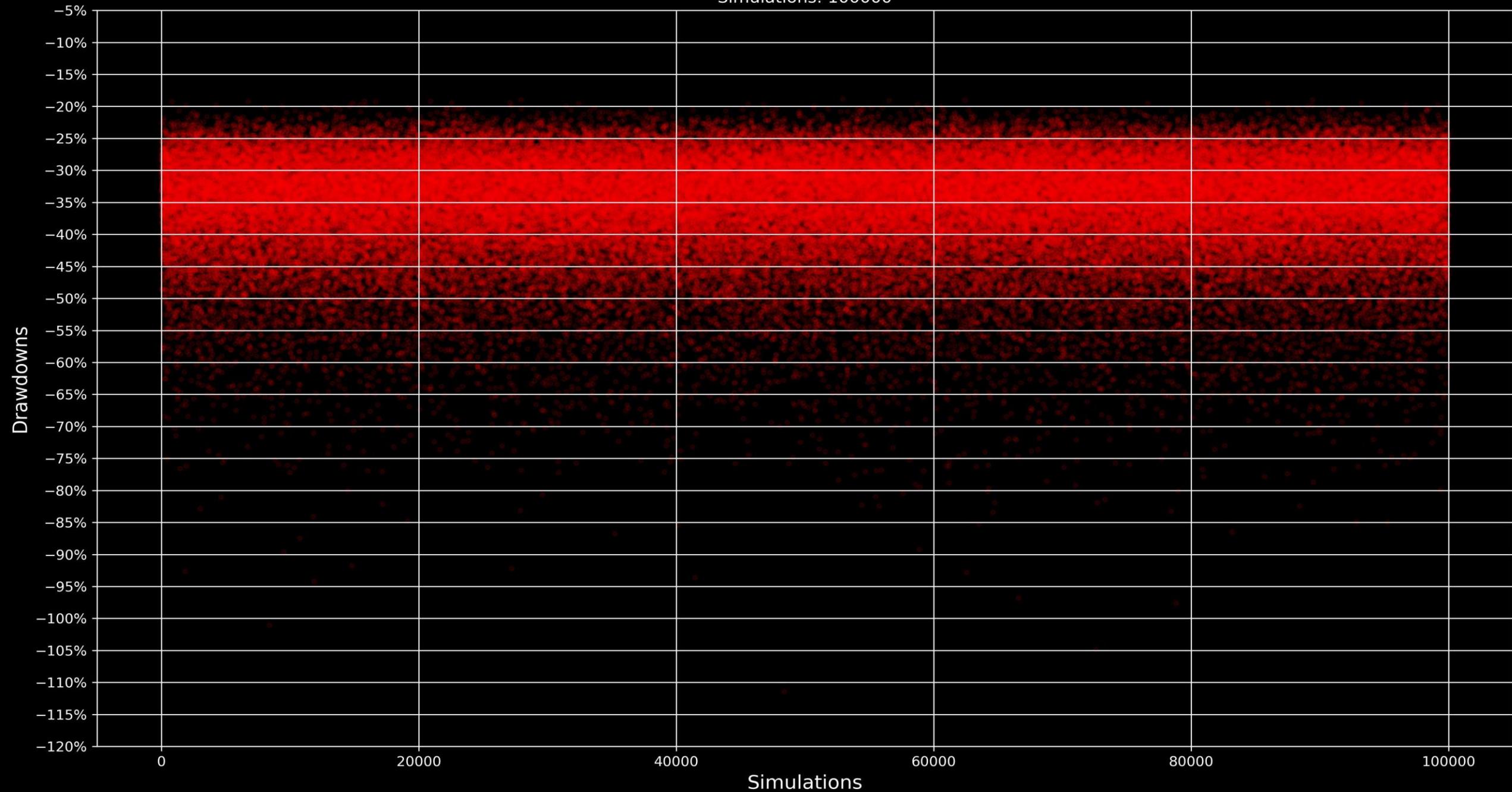
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis  
Valley To Base Drawdown Histogram (Cumulative)  
Simulations: 100000



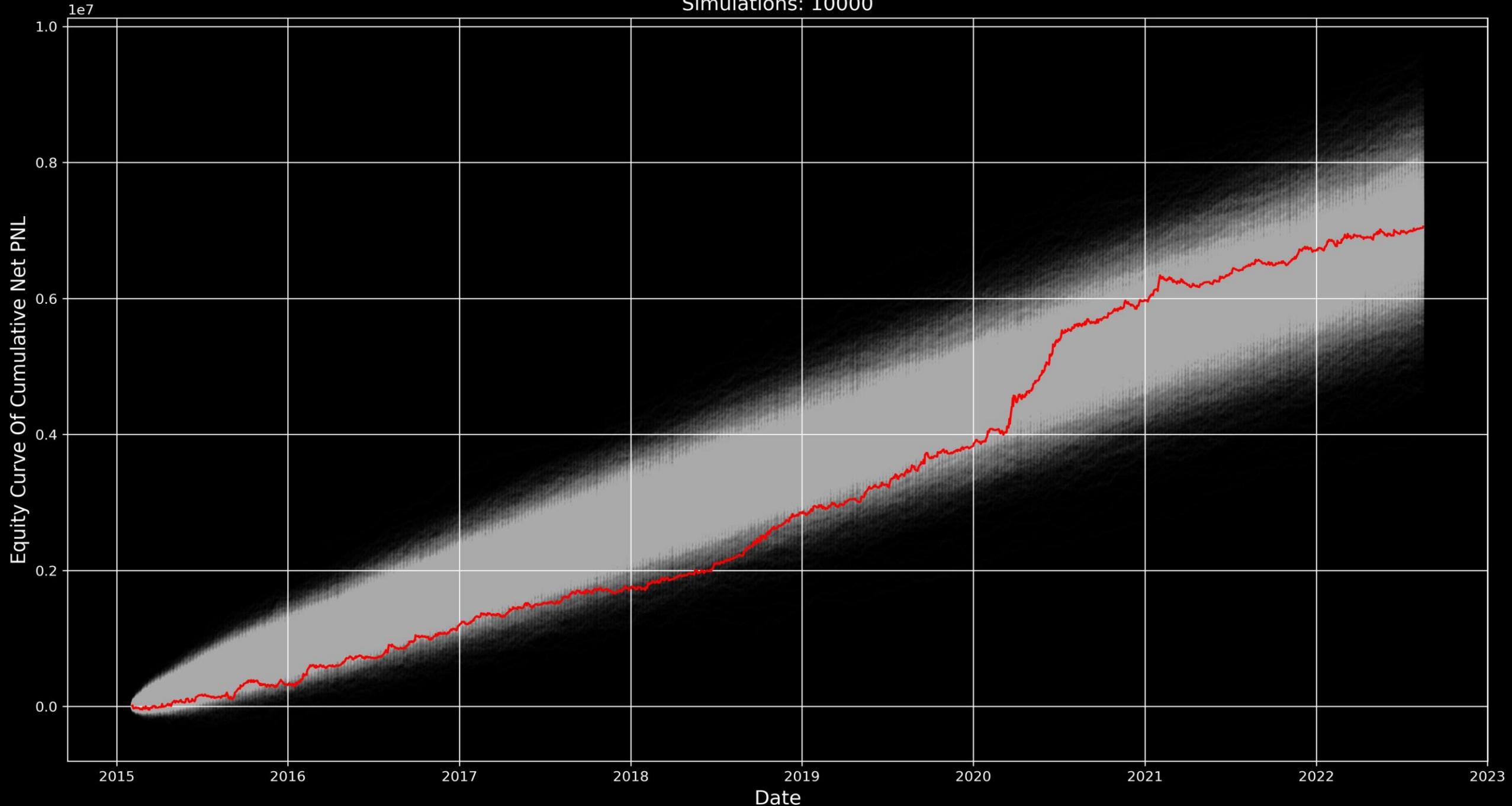
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis  
Valley To Peak Drawdown Scatter Plot  
Simulations: 100000



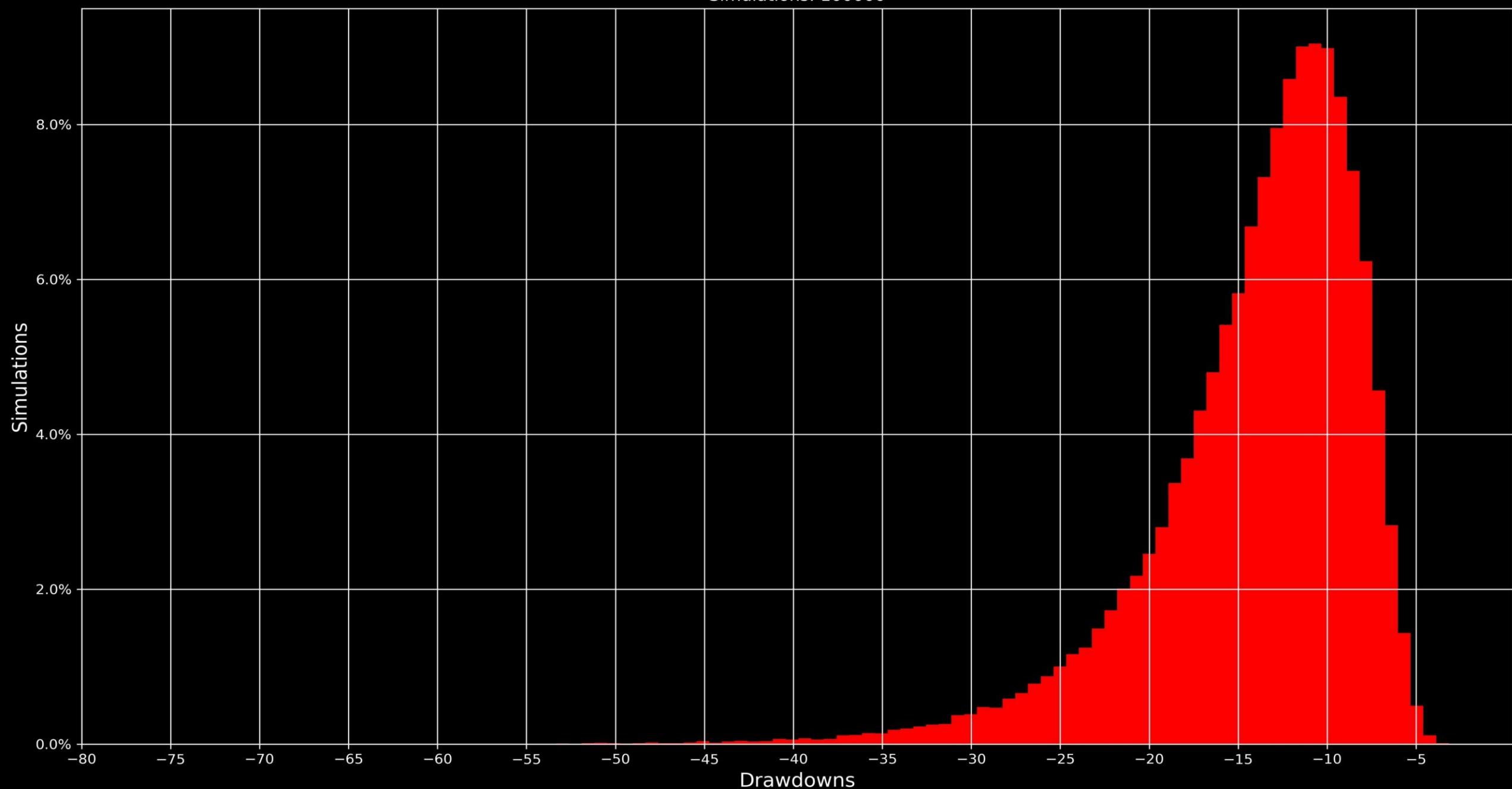
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis  
Valley To Base Drawdown Scatter Plot  
Simulations: 100000



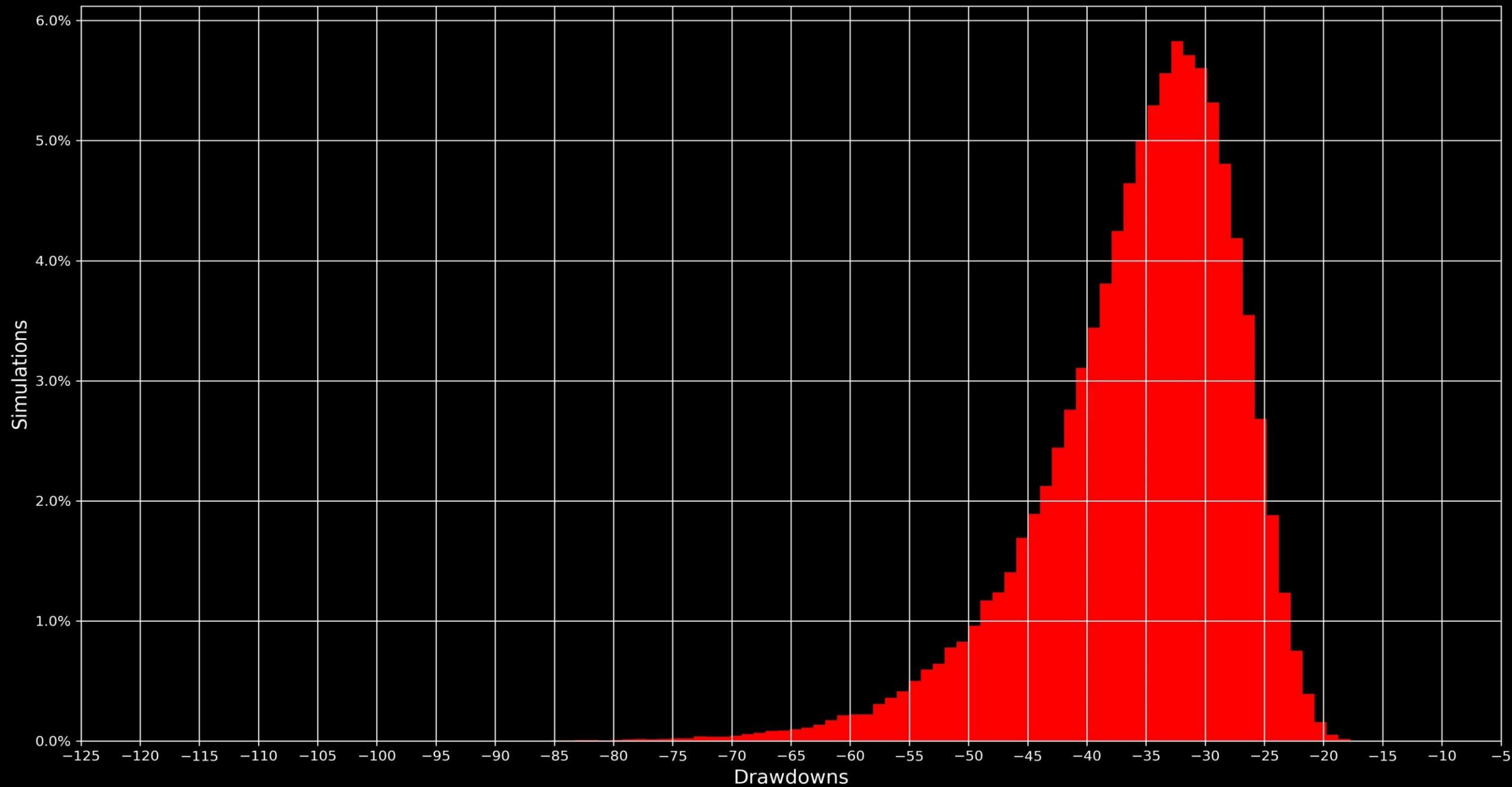
Monte Carlo Simulation (Re-sample)  
Simulations: 10000



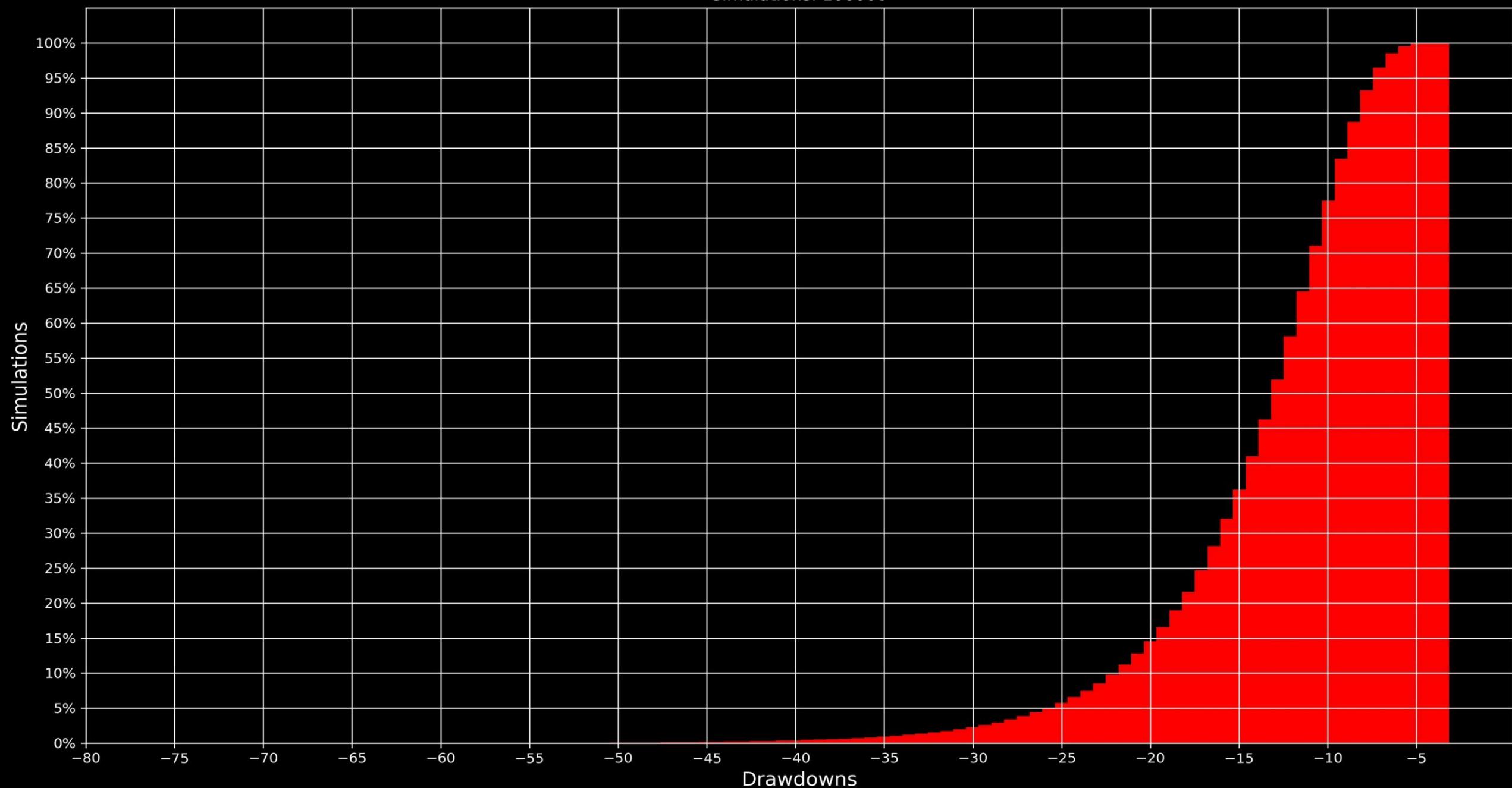
Monte Carlo Simulation (Re-sample) Drawdown Analysis  
Valley To Peak Drawdown Histogram  
Simulations: 100000



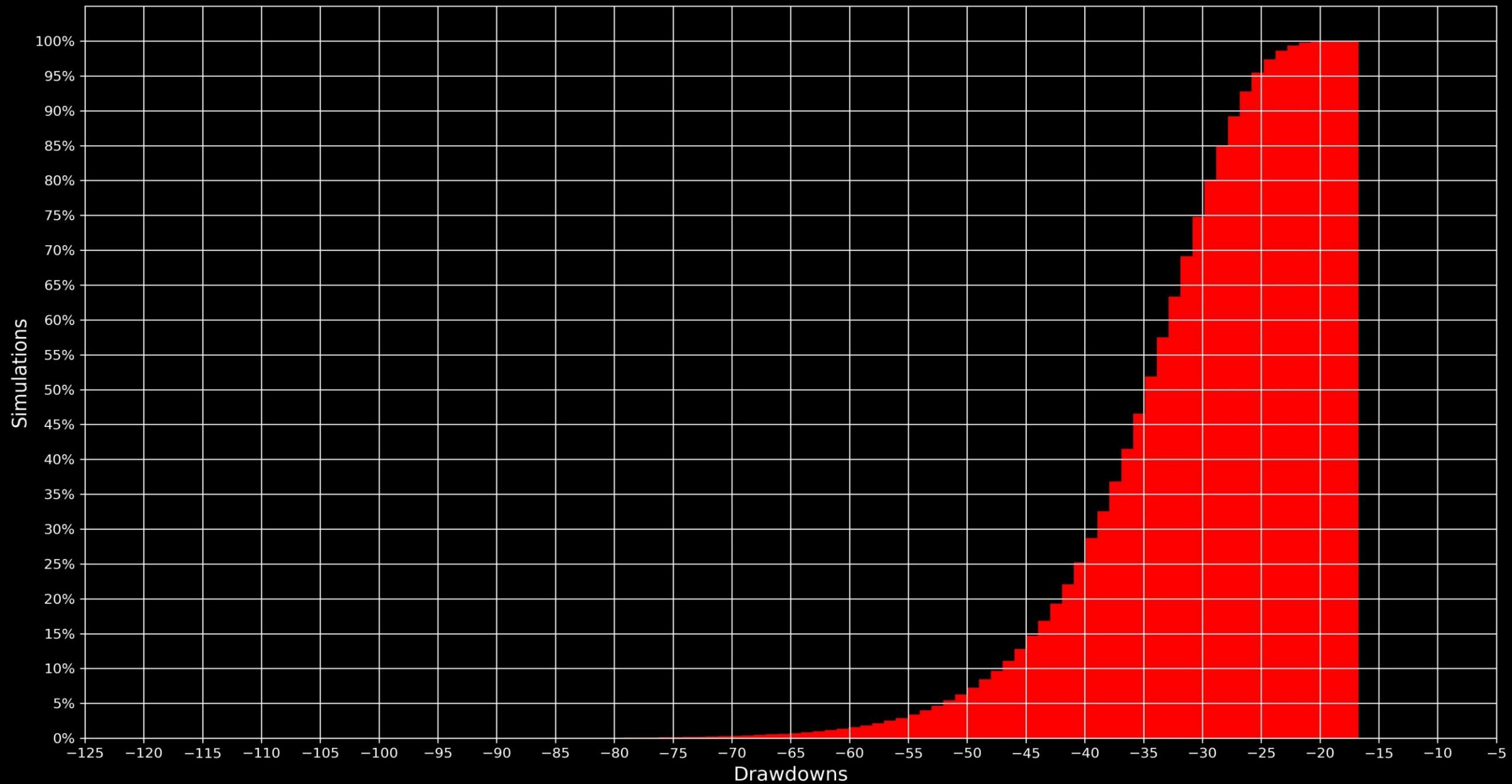
Monte Carlo Simulation (Re-sample) Drawdown Analysis  
Valley To Base Drawdown Histogram  
Simulations: 100000



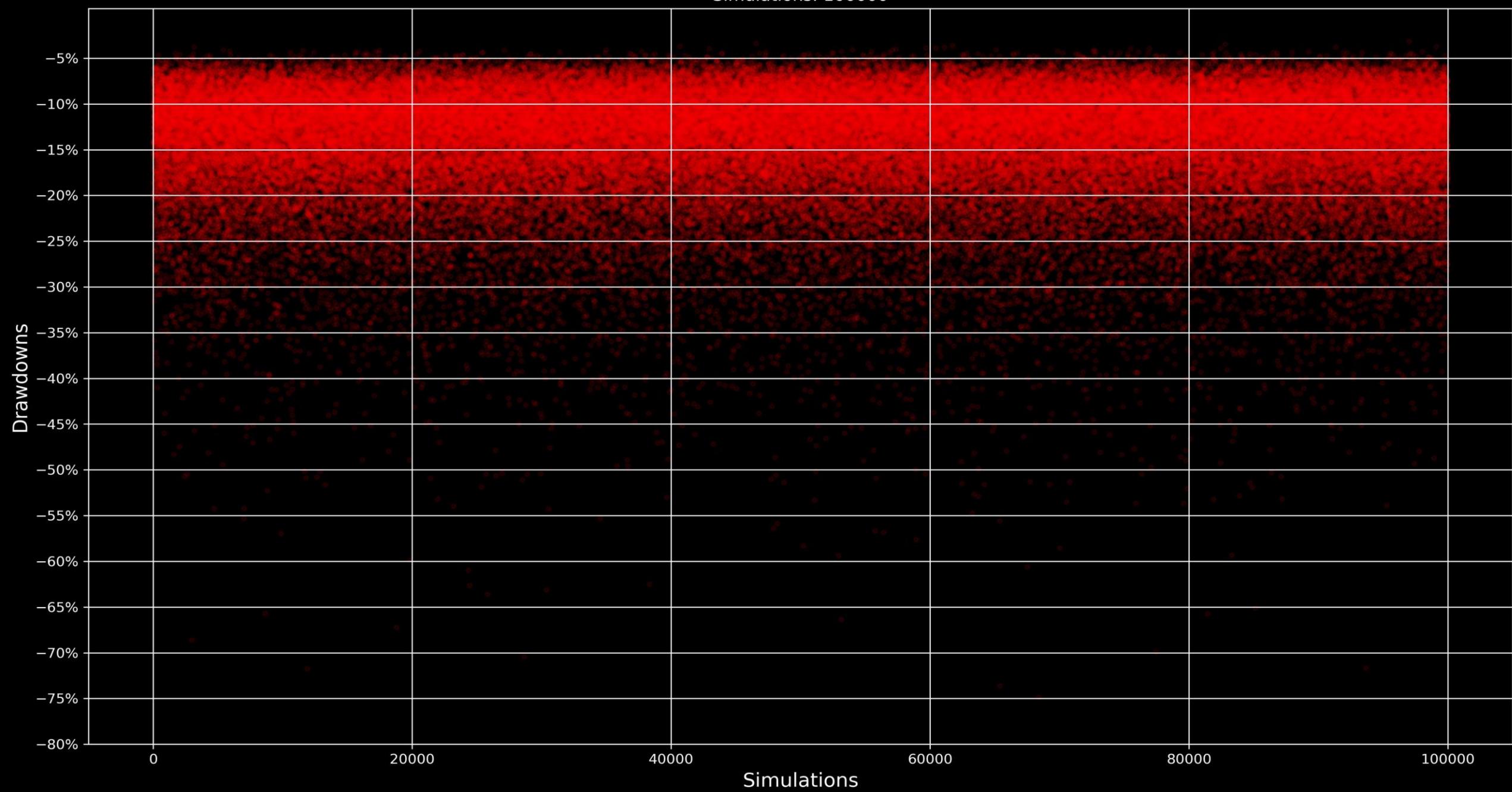
Monte Carlo Simulation (Re-sample) Drawdown Analysis  
Valley To Peak Drawdown Histogram (Cumulative)  
Simulations: 100000



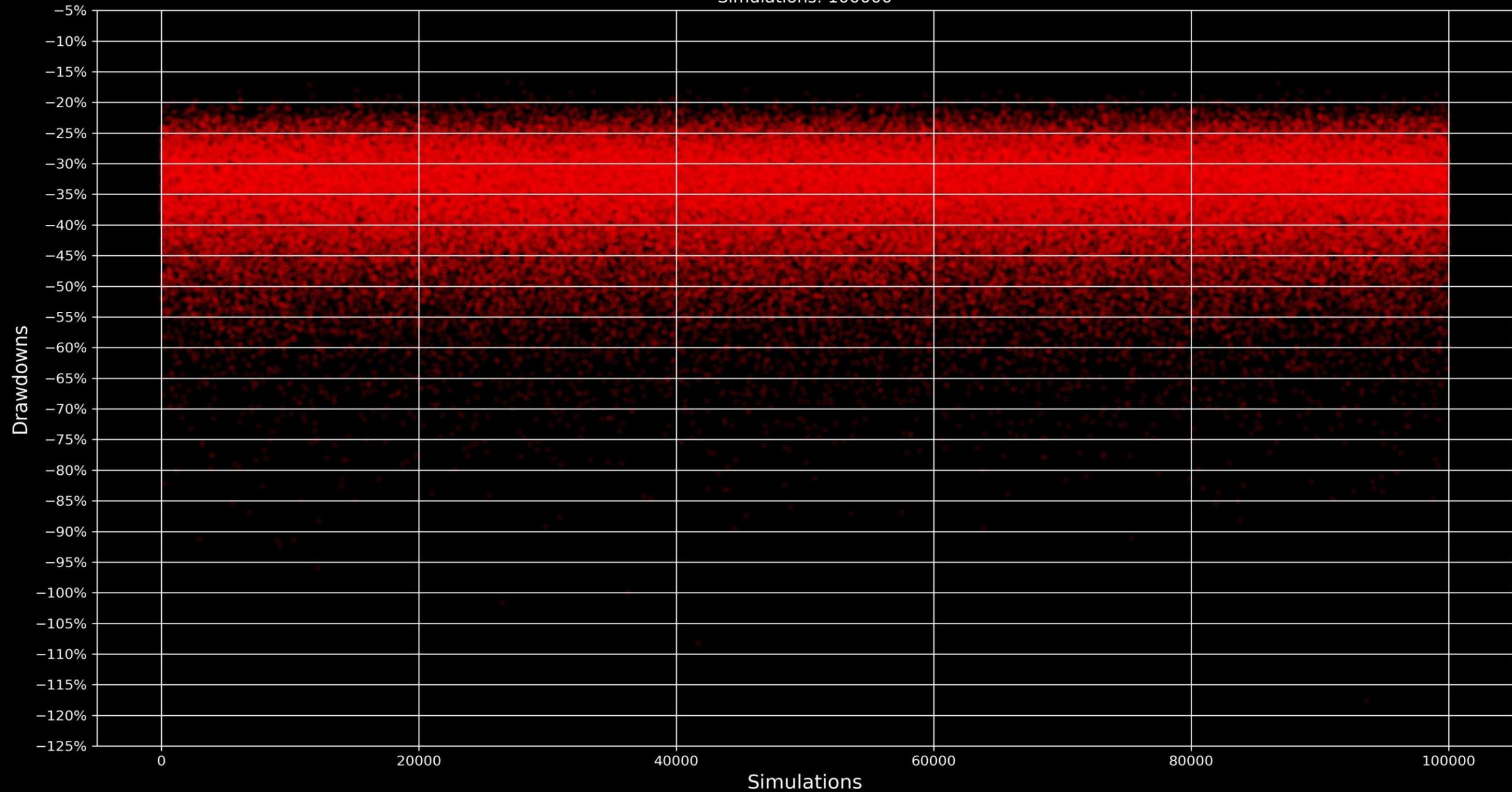
Monte Carlo Simulation (Re-sample) Drawdown Analysis  
Valley To Base Drawdown Histogram (Cumulative)  
Simulations: 100000



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



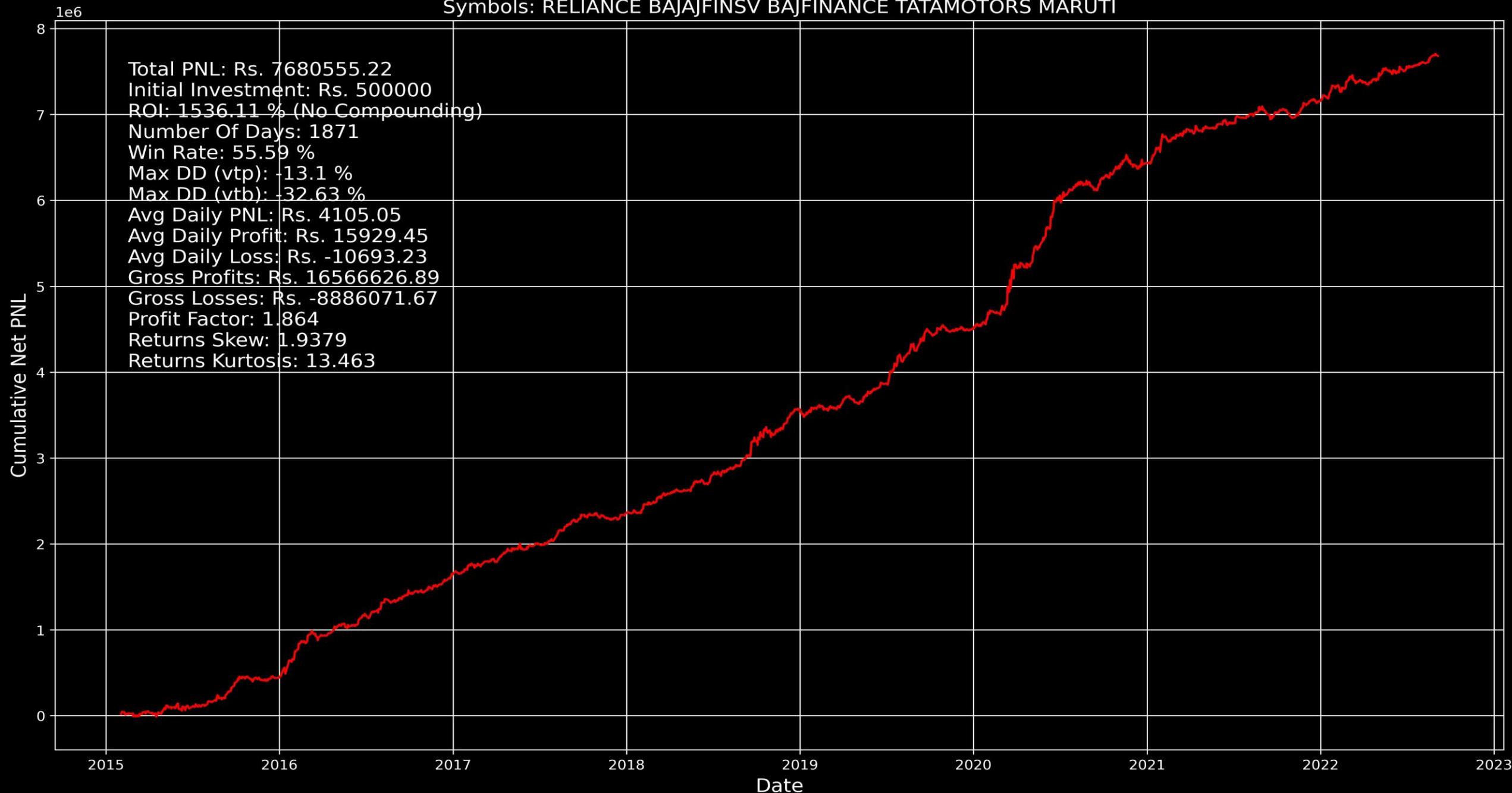
Monte Carlo Simulation (Re-sample) Drawdown Analysis  
Valley To Base Drawdown Scatter Plot  
Simulations: 100000



# Fixed Symbol Basket (ORB Core Block)

Basket Performance  
System: Morning Range System V2

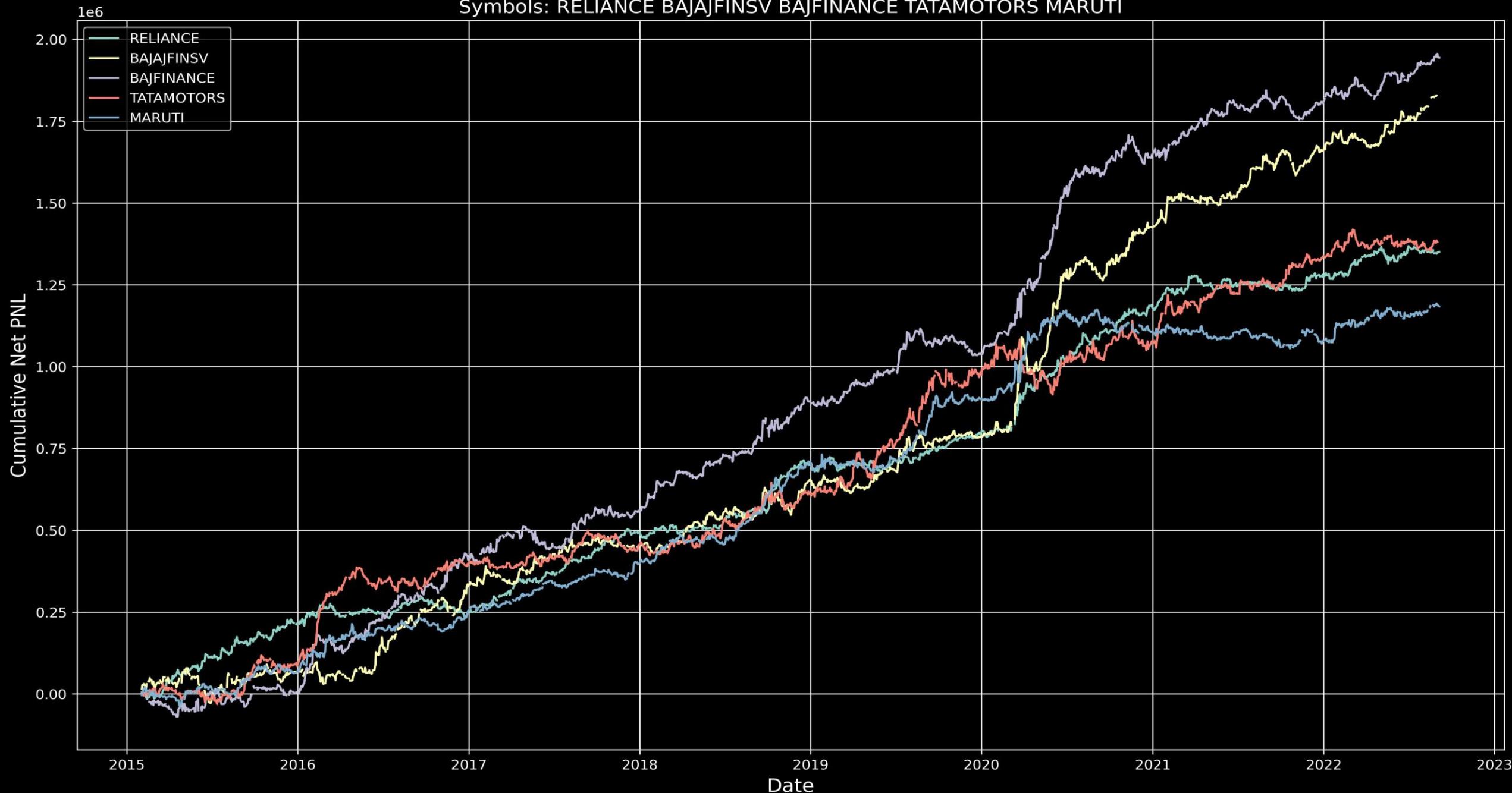
Symbols: RELIANCE BAJAJFINSV BAJFINANCE TATAMOTORS MARUTI



# Symbol-wise Performance Of Basket

## System: Morning Range System V2

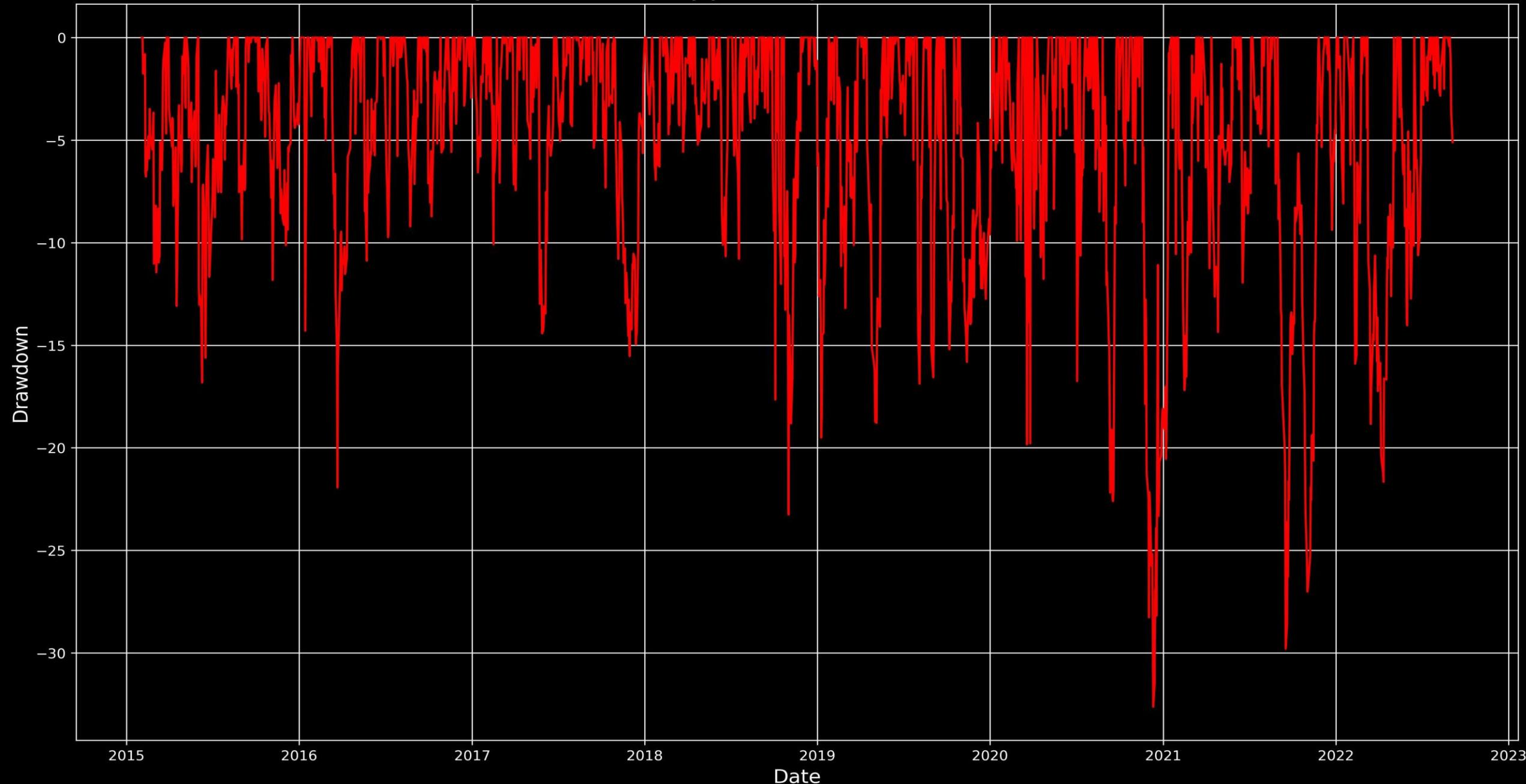
Symbols: RELIANCE BAJAJFINSV BAJFINANCE TATAMOTORS MARUTI



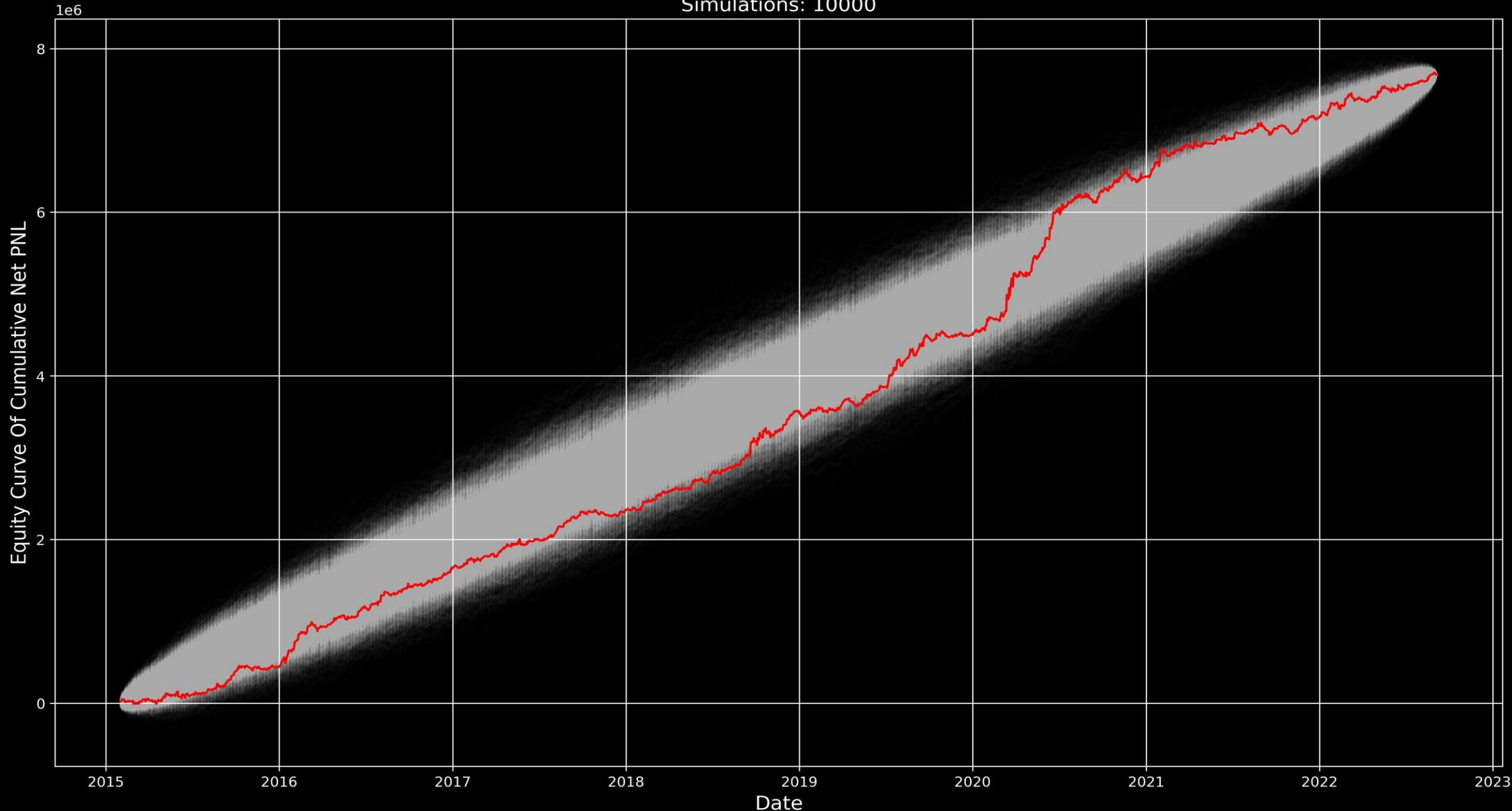
# Basket Draw-down Underwater Curve (vtb)

System: Morning Range System V2

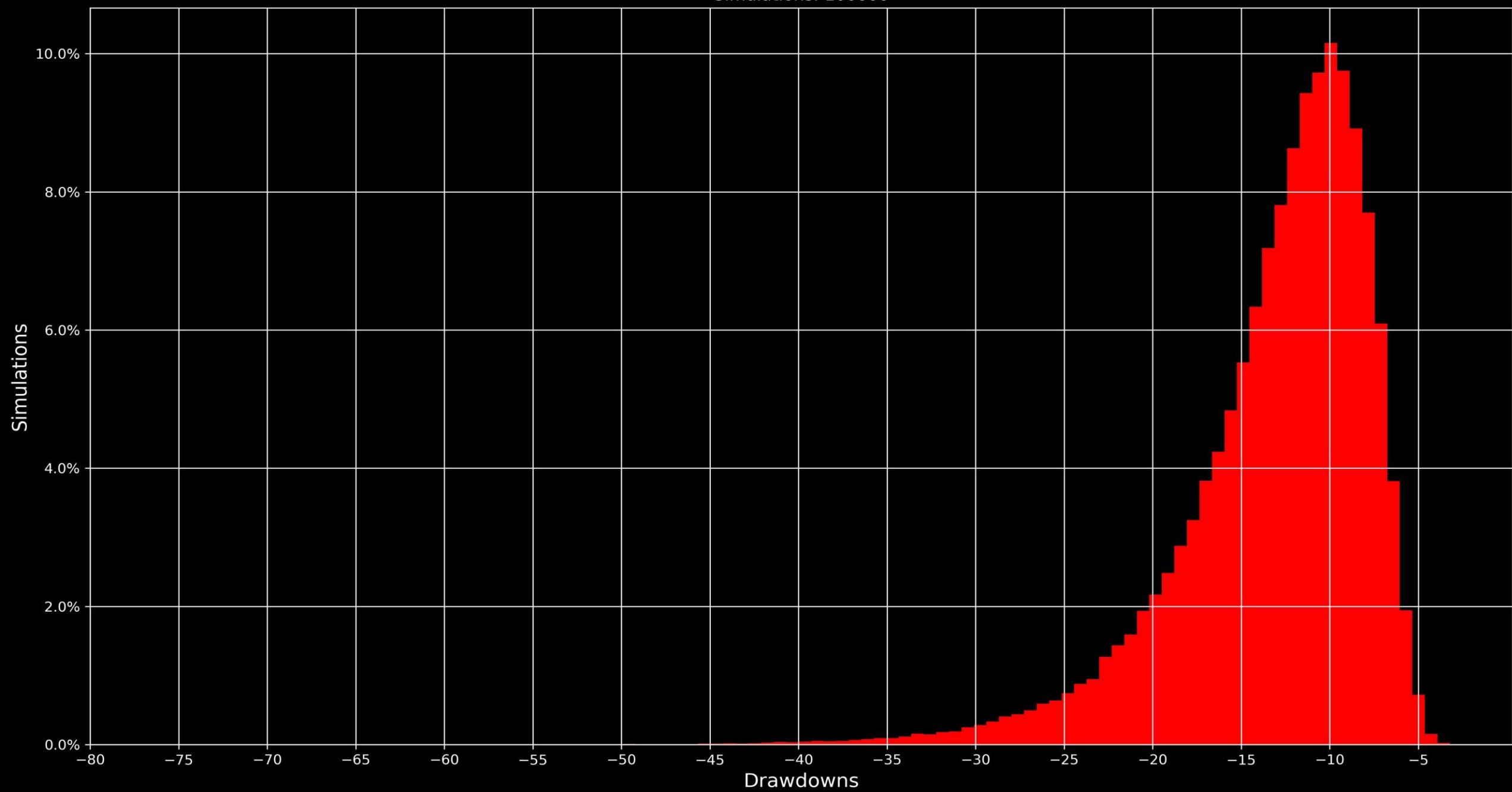
Symbols: RELIANCE BAJAJFINSV BAJFINANCE TATAMOTORS MARUTI



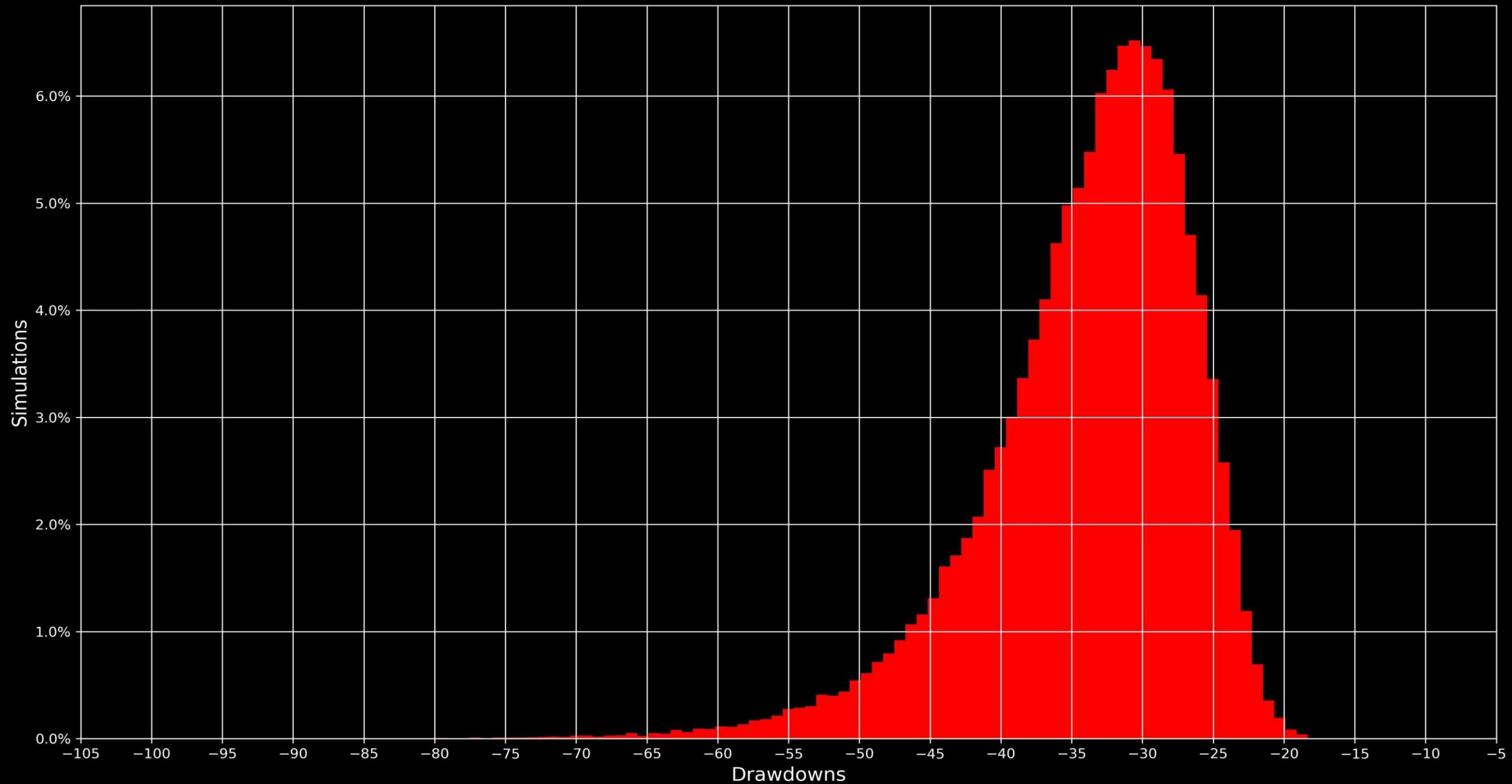
Monte Carlo Simulation (Re-shuffle)  
Simulations: 10000



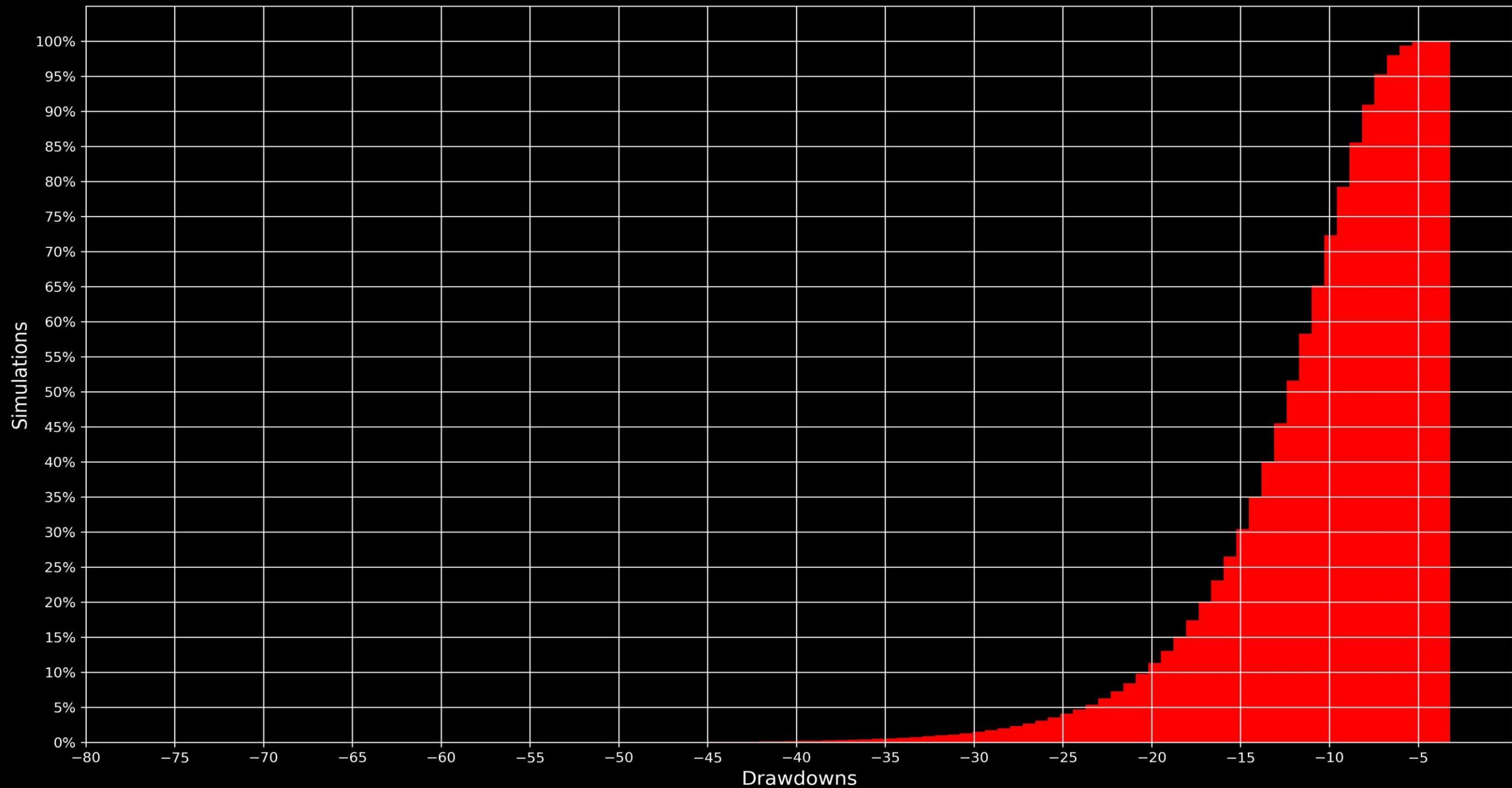
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis  
Valley To Peak Drawdown Histogram  
Simulations: 100000



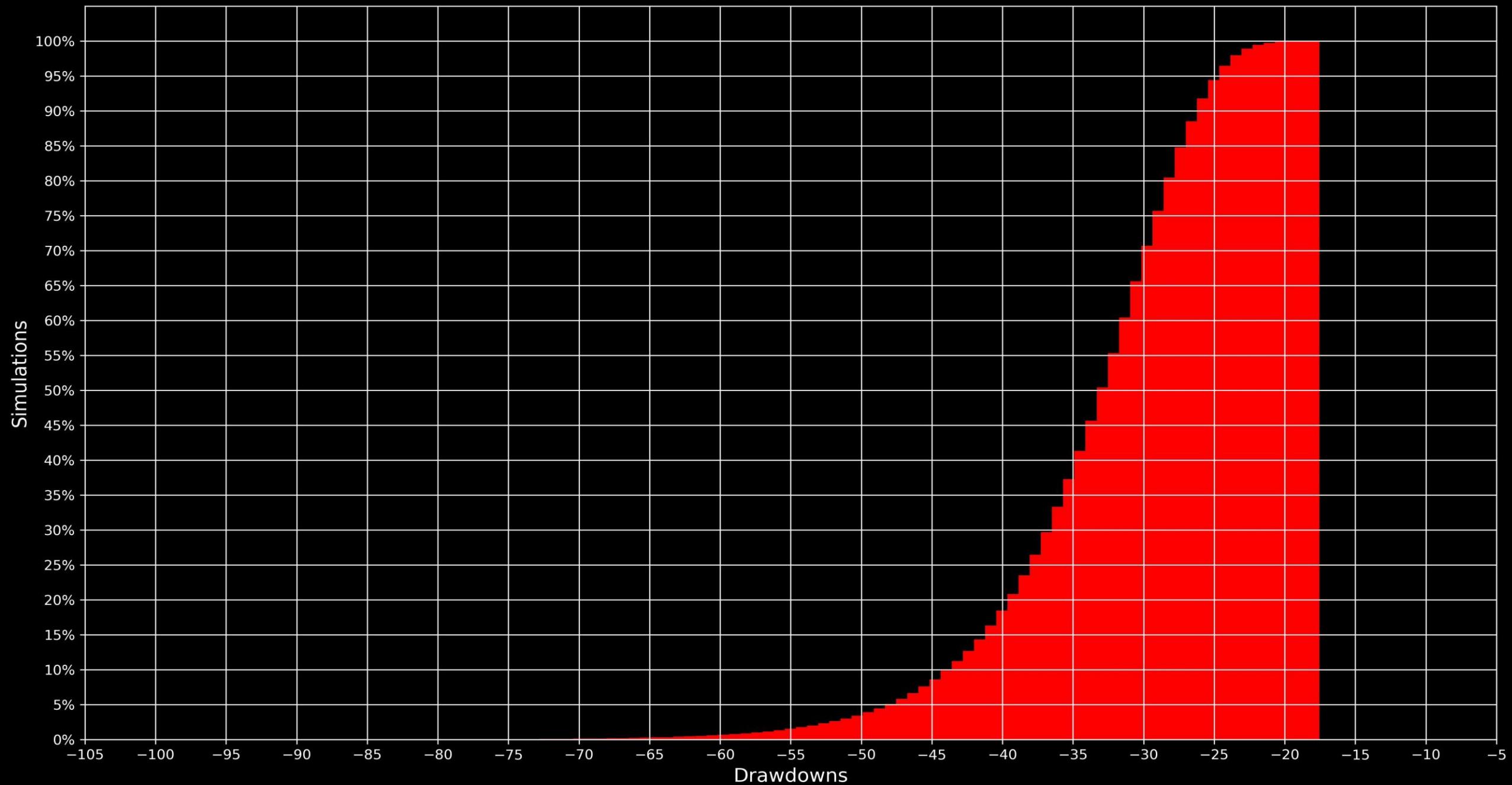
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis  
Valley To Base Drawdown Histogram  
Simulations: 100000



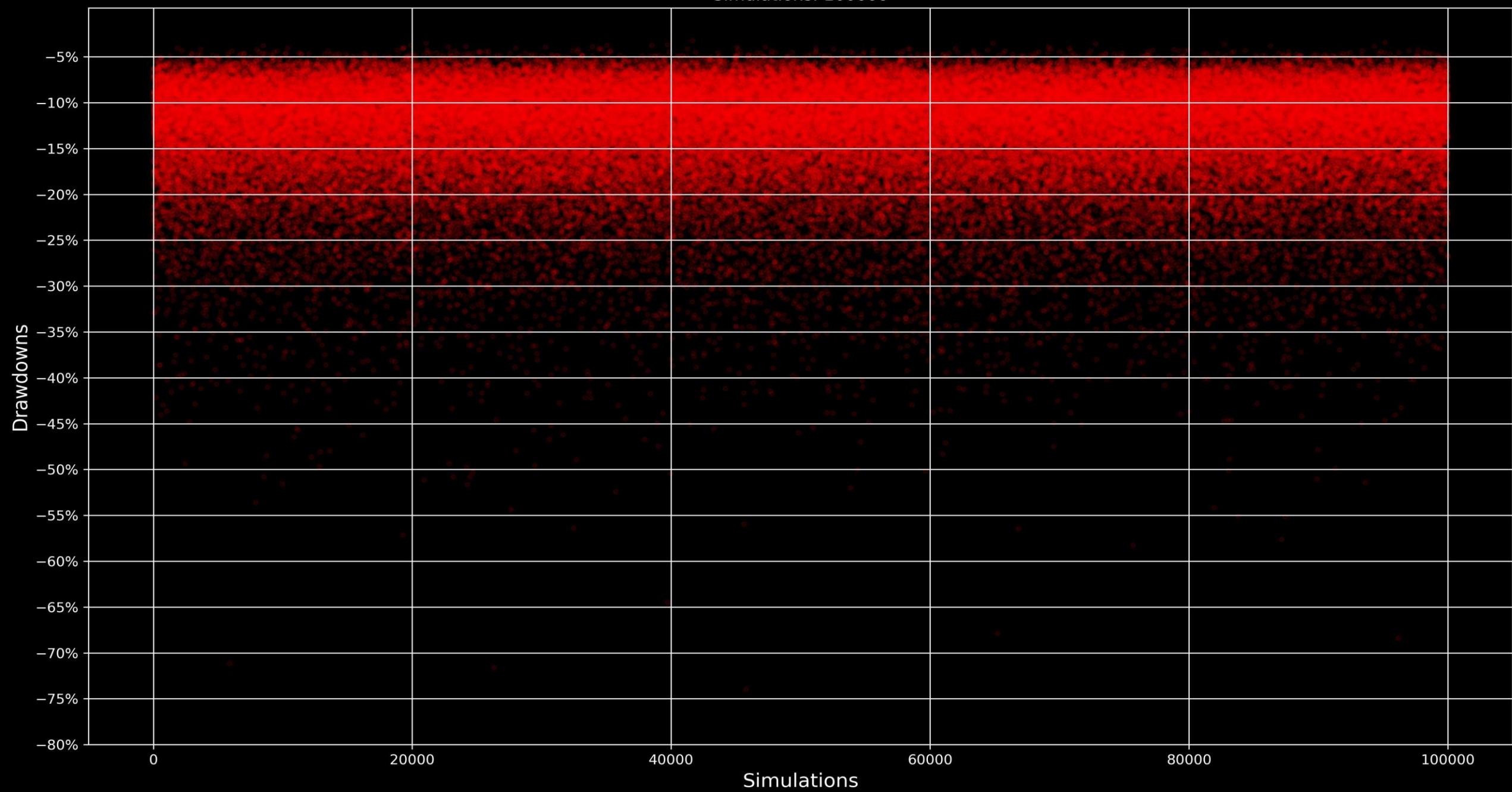
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis  
Valley To Peak Drawdown Histogram (Cumulative)  
Simulations: 100000



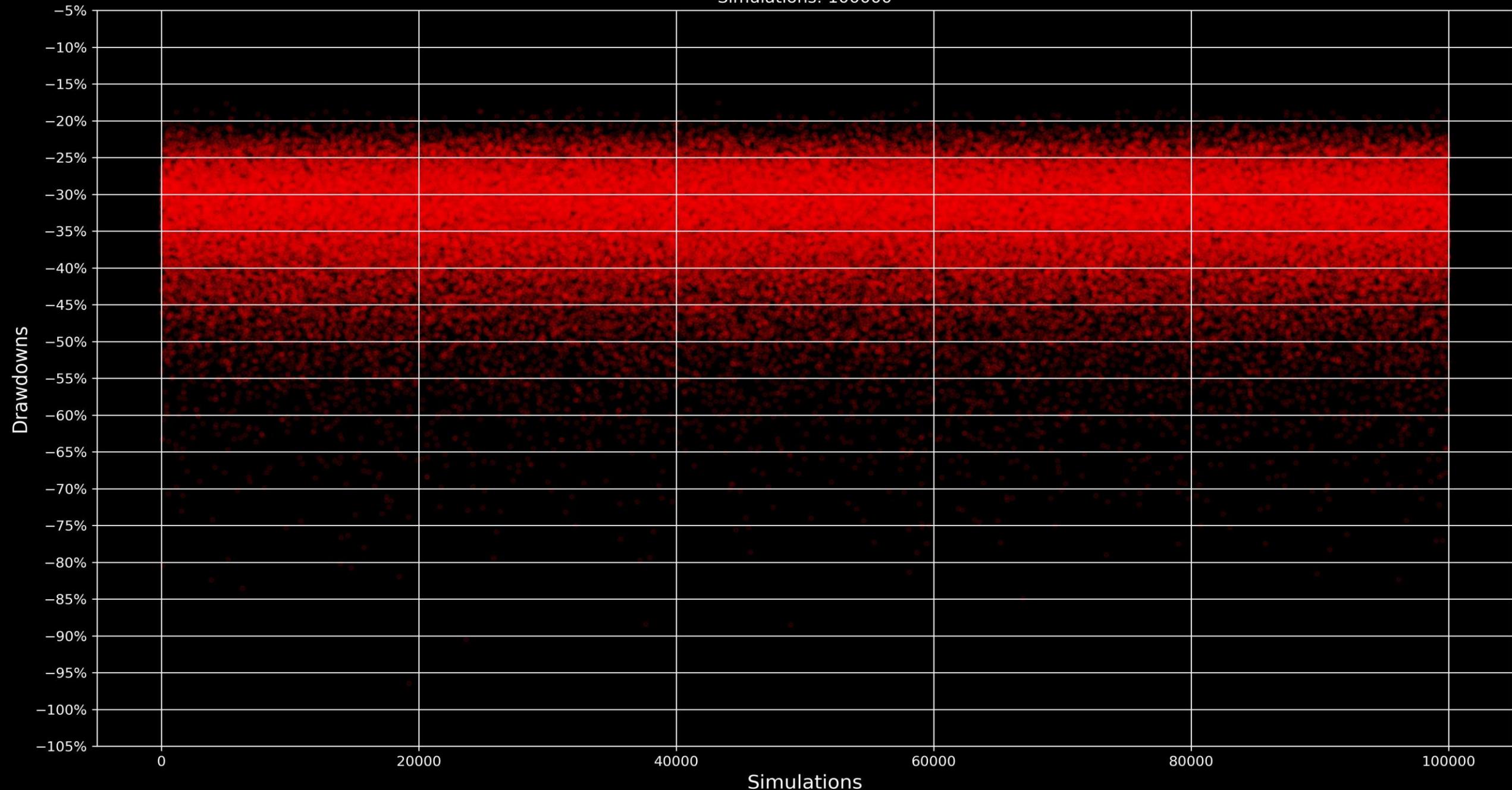
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis  
Valley To Base Drawdown Histogram (Cumulative)  
Simulations: 100000



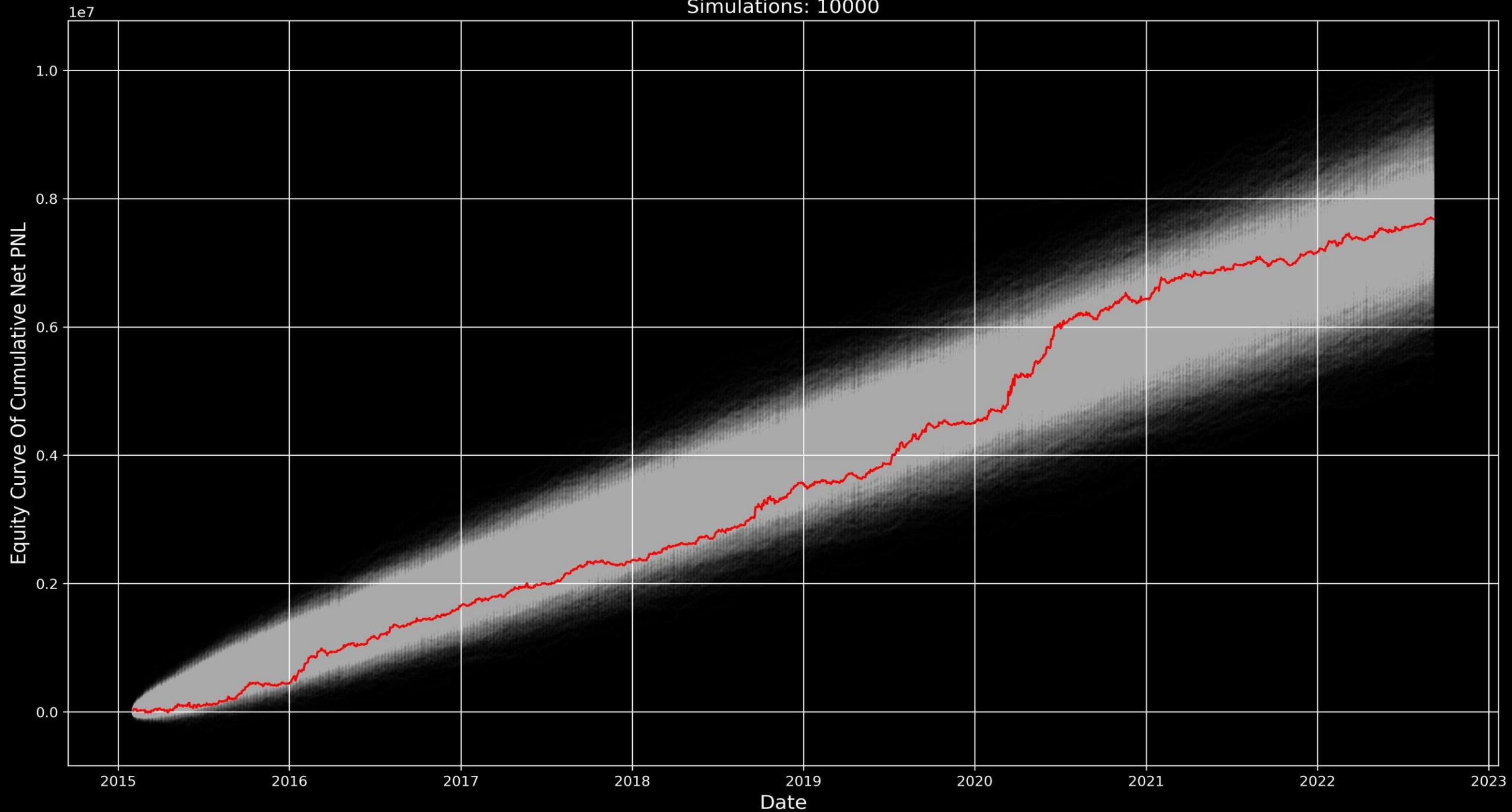
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis  
Valley To Peak Drawdown Scatter Plot  
Simulations: 100000



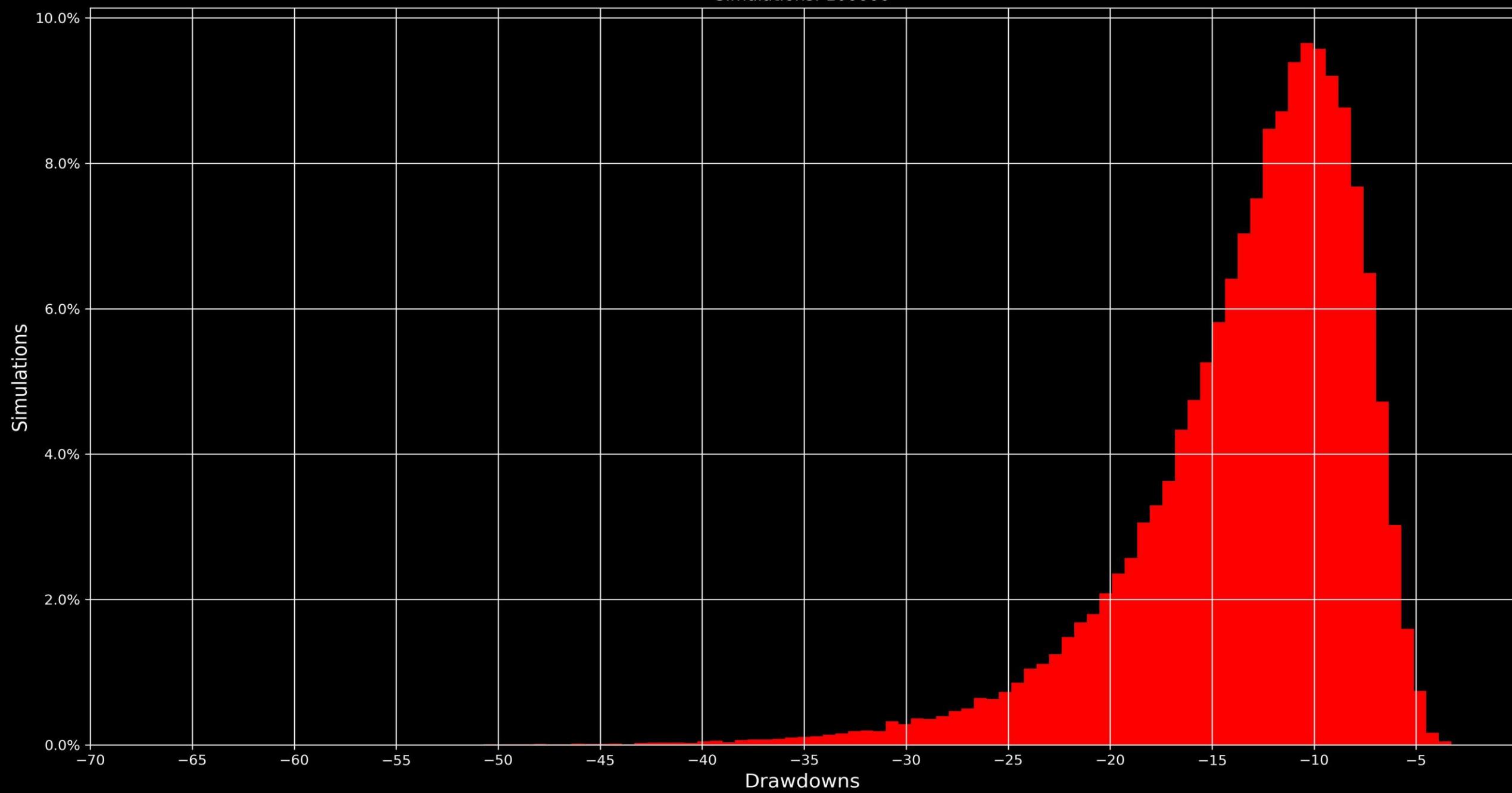
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis  
Valley To Base Drawdown Scatter Plot  
Simulations: 100000



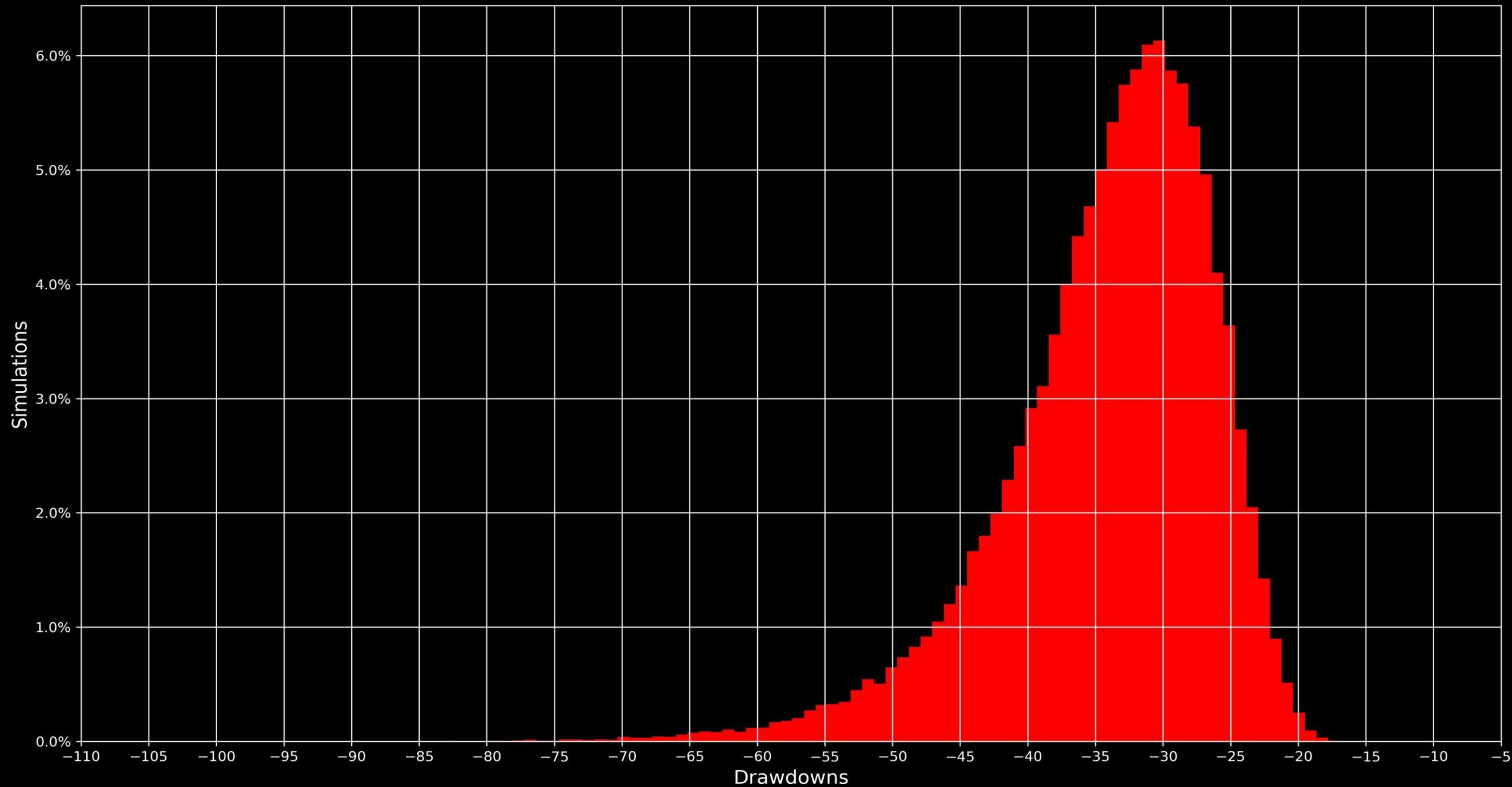
Monte Carlo Simulation (Re-sample)  
Simulations: 10000



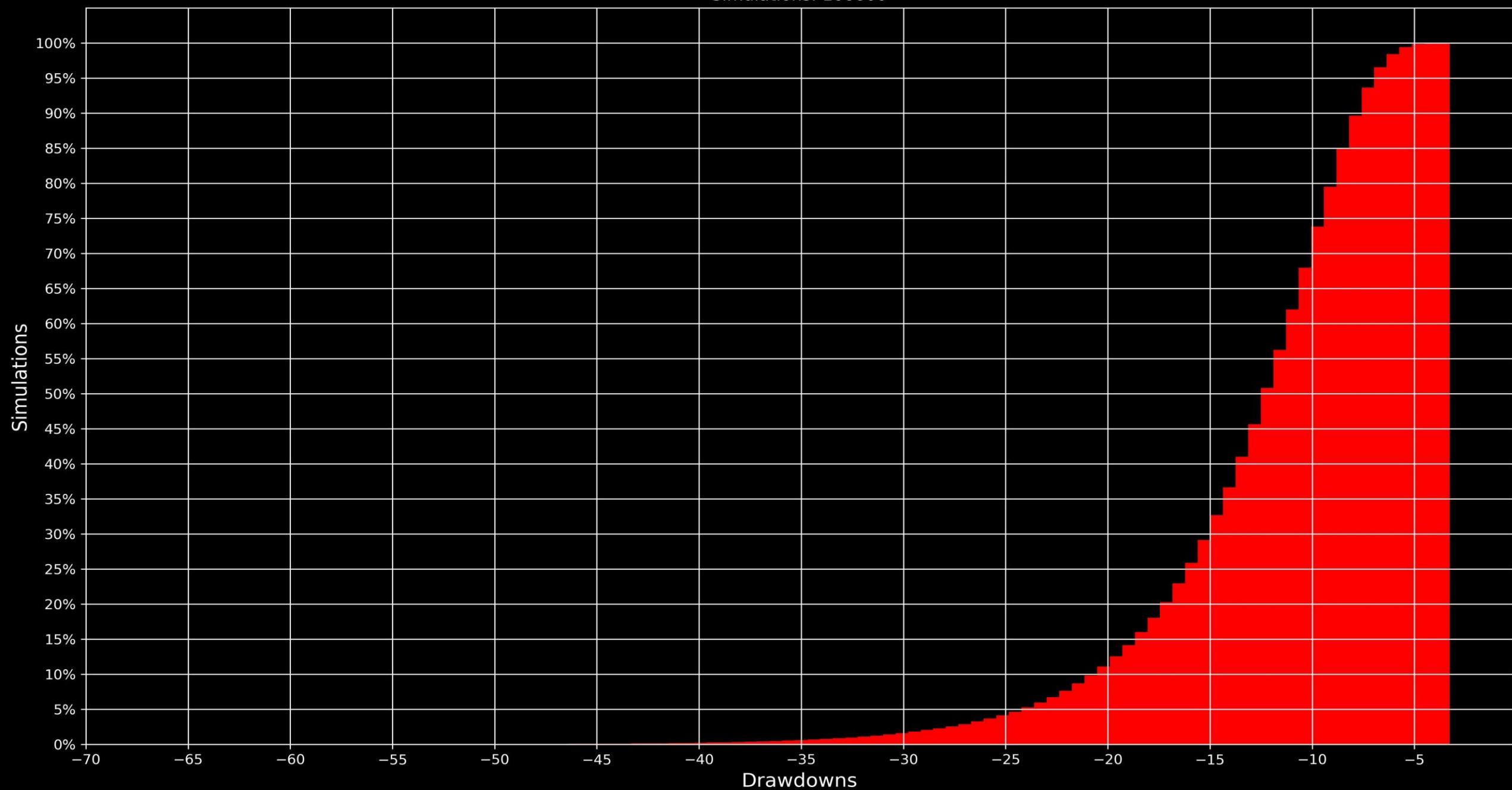
Monte Carlo Simulation (Re-sample) Drawdown Analysis  
Valley To Peak Drawdown Histogram  
Simulations: 100000



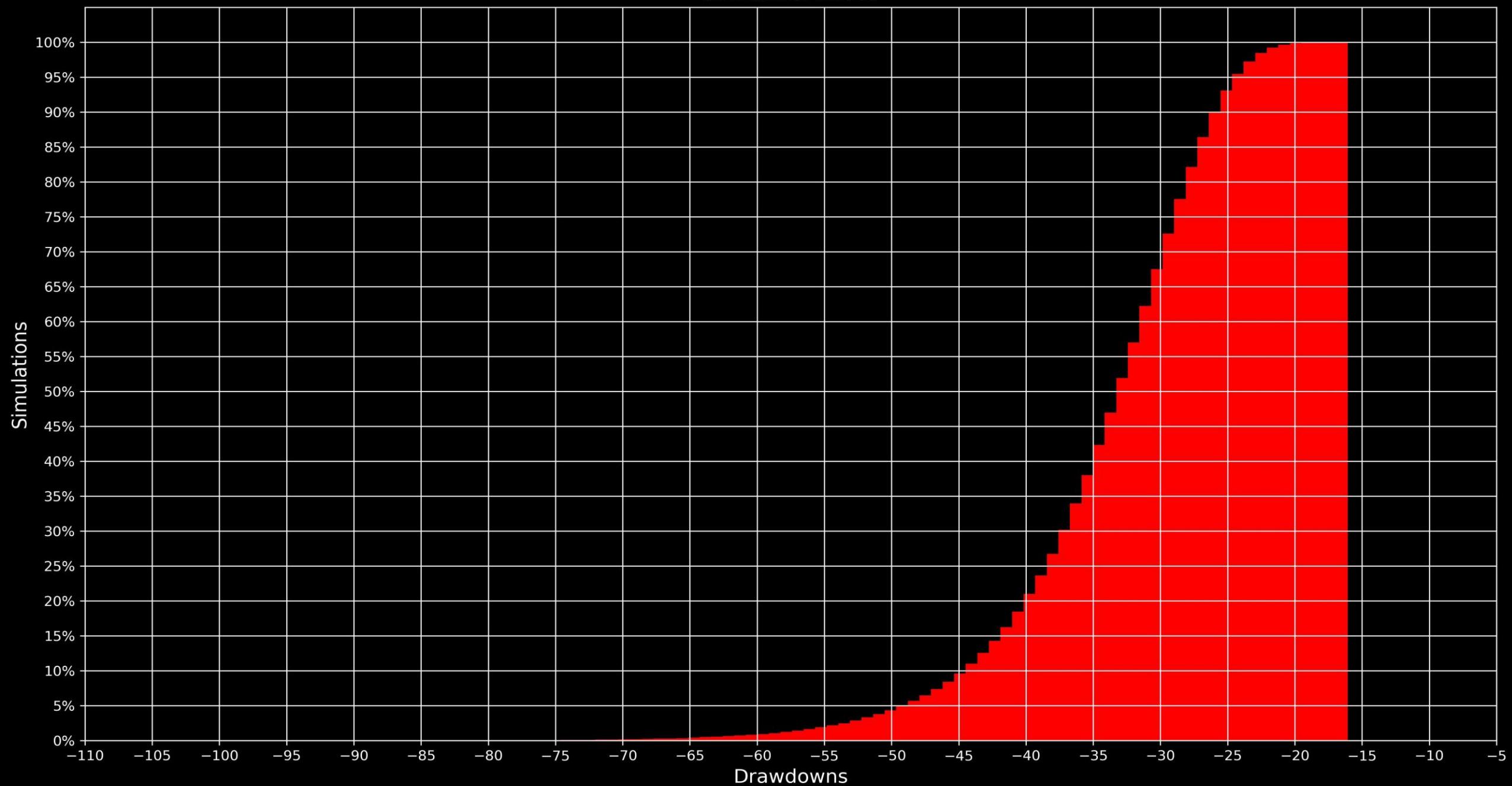
Monte Carlo Simulation (Re-sample) Drawdown Analysis  
Valley To Base Drawdown Histogram  
Simulations: 100000



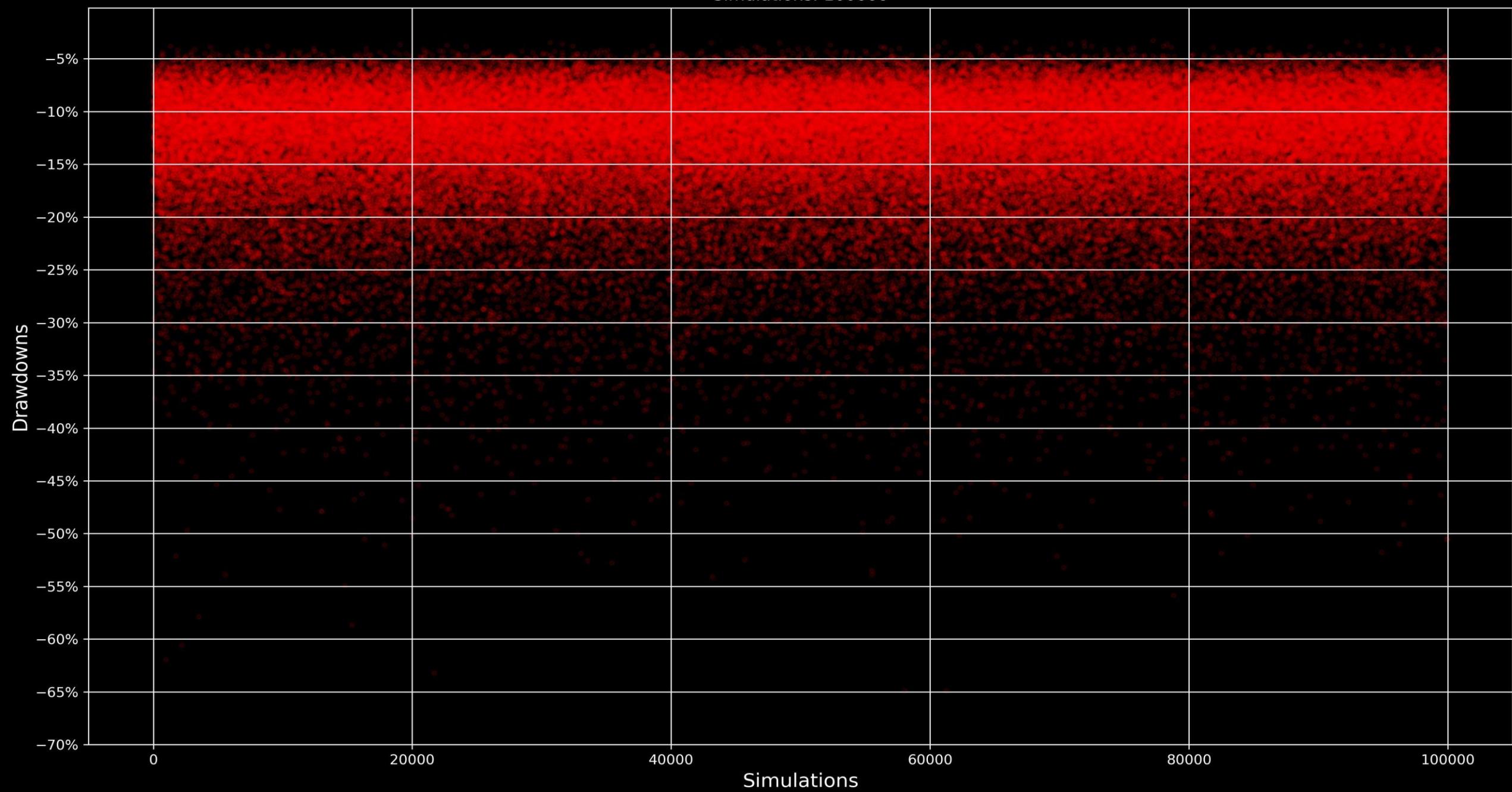
Monte Carlo Simulation (Re-sample) Drawdown Analysis  
Valley To Peak Drawdown Histogram (Cumulative)  
Simulations: 100000



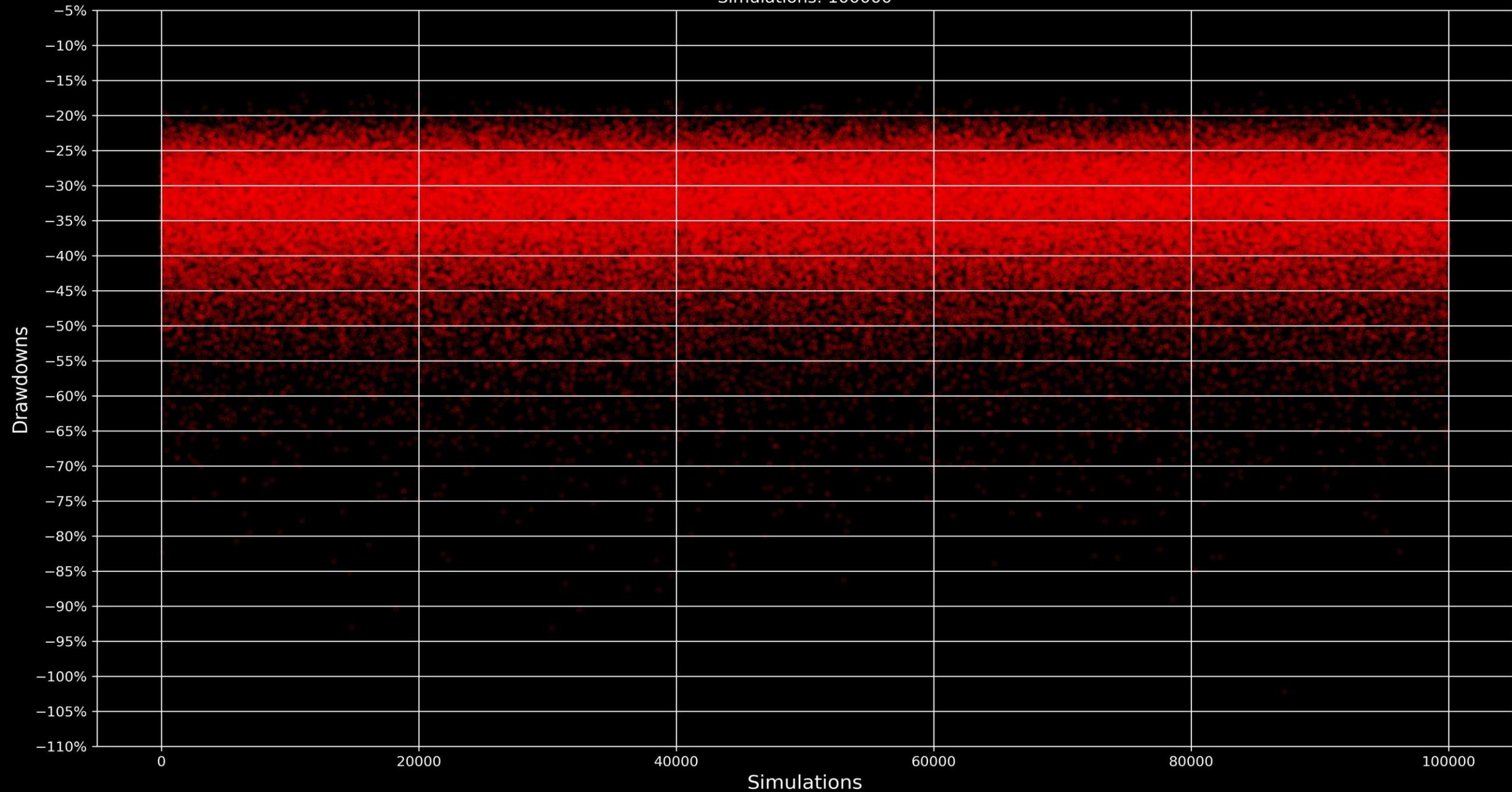
Monte Carlo Simulation (Re-sample) Drawdown Analysis  
Valley To Base Drawdown Histogram (Cumulative)  
Simulations: 100000



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

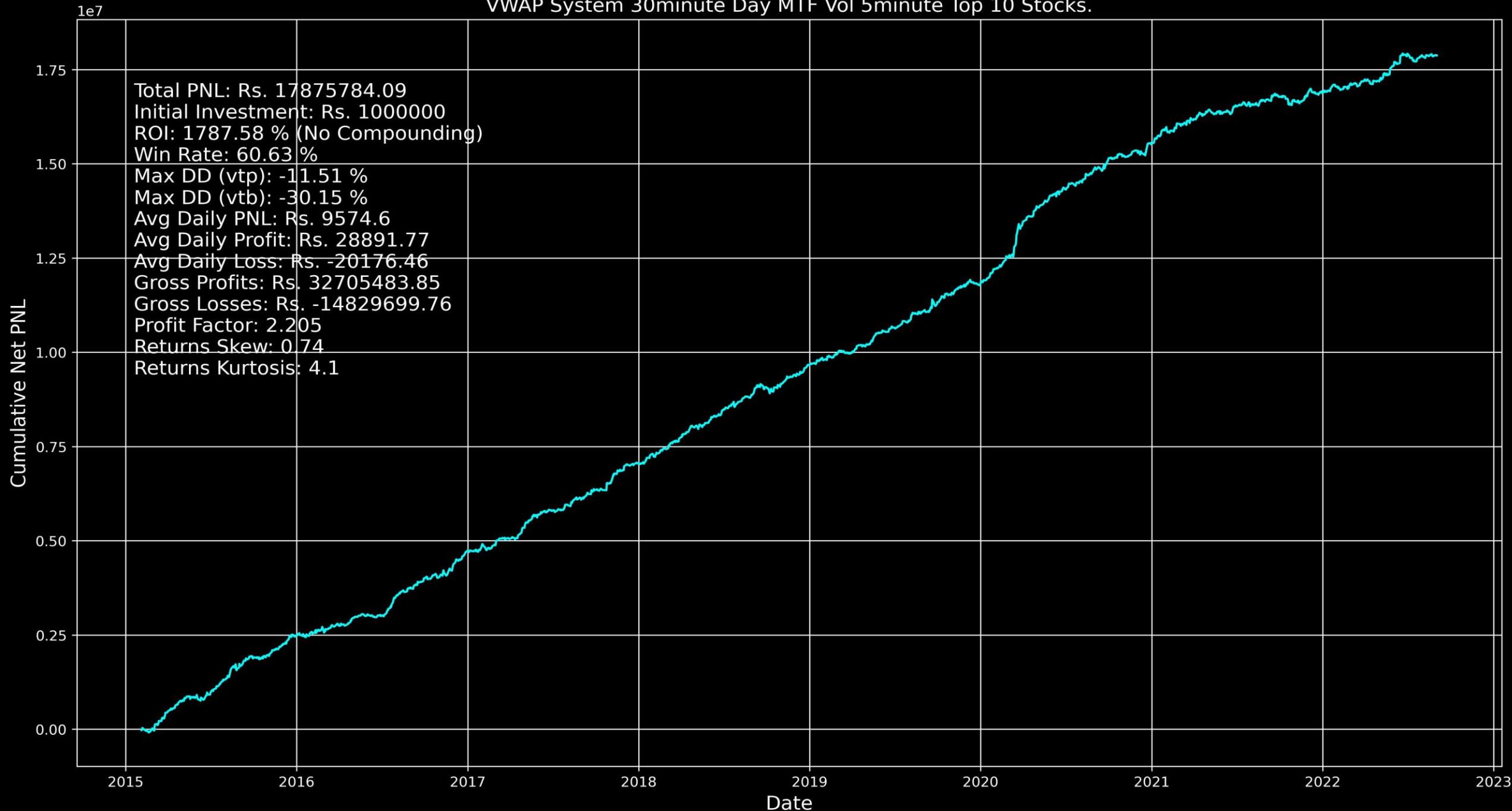


Monte Carlo Simulation (Re-sample) Drawdown Analysis  
Valley To Base Drawdown Scatter Plot  
Simulations: 100000

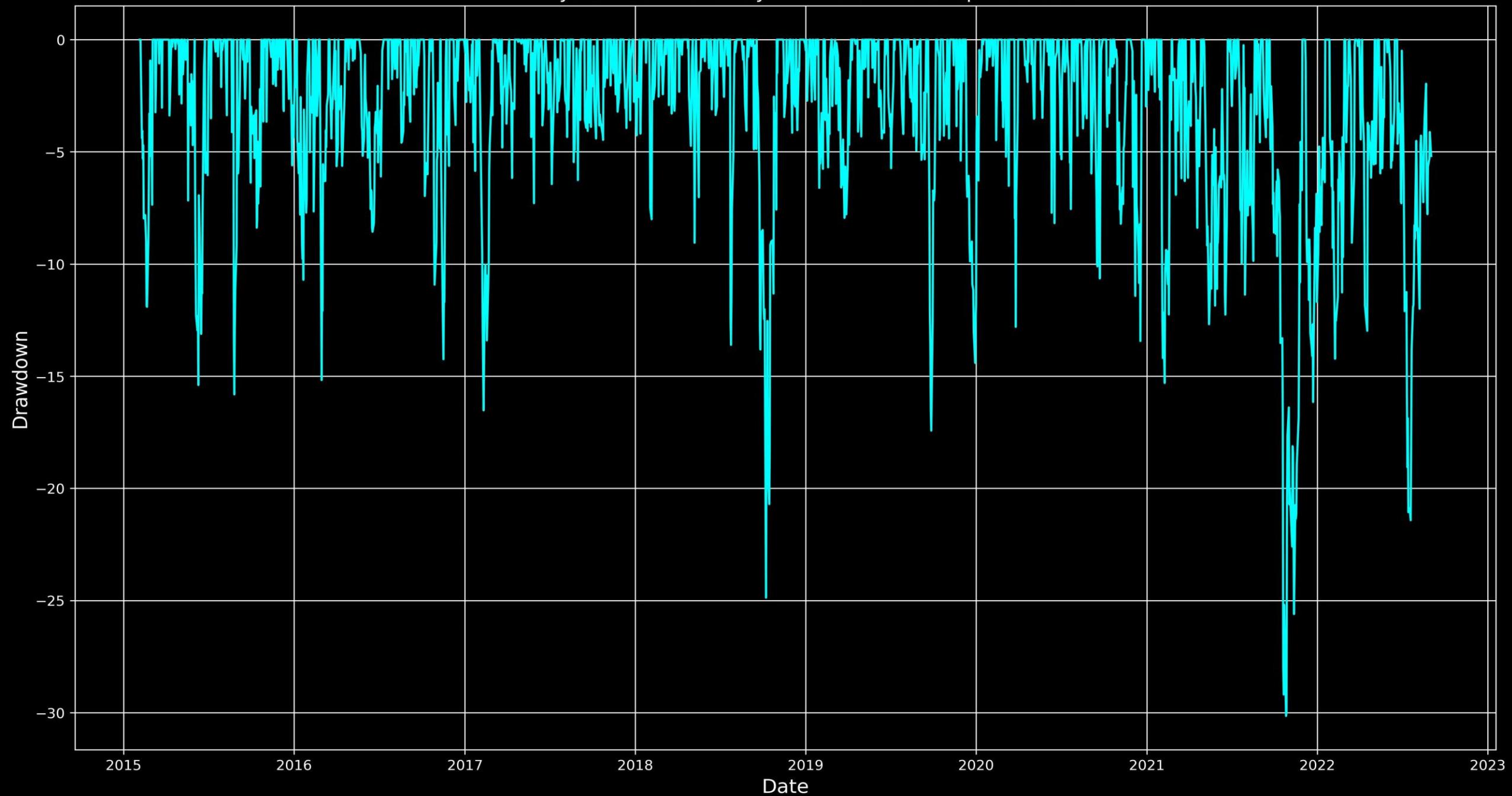


FNO Universe Ranked  
Dynamic Basket  
(VWAP Core Block)

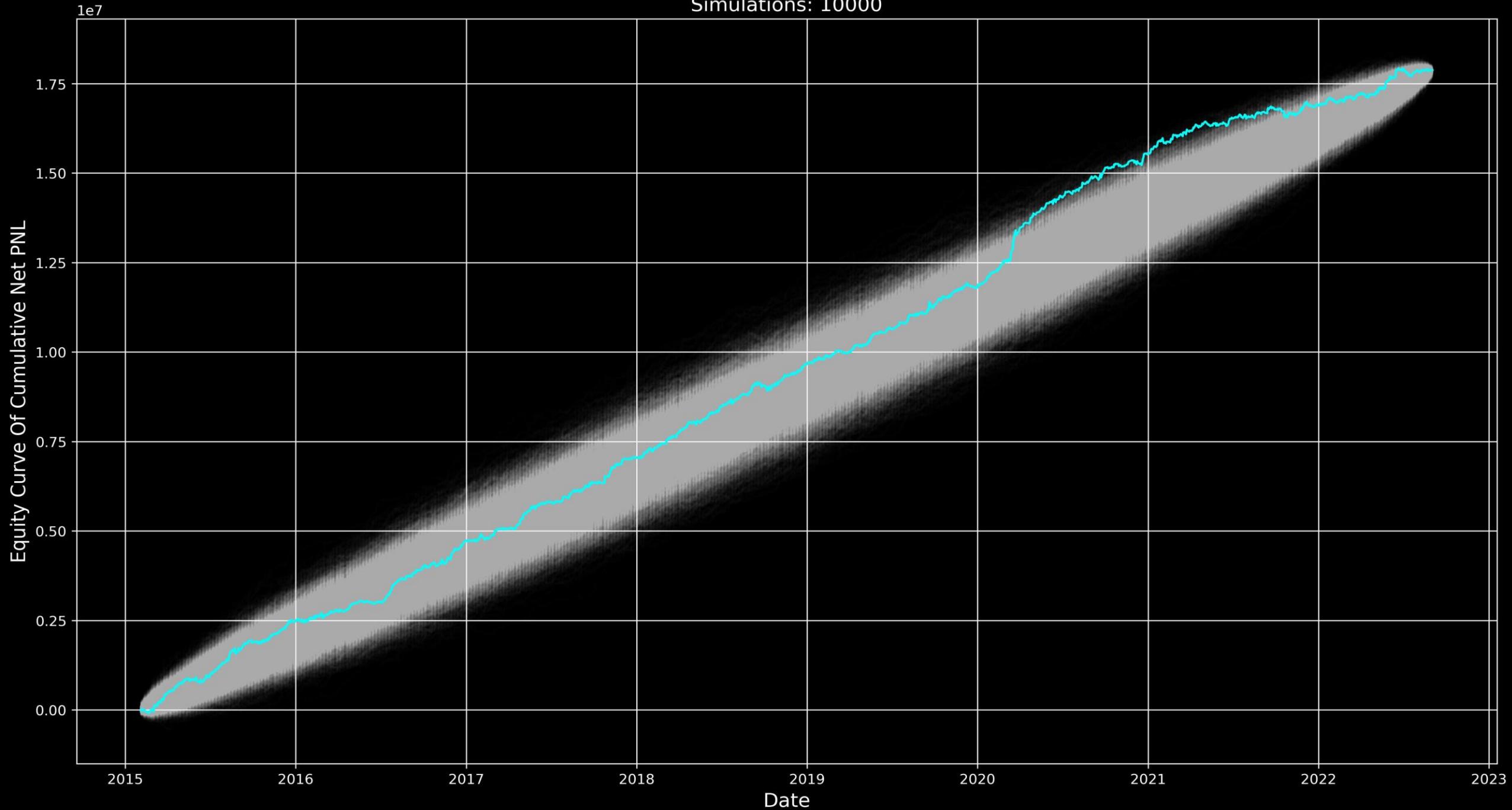
Ranked Universe System Performance (Day-wise)  
VWAP System 30minute Day MTF Vol 5minute Top 10 Stocks.



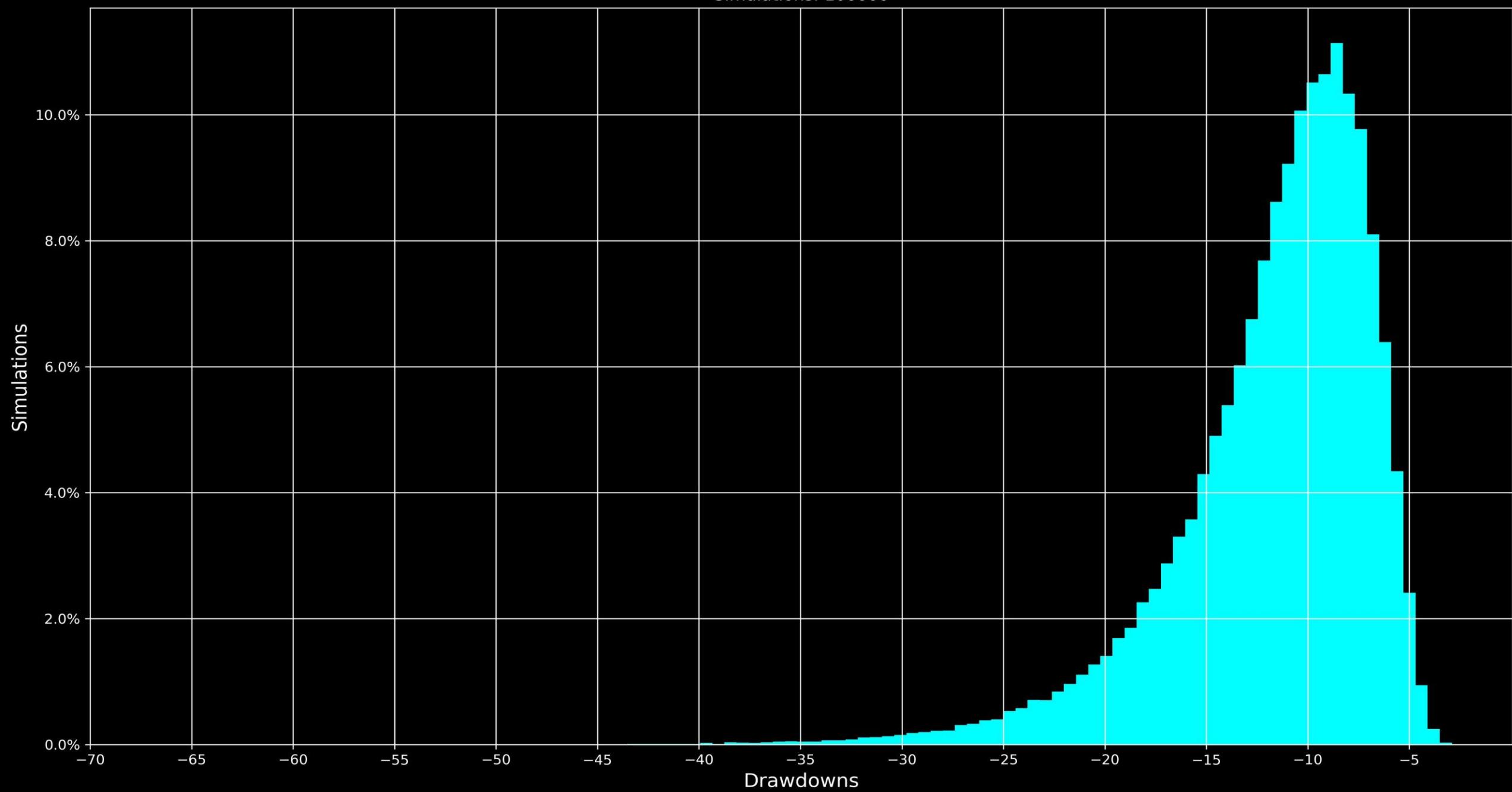
Draw-down Underwater Curve (vtb)  
VWAP System 30minute Day MTF Vol 5minute Top 10 Stocks.



Monte Carlo Simulation (Re-shuffle)  
Simulations: 10000



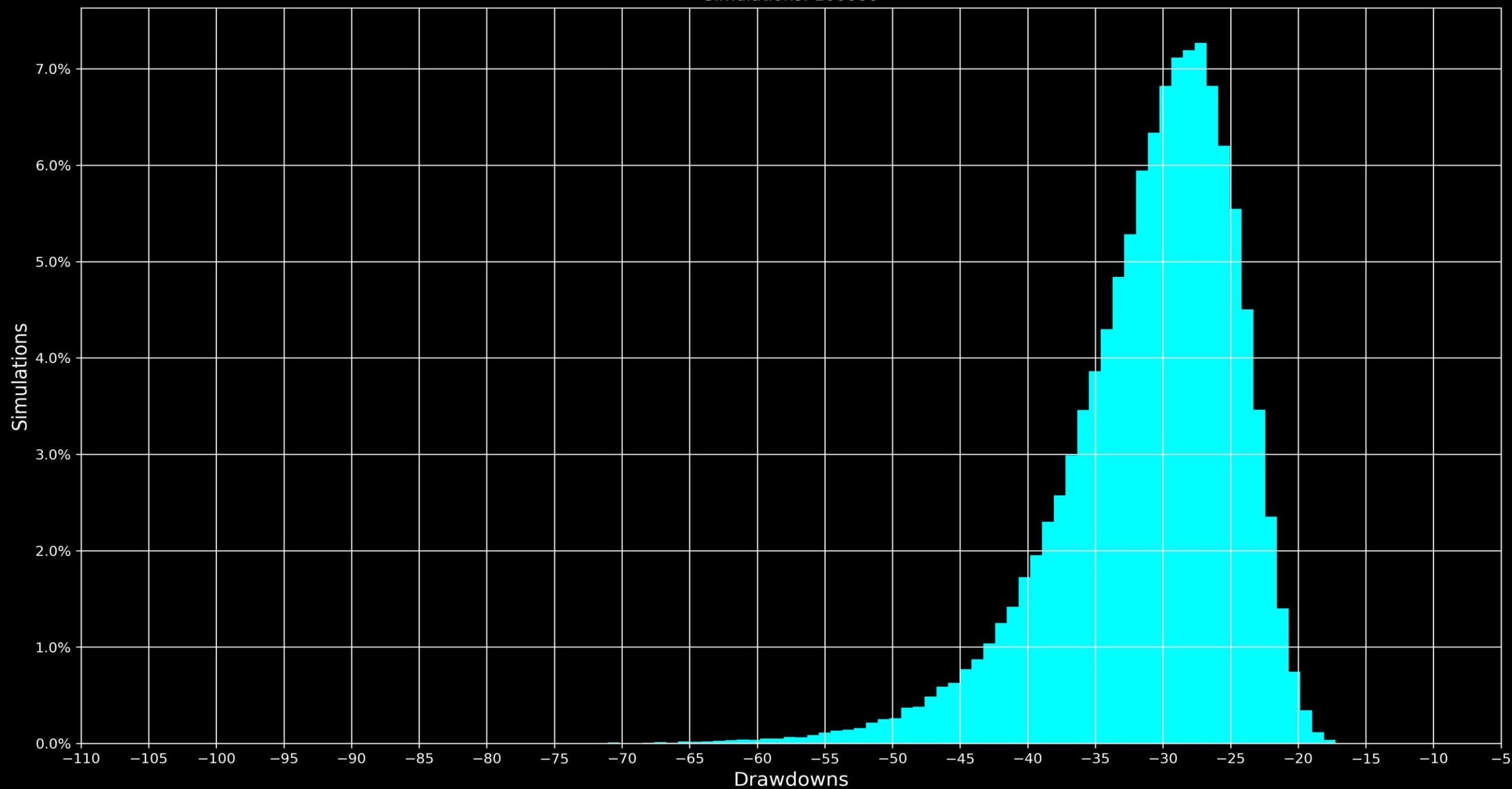
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis  
Valley To Peak Drawdown Histogram  
Simulations: 100000



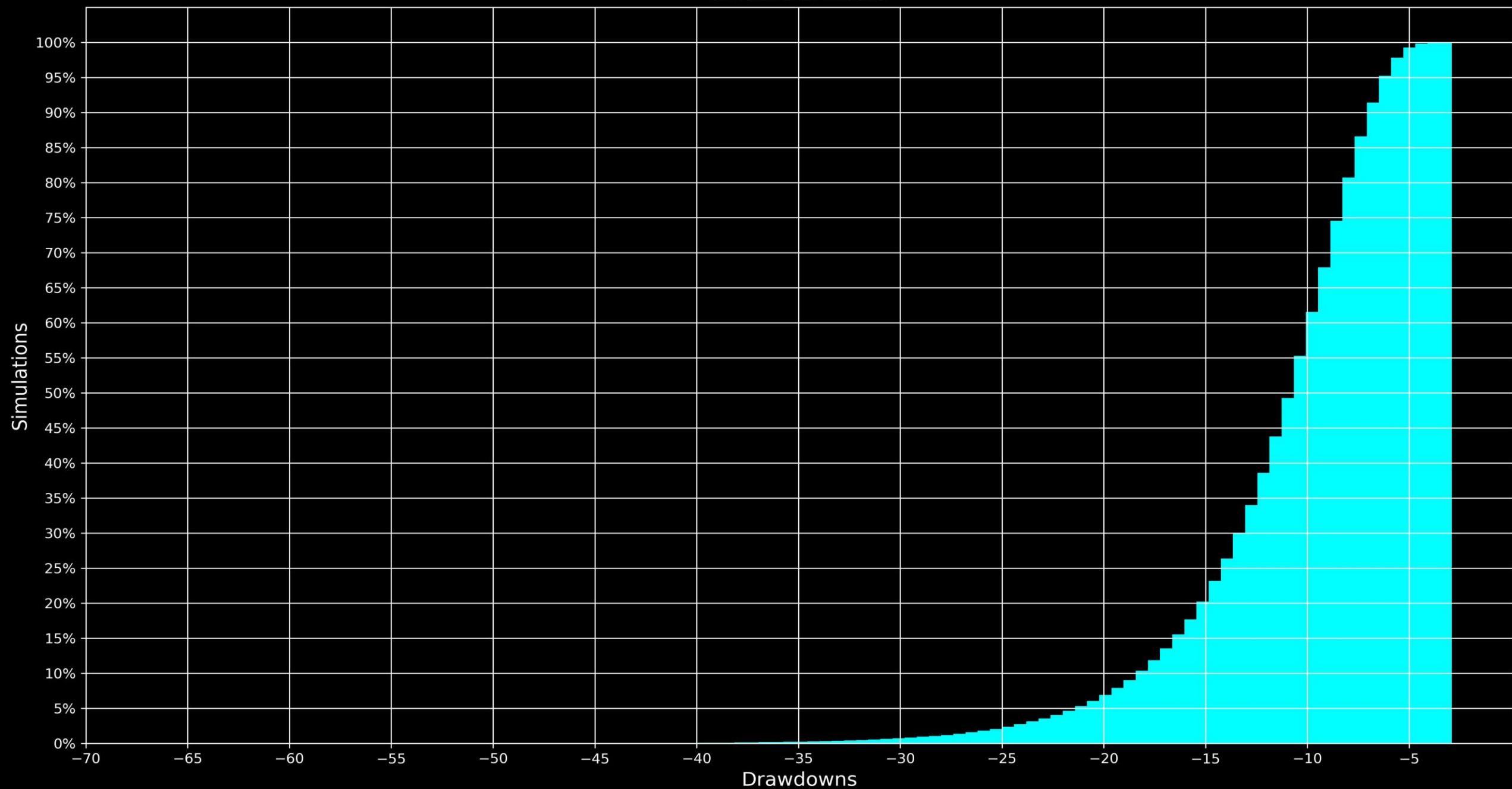
# Monte Carlo Simulation (Re-shuffle) Drawdown Analysis

## Valley To Base Drawdown Histogram

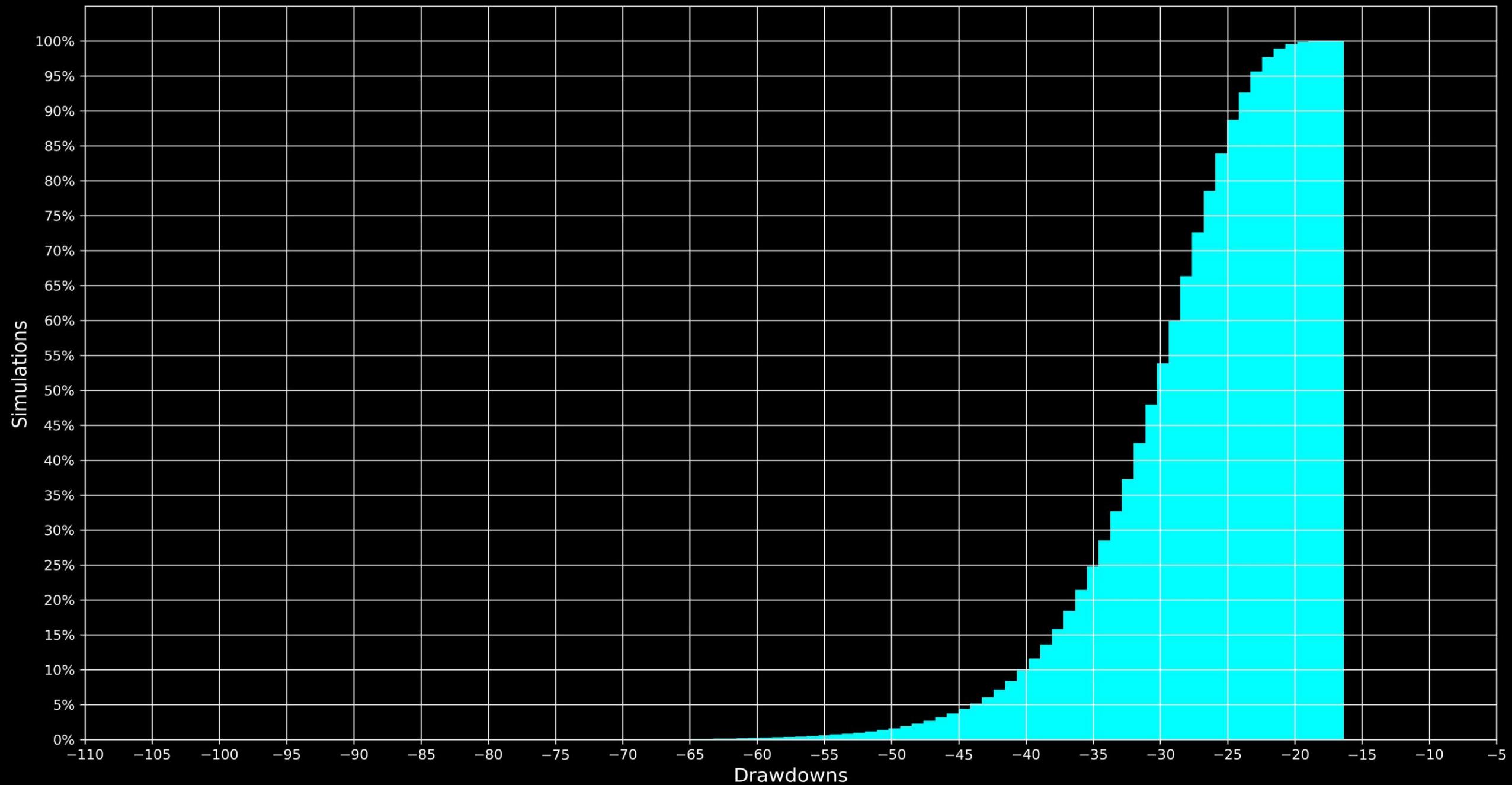
### Simulations: 100000



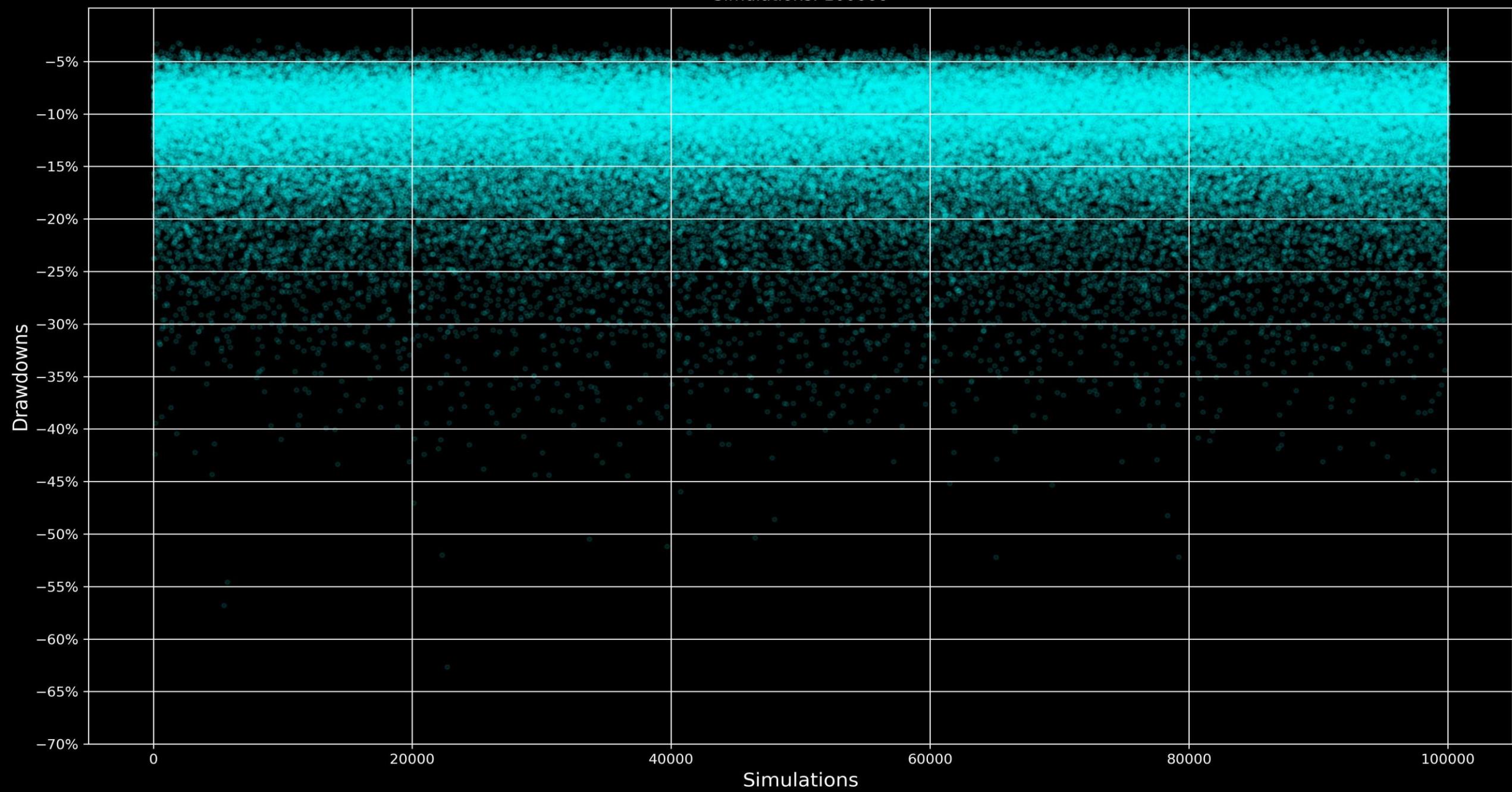
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis  
Valley To Peak Drawdown Histogram (Cumulative)  
Simulations: 100000



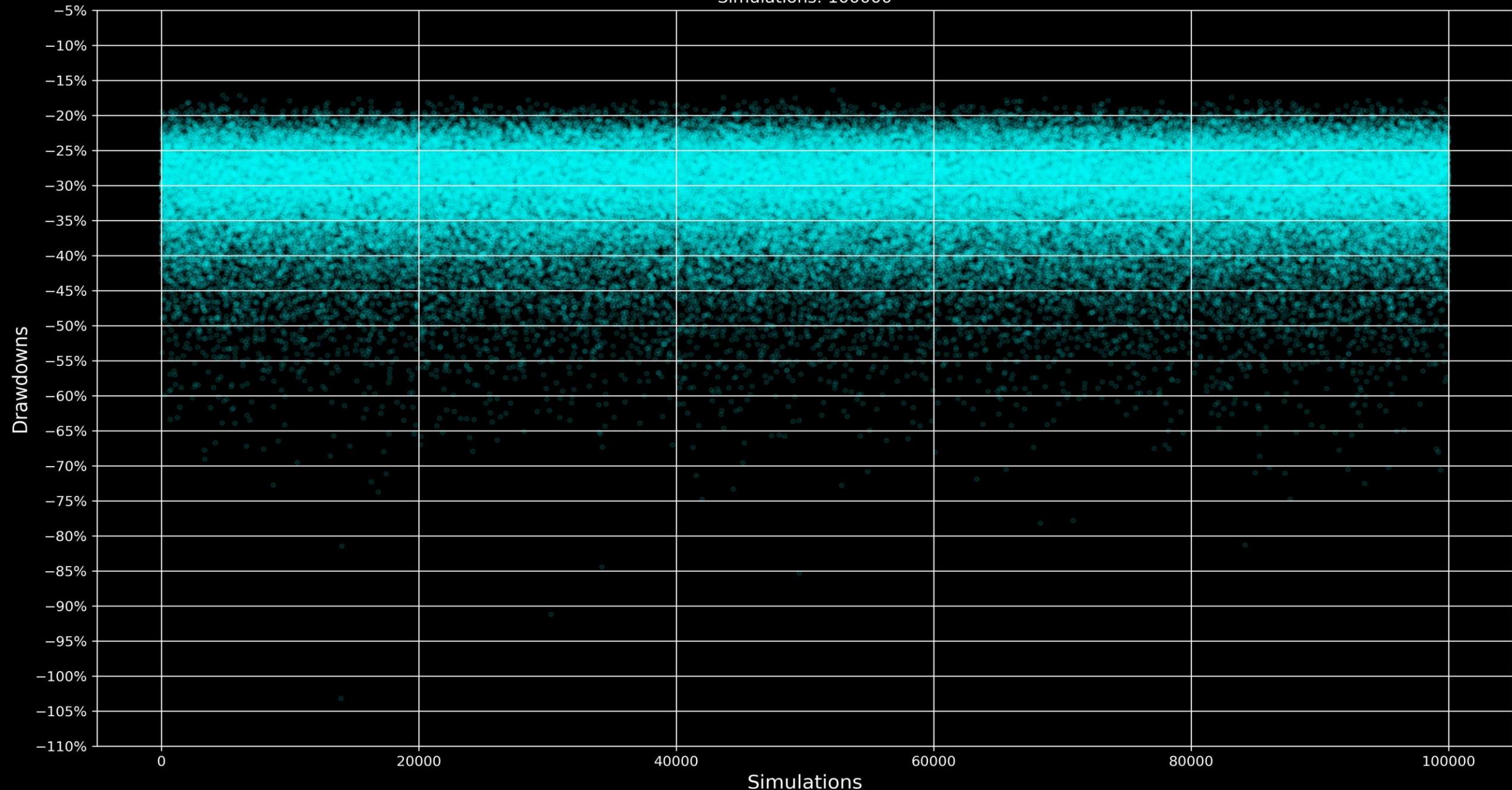
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis  
Valley To Base Drawdown Histogram (Cumulative)  
Simulations: 100000



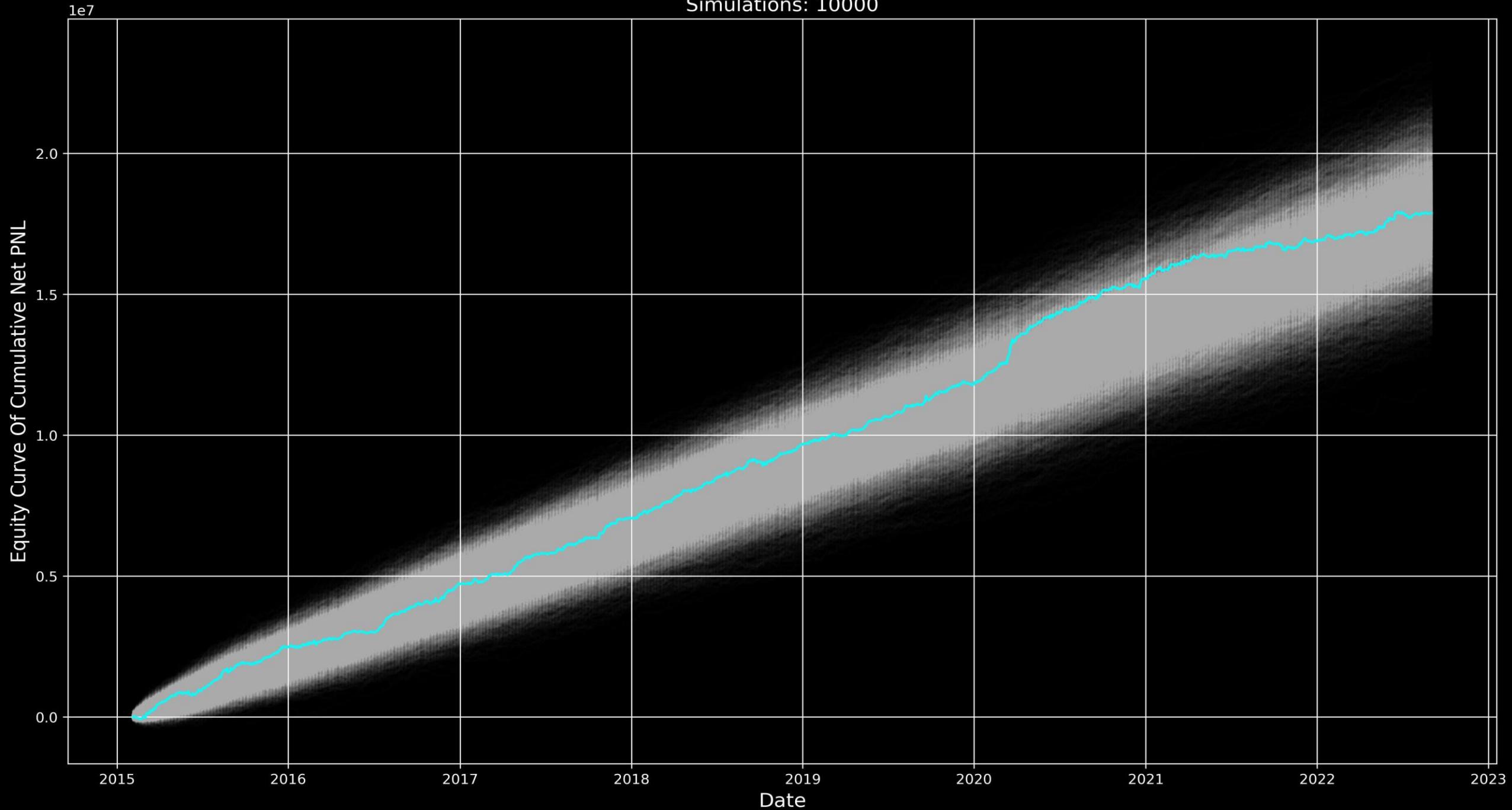
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis  
Valley To Peak Drawdown Scatter Plot  
Simulations: 100000



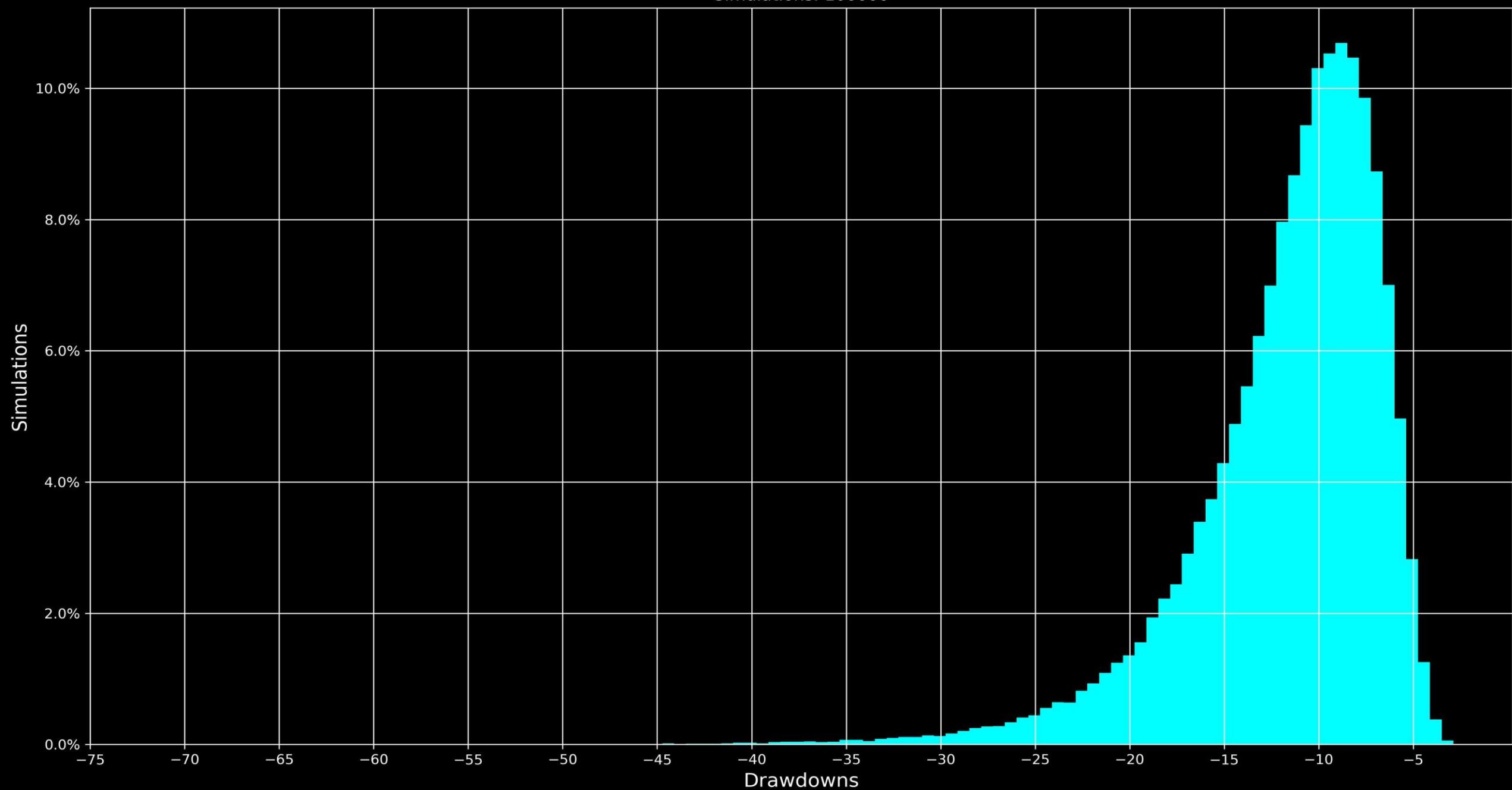
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis  
Valley To Base Drawdown Scatter Plot  
Simulations: 100000



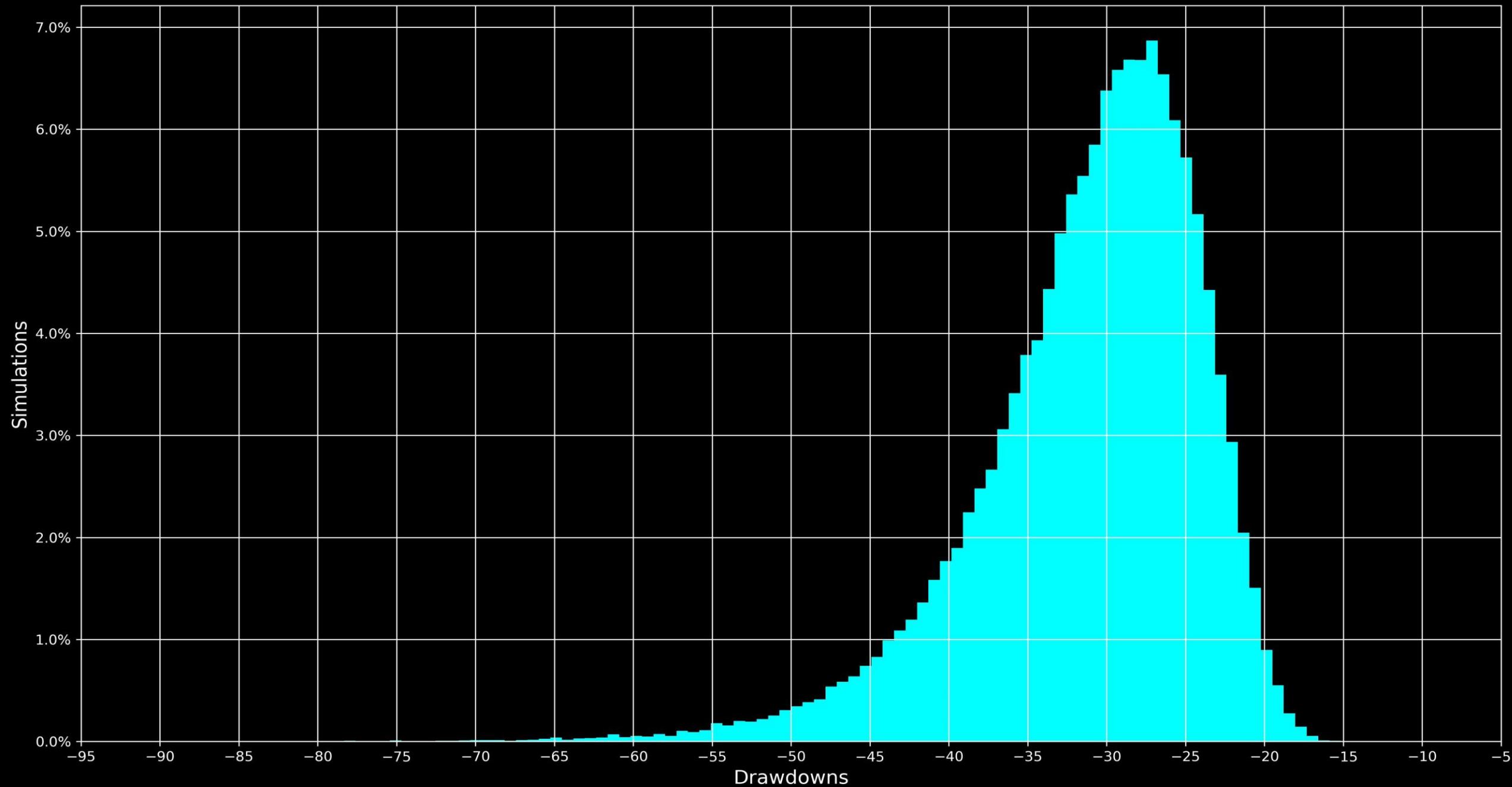
Monte Carlo Simulation (Re-sample)  
Simulations: 10000



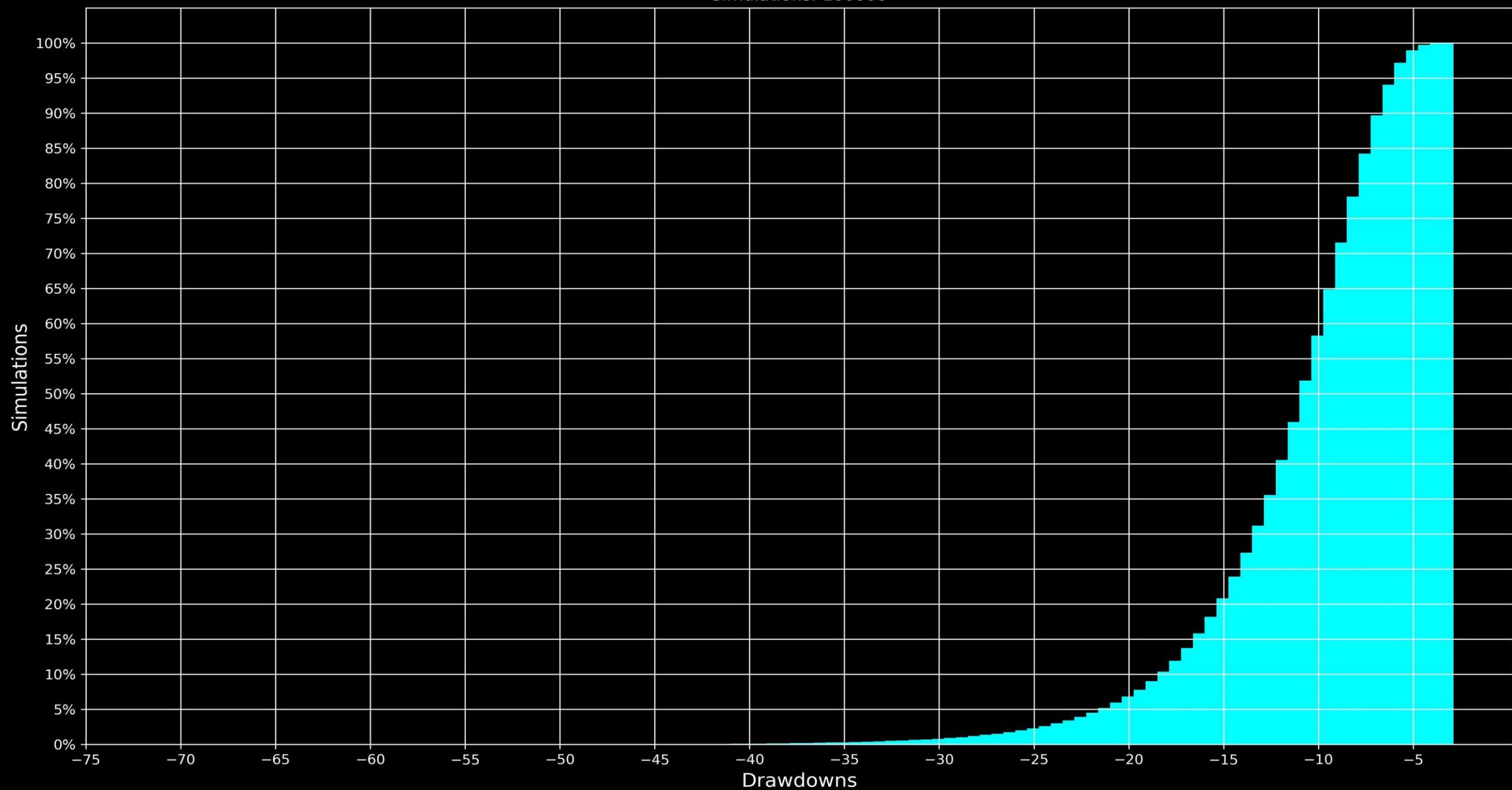
Monte Carlo Simulation (Re-sample) Drawdown Analysis  
Valley To Peak Drawdown Histogram  
Simulations: 100000



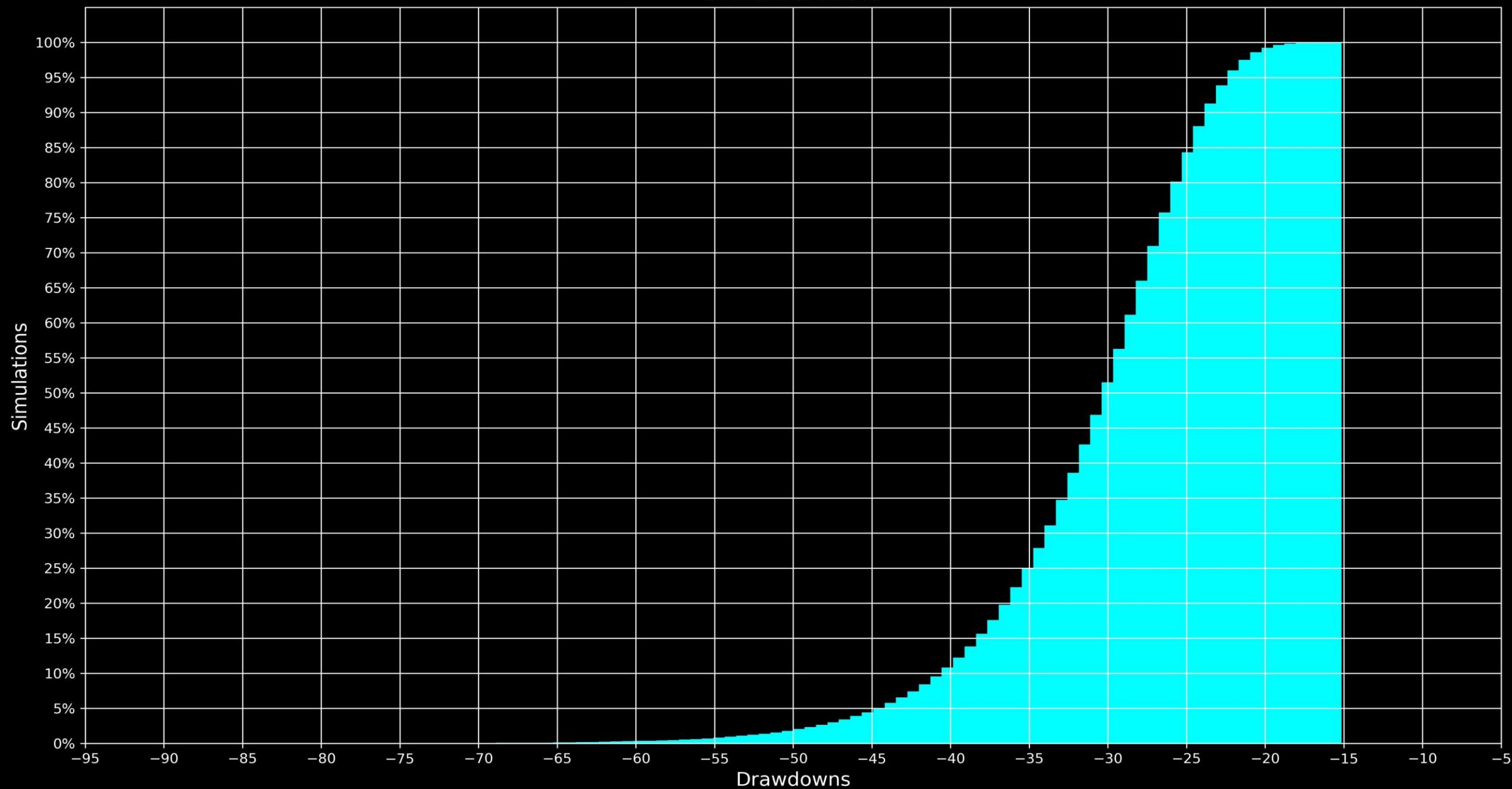
Monte Carlo Simulation (Re-sample) Drawdown Analysis  
Valley To Base Drawdown Histogram  
Simulations: 100000



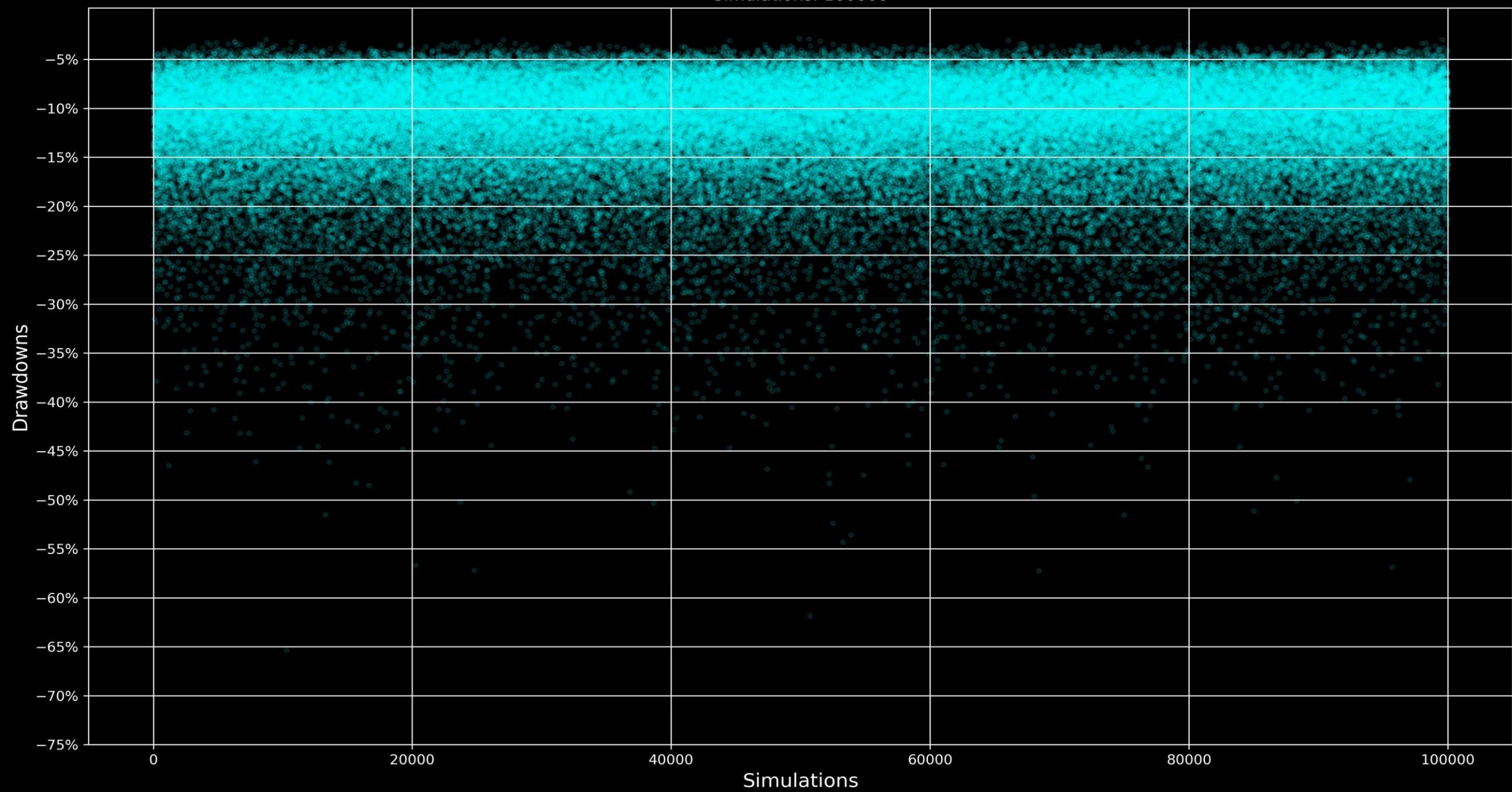
Monte Carlo Simulation (Re-sample) Drawdown Analysis  
Valley To Peak Drawdown Histogram (Cumulative)  
Simulations: 100000



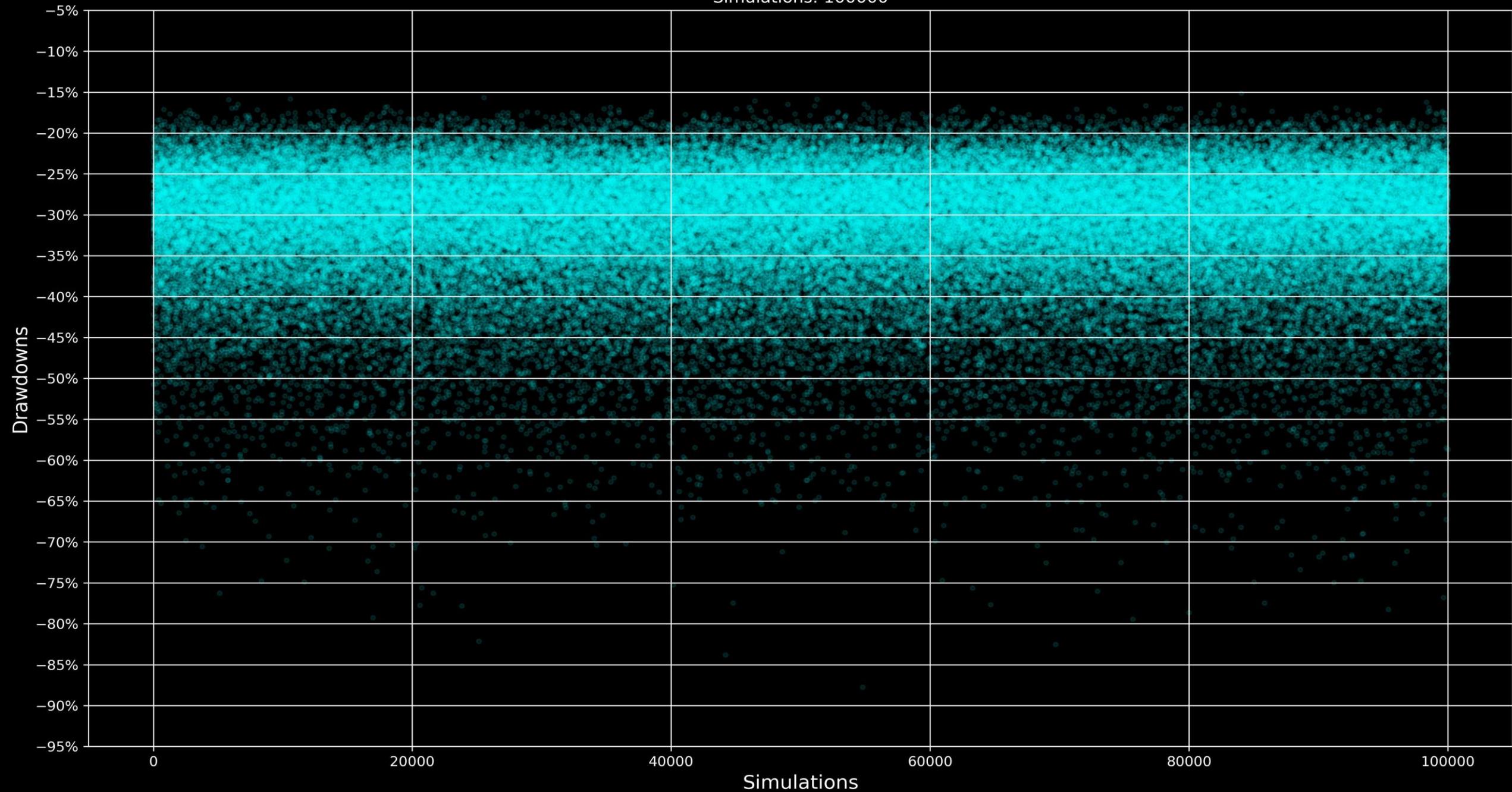
Monte Carlo Simulation (Re-sample) Drawdown Analysis  
Valley To Base Drawdown Histogram (Cumulative)  
Simulations: 100000



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

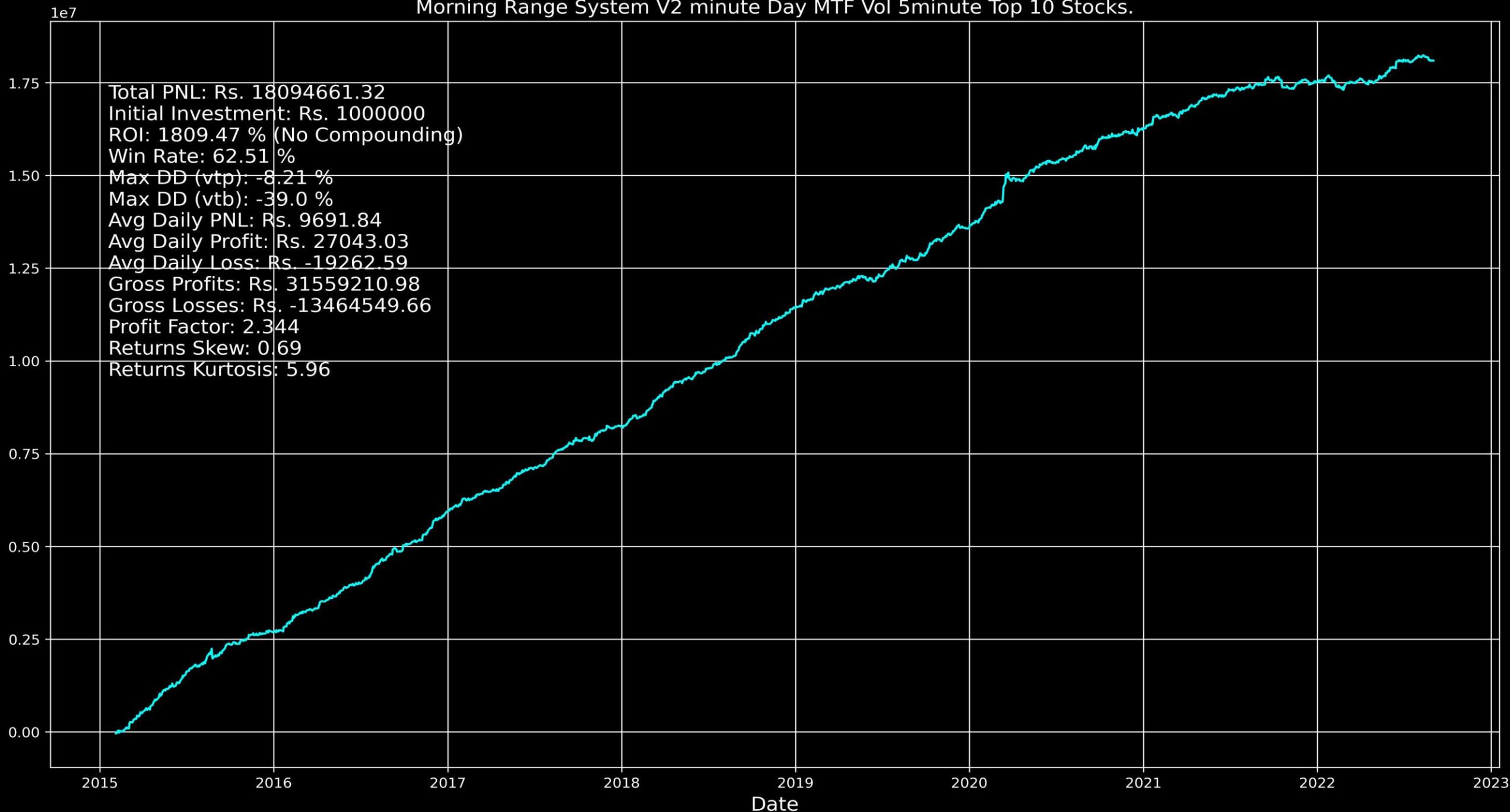


Monte Carlo Simulation (Re-sample) Drawdown Analysis  
Valley To Base Drawdown Scatter Plot  
Simulations: 100000

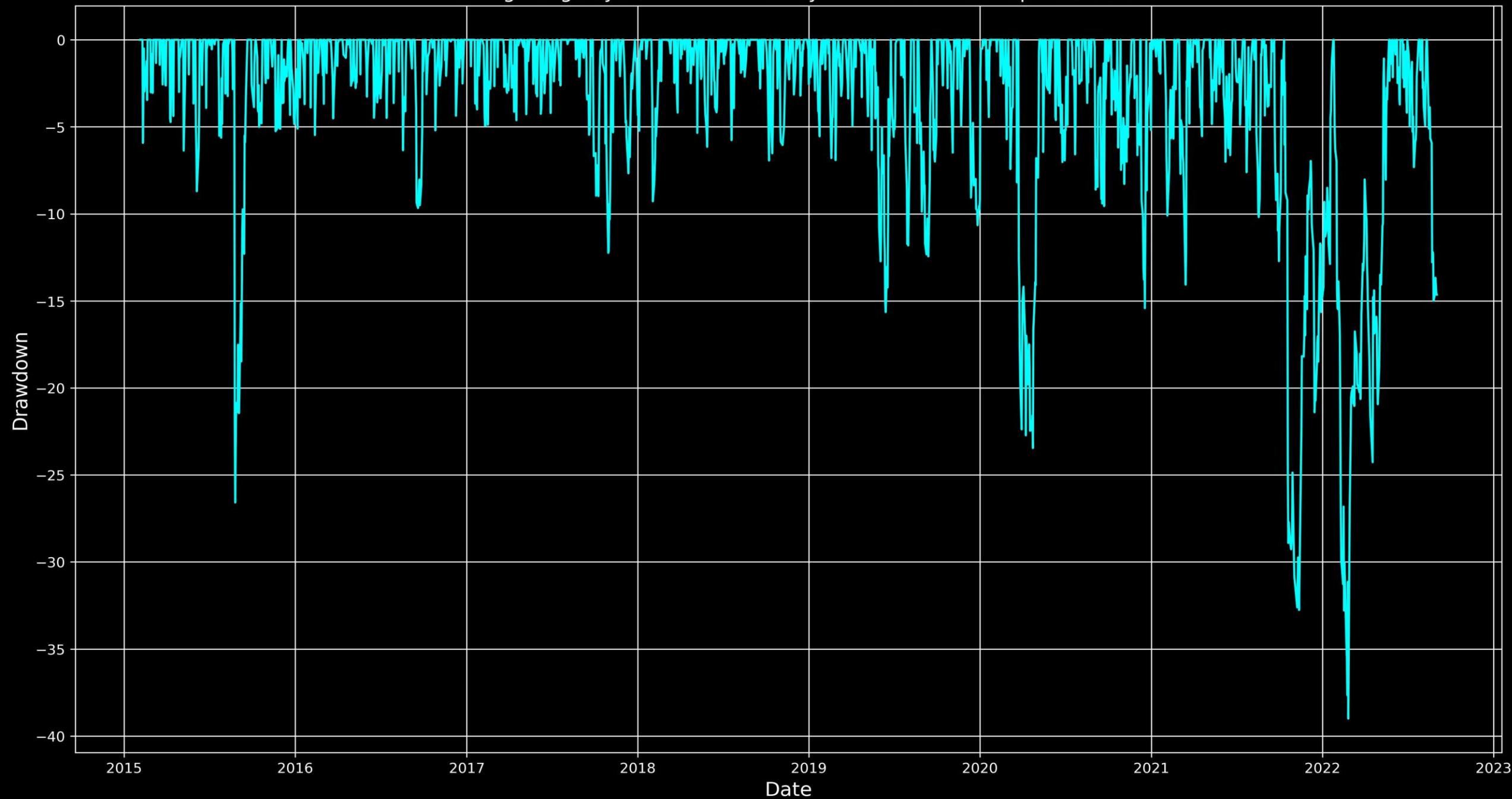


# FNO Universe Ranked Dynamic Basket (ORB Core Block)

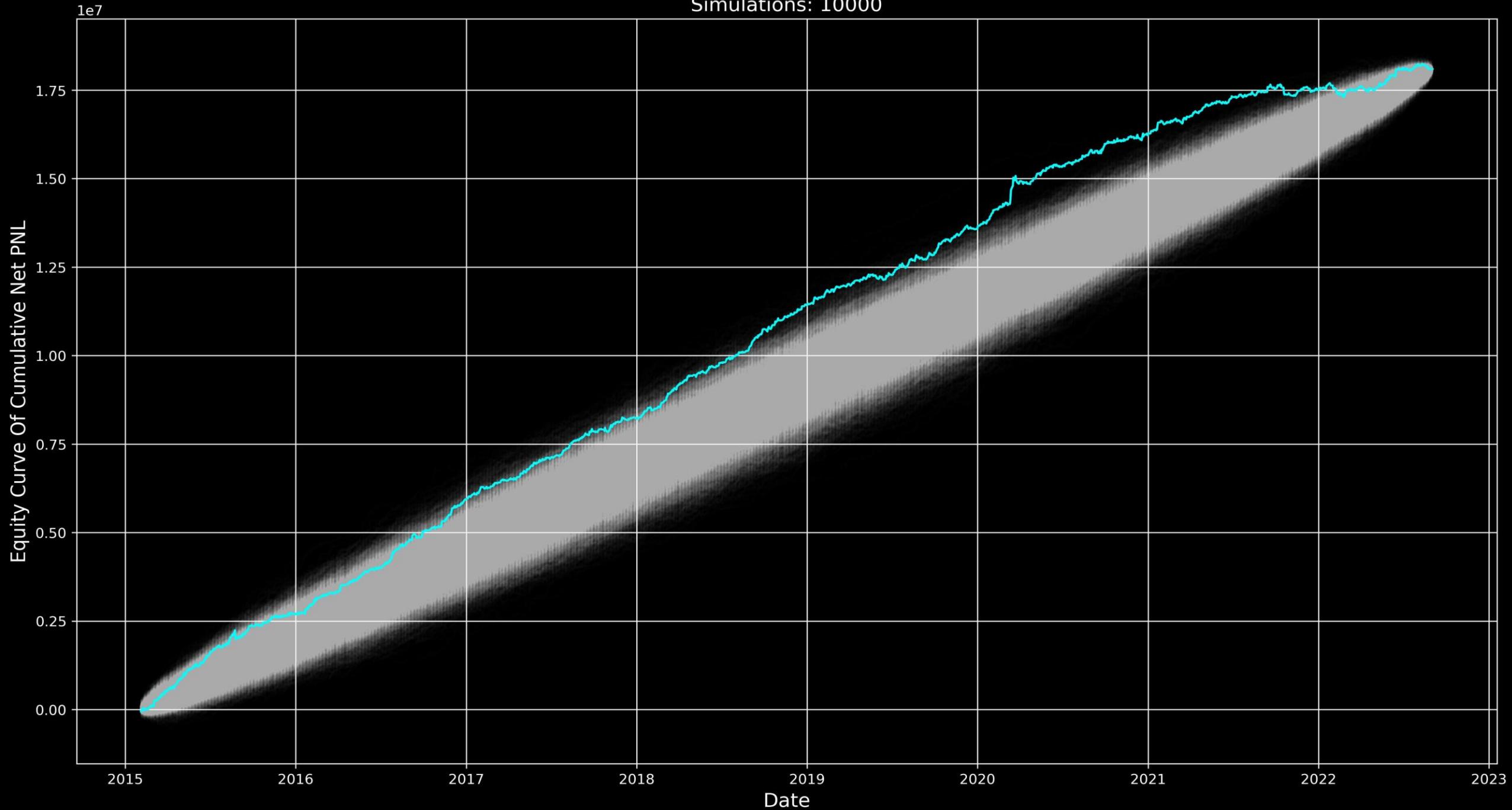
Ranked Universe System Performance (Day-wise)  
Morning Range System V2 minute Day MTF Vol 5minute Top 10 Stocks.



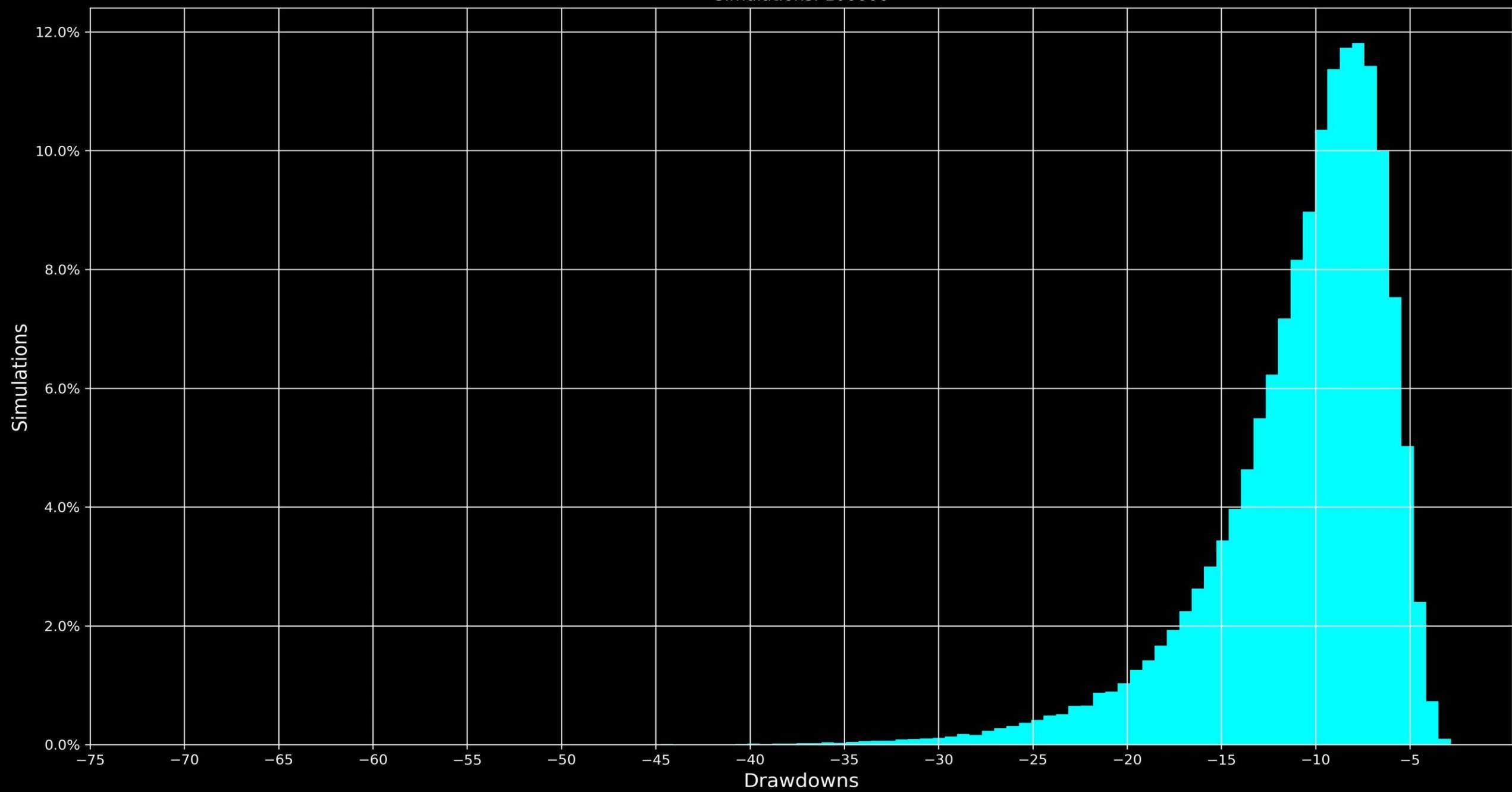
Draw-down Underwater Curve (vtb)  
Morning Range System V2 minute Day MTF Vol 5minute Top 10 Stocks.



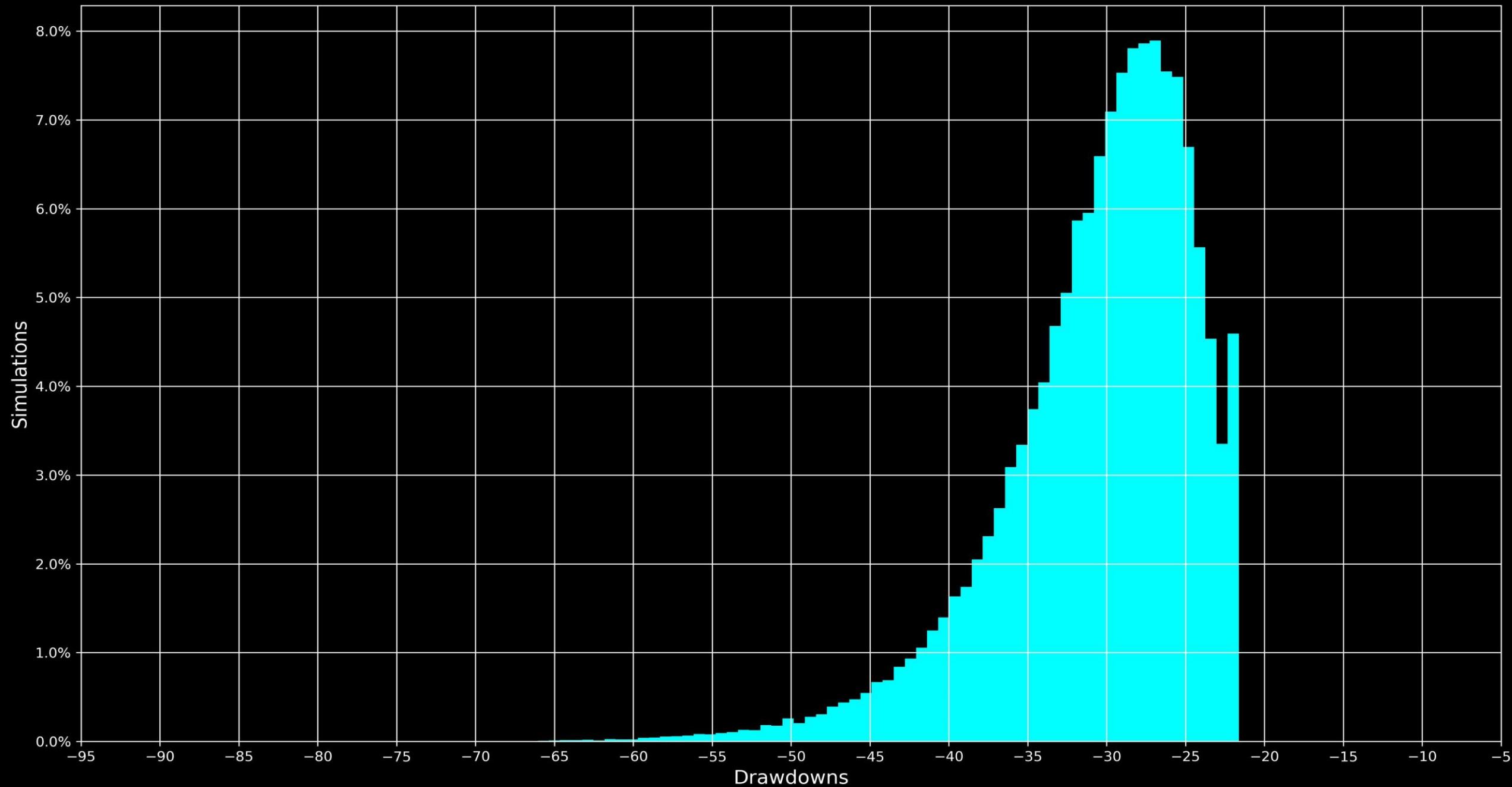
Monte Carlo Simulation (Re-shuffle)  
Simulations: 10000



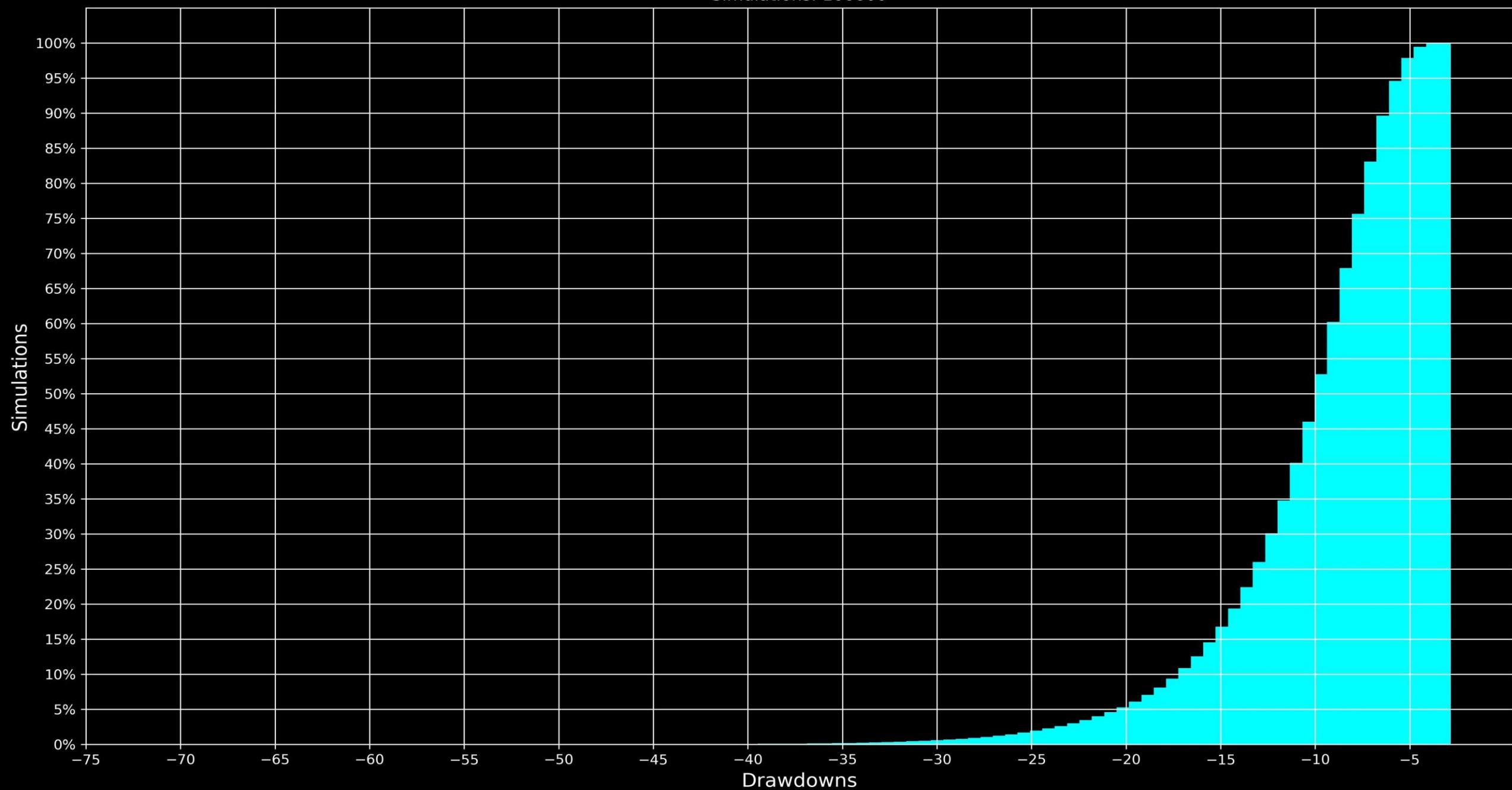
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis  
Valley To Peak Drawdown Histogram  
Simulations: 100000



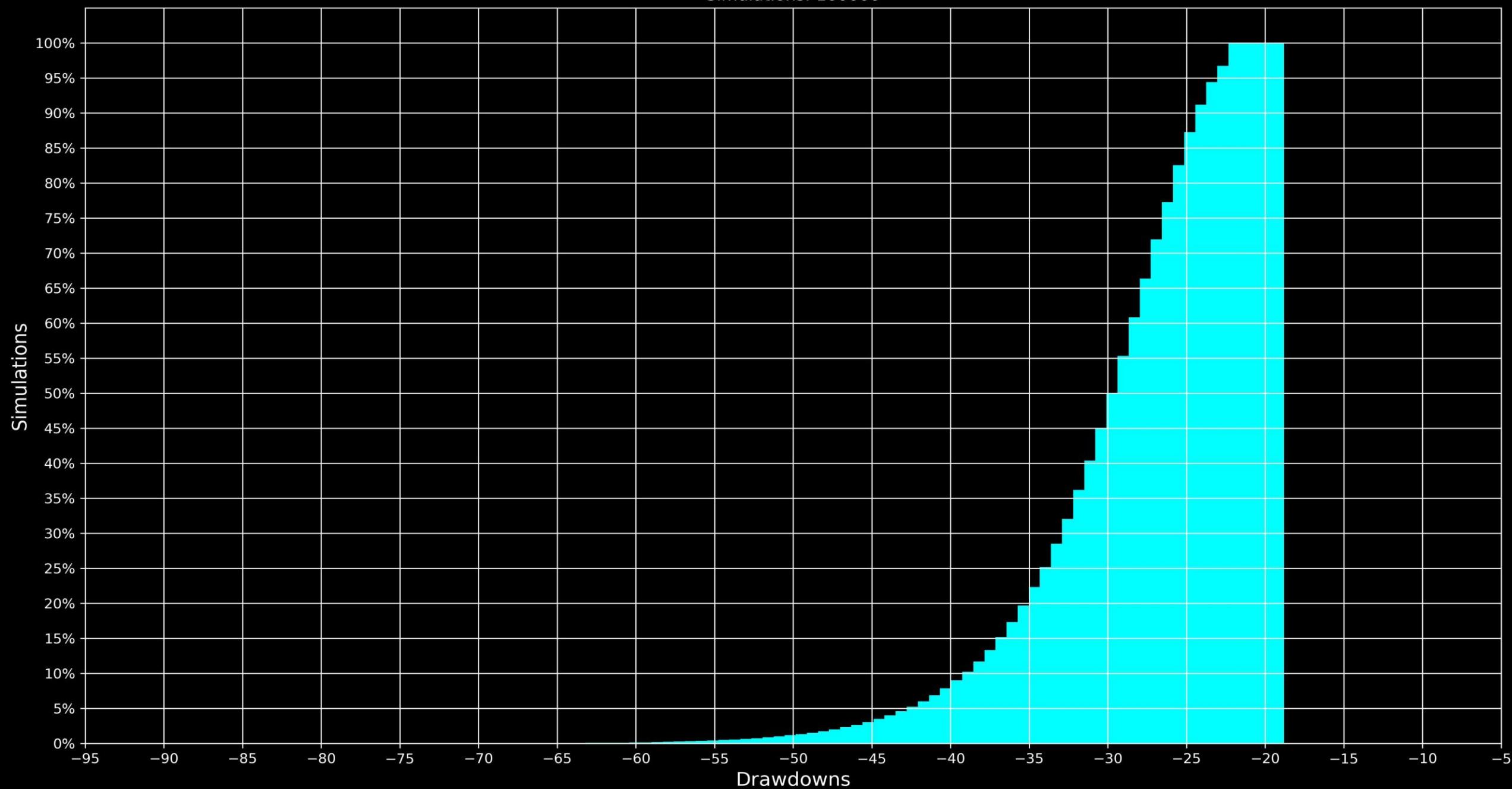
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis  
Valley To Base Drawdown Histogram  
Simulations: 100000



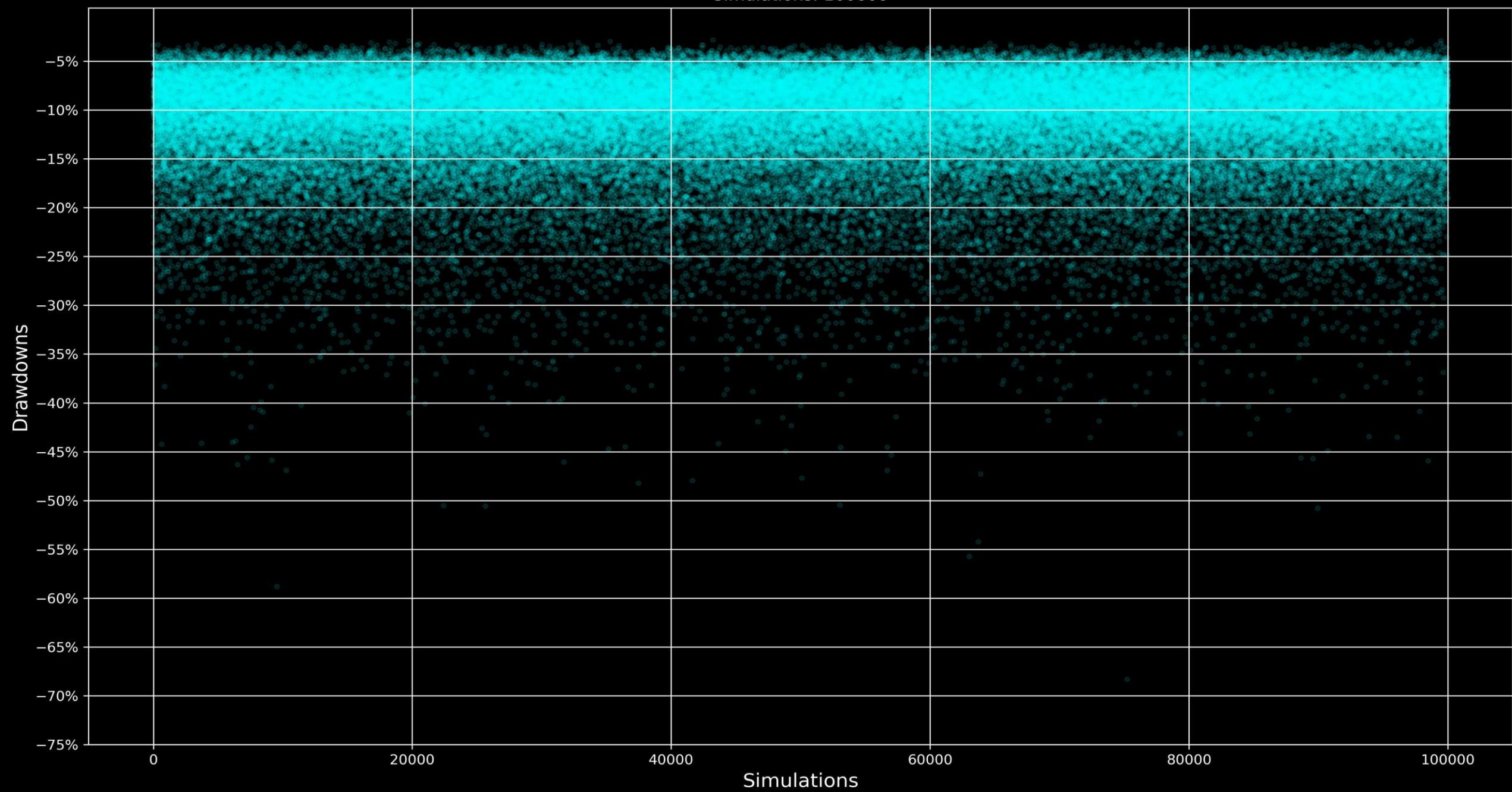
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis  
Valley To Peak Drawdown Histogram (Cumulative)  
Simulations: 100000



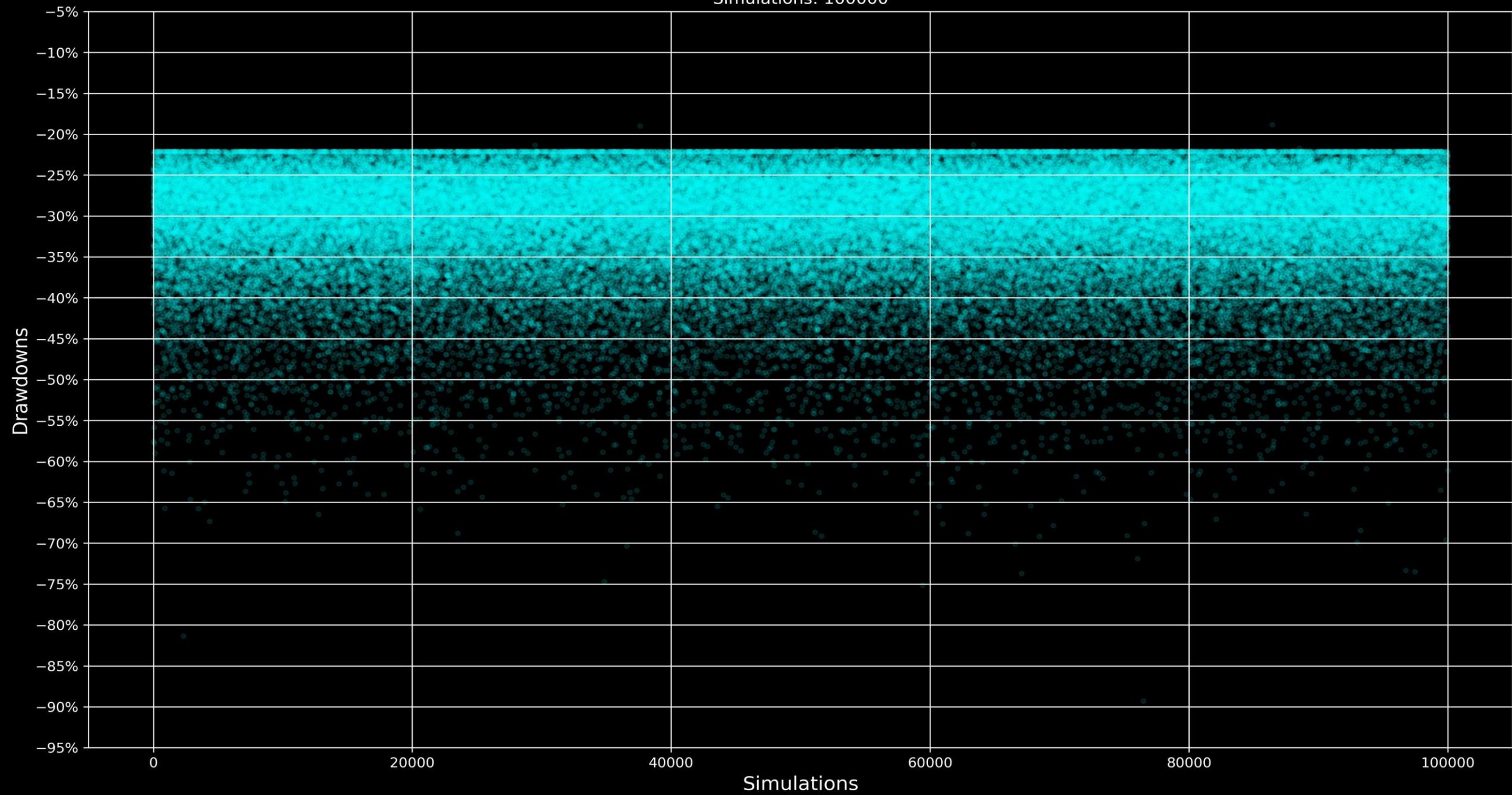
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis  
Valley To Base Drawdown Histogram (Cumulative)  
Simulations: 100000



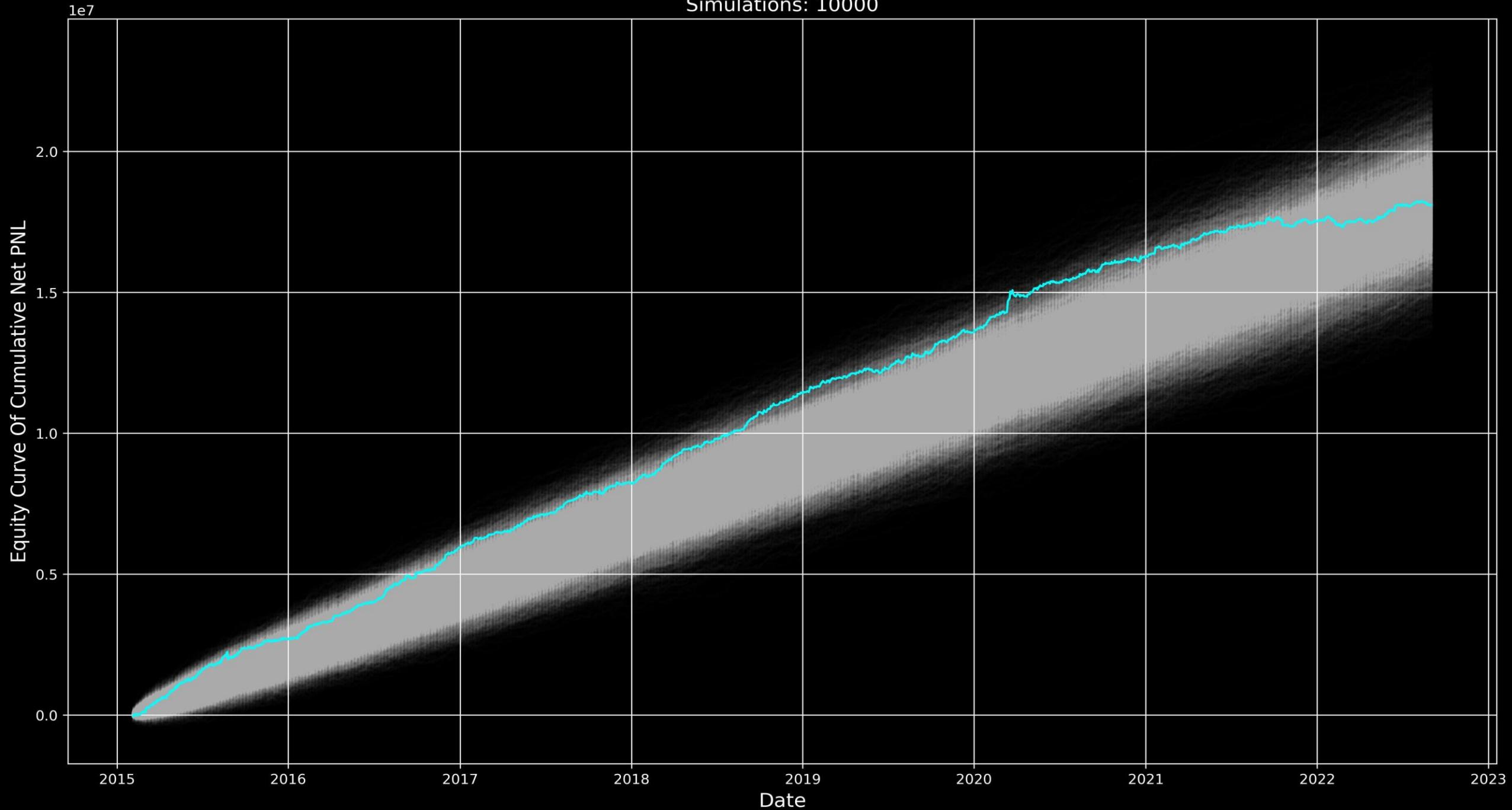
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis  
Valley To Peak Drawdown Scatter Plot  
Simulations: 100000



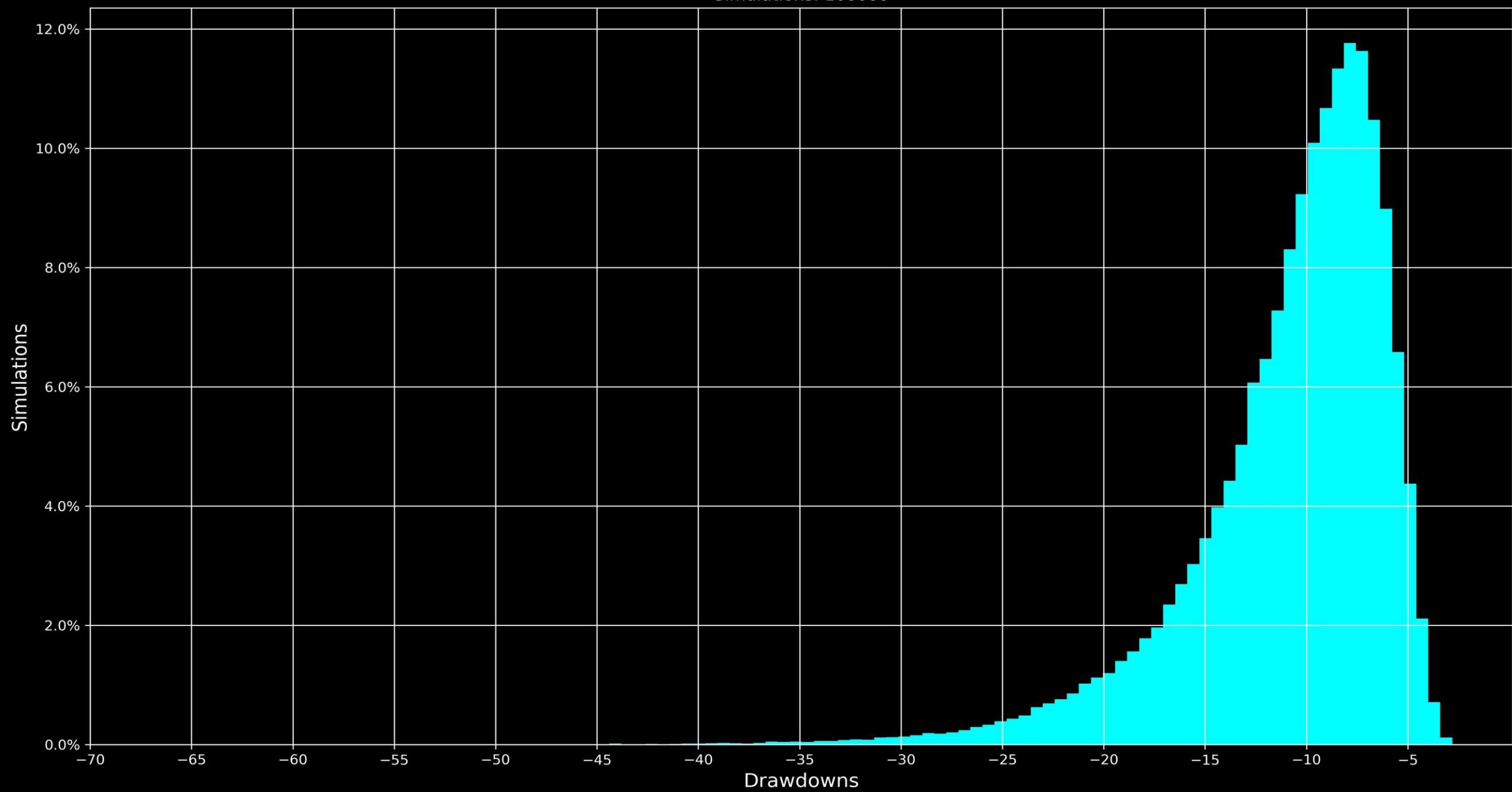
Monte Carlo Simulation (Re-shuffle) Drawdown Analysis  
Valley To Base Drawdown Scatter Plot  
Simulations: 100000



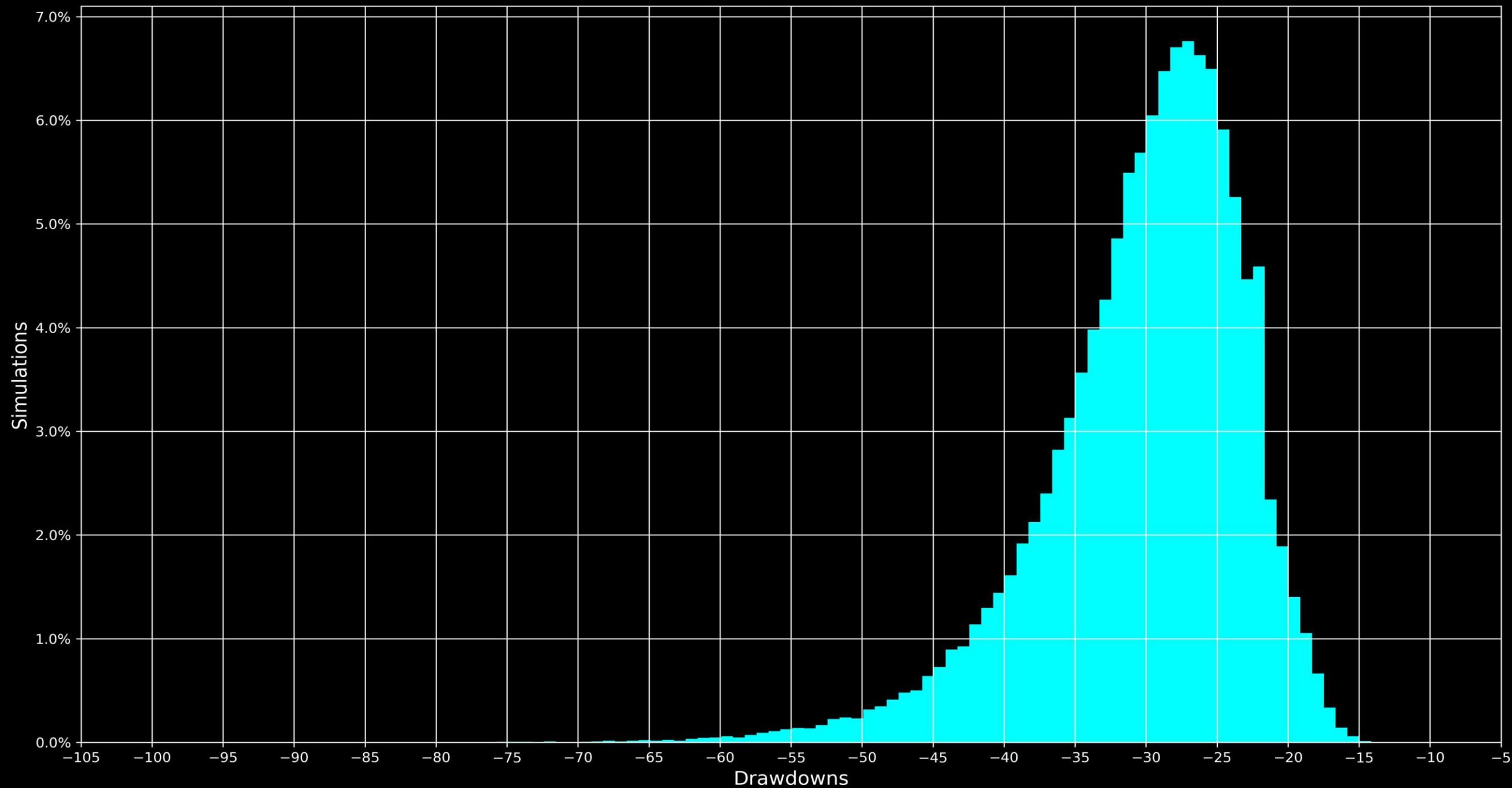
Monte Carlo Simulation (Re-sample)  
Simulations: 10000



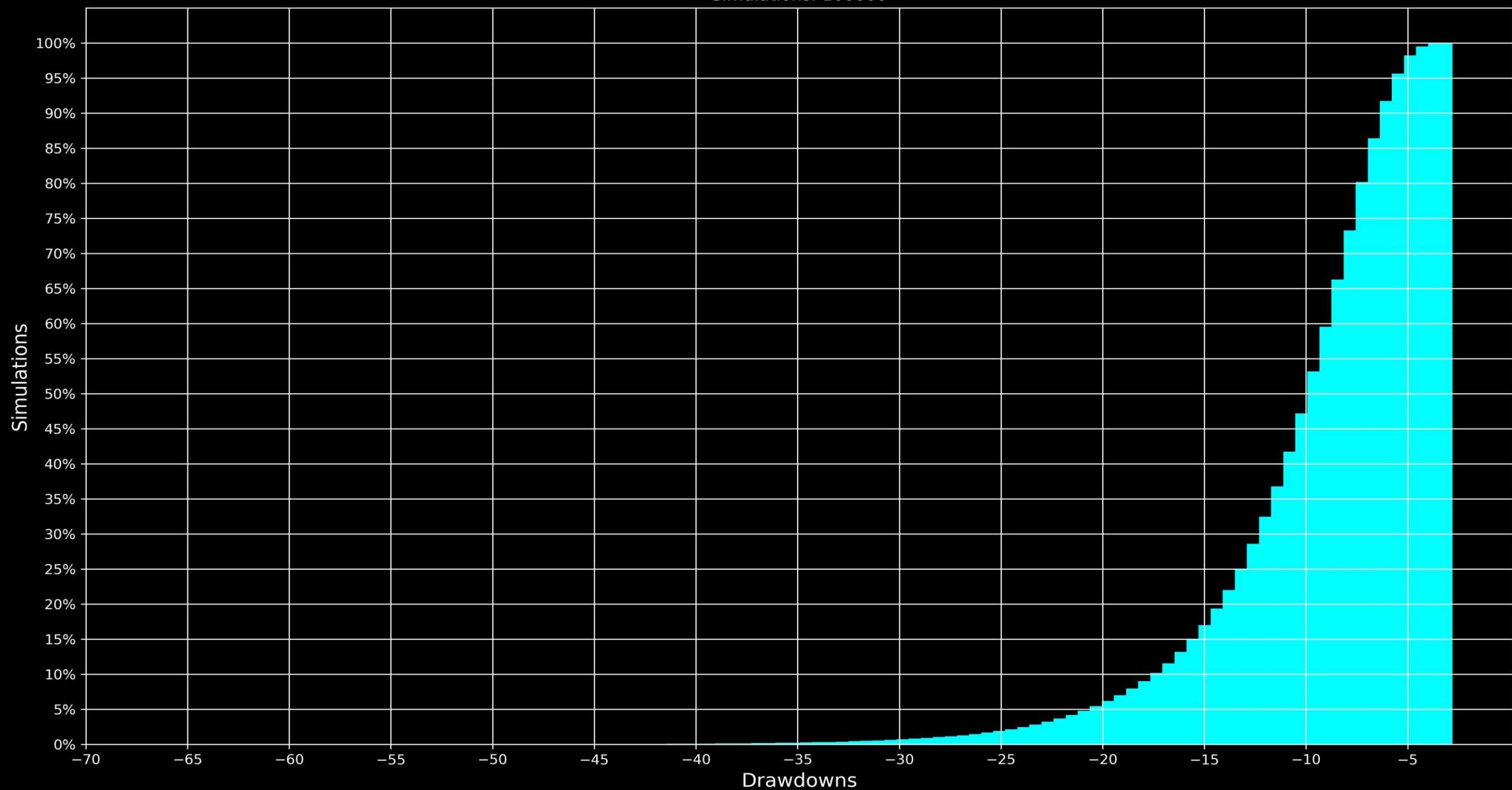
Monte Carlo Simulation (Re-sample) Drawdown Analysis  
Valley To Peak Drawdown Histogram  
Simulations: 100000



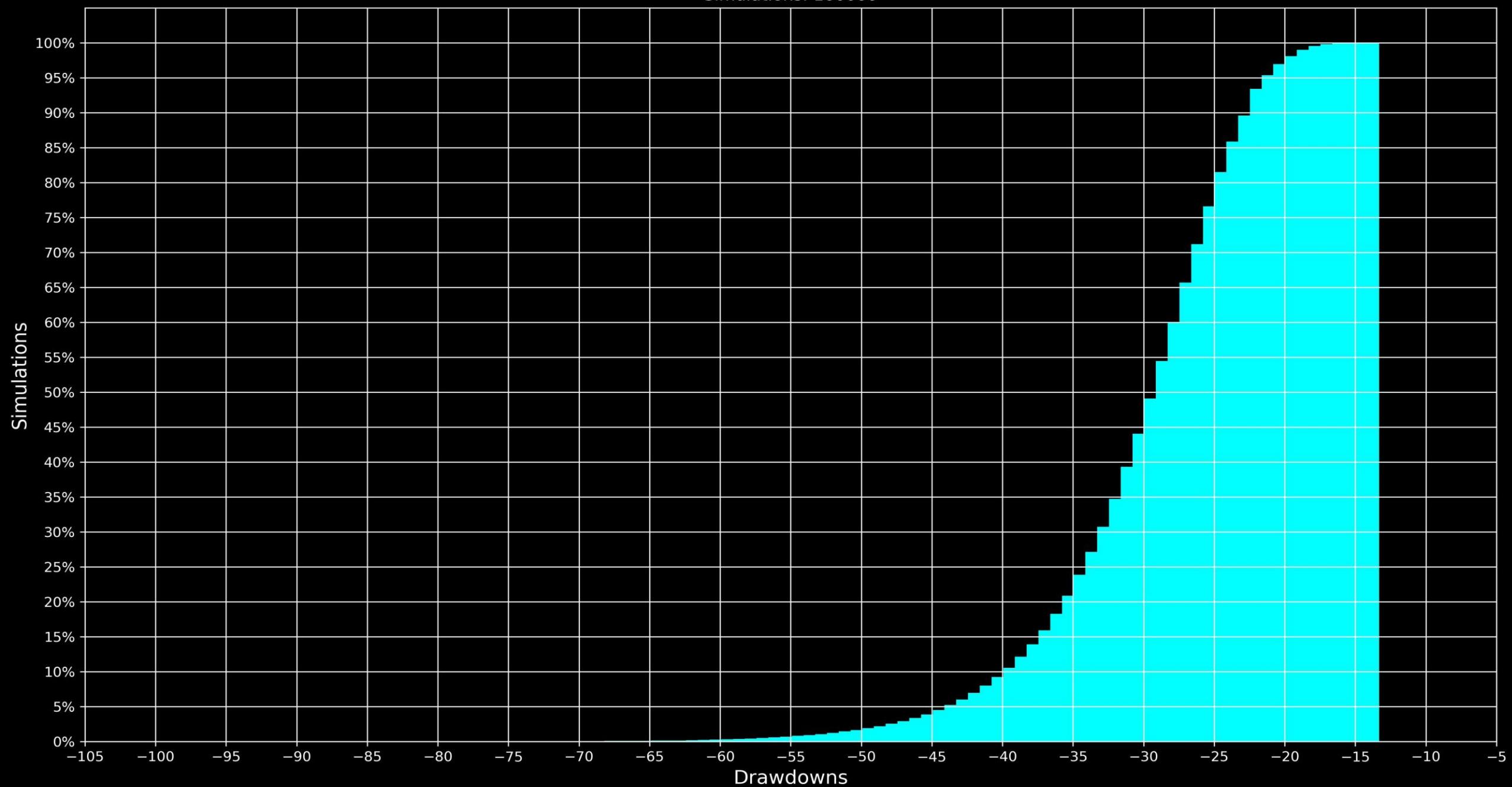
# Monte Carlo Simulation (Re-sample) Drawdown Analysis Valley To Base Drawdown Histogram Simulations: 100000



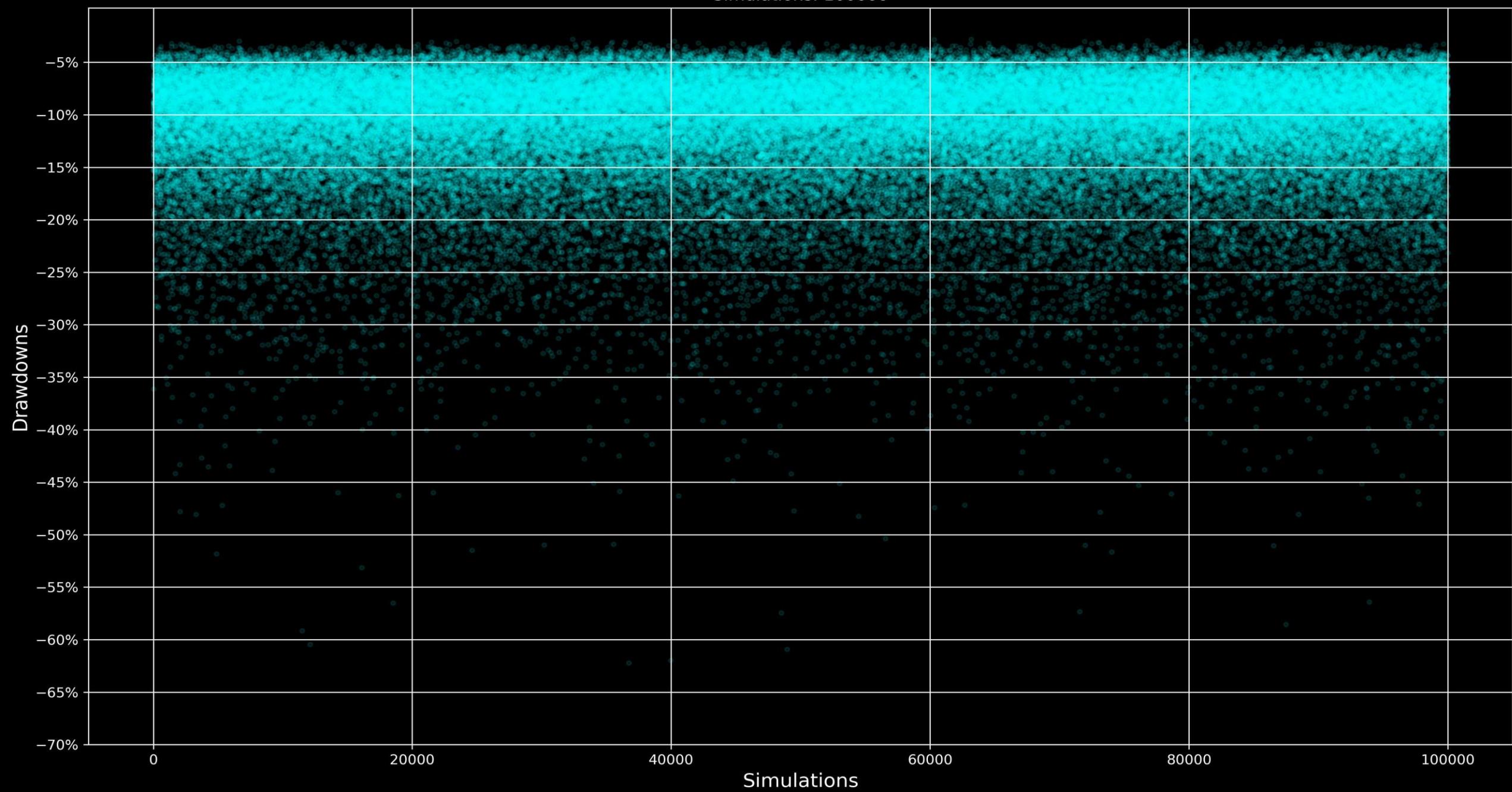
Monte Carlo Simulation (Re-sample) Drawdown Analysis  
Valley To Peak Drawdown Histogram (Cumulative)  
Simulations: 100000



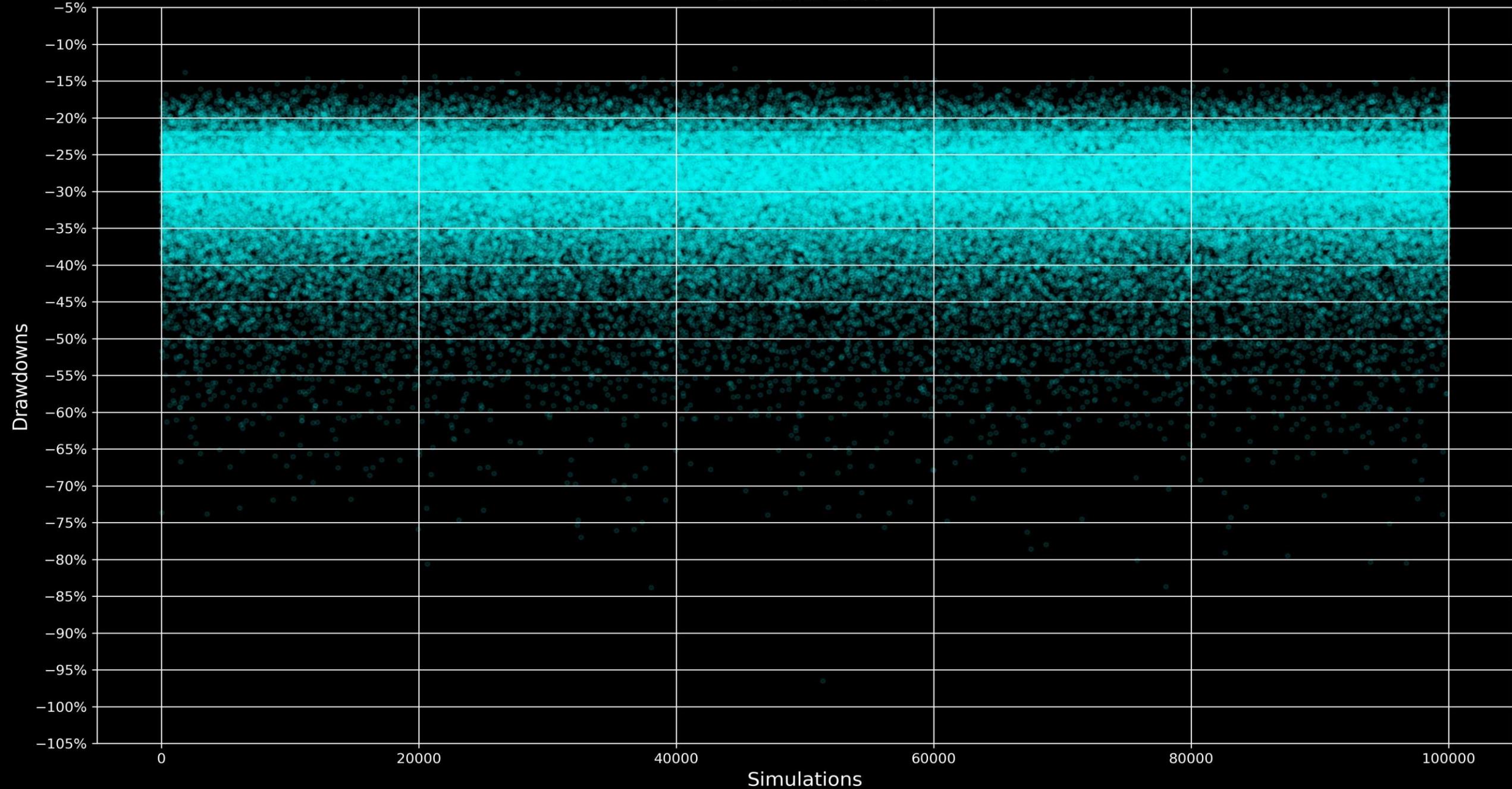
Monte Carlo Simulation (Re-sample) Drawdown Analysis  
Valley To Base Drawdown Histogram (Cumulative)  
Simulations: 100000



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