AlgoBulls Technologies

July 2025

NIFTY 50 OPTIONS STRATEGY

Digital Marketing Transformation Initiative

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Prepared for :
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Table of Contents

Summary

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This report details the design, implementation, and performance evaluation of a realistic and robust NIFTY 50 options trading strategy developed during my Practice School-I internship at AlgoBulls Technologies from May 26 to July 5, 2025. It captures the journey from initial technical exploration to the creation of a sophisticated system incorporating both buy-side and sell-side logic, dynamic volatility filters, realistic slippage, margin modeling, and risk control. The final strategy achieved a **270.08%** return on **₹10L** capital over **18 months** with a **maximum drawdown of only ₹1.24L** and a Sharpe ratio of 3.11, indicating strong risk-adjusted performance.

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Objectives

01

Develop systematic, rule-based options trading strategies for the NIFTY 50 index using quantitative signals.

02

Build a full-cycle trading simulation engine that includes signal generation, trade filtering, execution simulation, and portfolio tracking.

03

Simulate real-world trading frictions such as slippage, brokerage, and liquidity-based execution uncertainty.

04

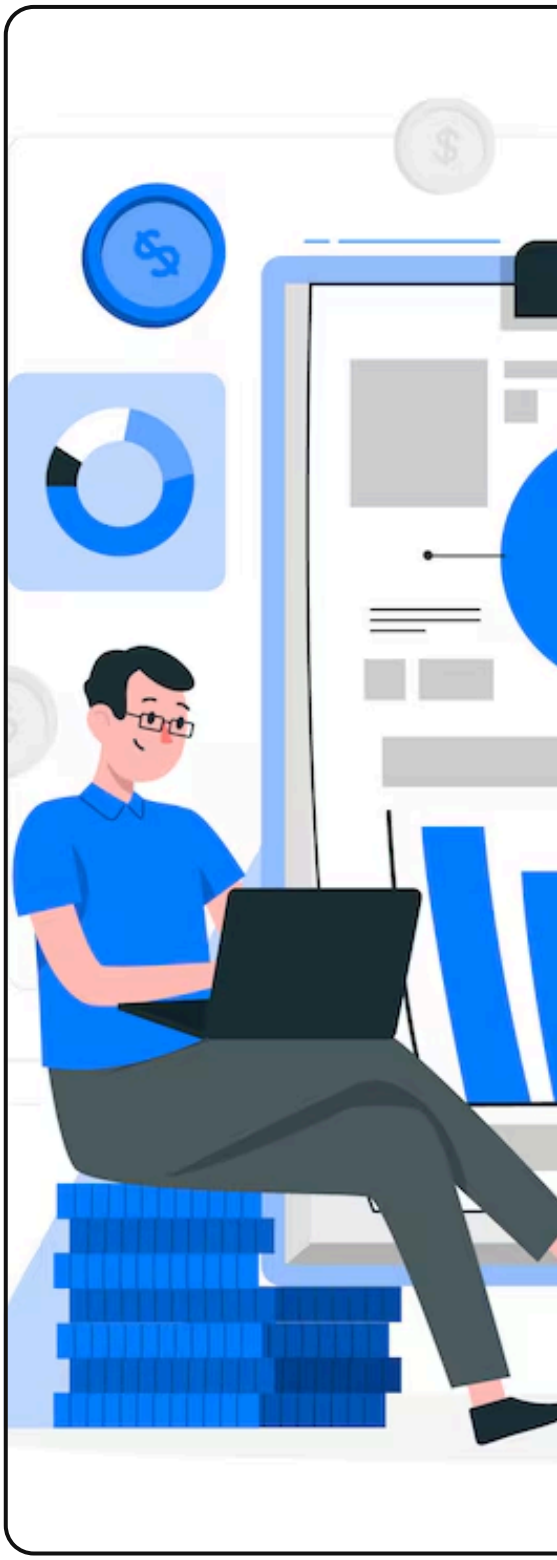
Incorporate volatility filters (India VIX) and technical indicators (SMA crossovers, RSI, MACD) into trading logic.

05

Evaluate risk-adjusted performance using financial metrics like Sharpe, Sortino, Calmar ratios and compare trade distributions over time.

06

Validate reliability of performance using techniques such as Monte Carlo simulations and dynamic volatility regime segmentation.



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Timeline

1

26 May – 2 June

Onboarding, data acquisition, and cleaning

2

3 June – 13 June

Initial SMA crossover strategy implementation

3

14 June – 20 June

Integration of VIX/IVR filters, TP/SL logic

4

21 June – 27 June

Realistic cost modeling, position sizing, bug fixes

5

28 June – 4 July

Final backtests, analytics, reporting, documentation

Scope of the Project

Inclusion

- **Asset Class:** Focused entirely on NIFTY 50 index options — both Call and Put contracts — across a broad strike range. The strategy spans across weekly expiries with ATM and OTM instruments, capturing momentum and mean-reversion opportunities.
- **Data:** Utilized minute-level OHLCV data for NIFTY 50 spot and options from **June 2023 to January 2025**. The dataset also includes synchronized India VIX data and pre-computed trading signals (**50-200 Golden Cross Over**). More than 37,000 raw CSVs were cleaned and consolidated into a high-integrity back test-ready database.
- **Strategy Types:**
  - Buy-Side: Pure options buying based on directional breakouts and SMA crossovers, filtered by volatility and liquidity.
  - Sell-Side: Credit spread strategies (bull put and bear call) using trend-confirmed entries and breakout filters to exploit time decay and volatility contraction.
- **Simulation Engine:** Designed to simulate trading with realistic frictions like slippage, brokerage, partial fills, missed trades

Exclusion

- The project does not include live deployment or integration with real broker APIs.
- Trading was constrained to Indian market hours and did not include overnight risk.

Methodology

01

Data Preparation

Cleaning, merging and validating 37,000+ NIFTY Options data and spot CSVs into 7000+ usable, timezone-synced records with over 1 Million+ data points.

02

Signal Generation

Built SMA crossover signals and added filters such as RSI, MACD, India VIX, IV Rank

03

Execution

Realistic modeling of trade execution including fill probabilities, position sizing, costs, and expiry logic.

04

Risk management

Dynamic SL/TP logic, partial exits, max loss per trade, VIX/IVR filters, and strict expiry rules

05

Analytics

Visualized portfolio curve, drawdowns, trade histograms, and PnL heatmaps

06

Robustness

Monte Carlo simulation with 1,000 resamplings of trade PnL sequences to assess consistency

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Risk Assesment

Market Risk Control

Implemented hard stop-losses, trailing stops, and filtered trades using VIX below MA20 to reduce volatility exposure.

Execution Risk Mitigation

Incorporated realistic slippage, partial fills, bid-ask spread impacts, and liquidity constraints into the model.

Data Risk Resolution

Addressed data integrity by cleaning corrupted files, correcting timezone discrepancies, and handling missing data.

Overfitting Prevention

Used simplified rule sets, conservative thresholds, and Monte Carlo validation to ensure model robustness.

Operational Risk Management

Strategy tested in a controlled sandbox Python environment to avoid real-world operational issues.

Calculations

Metric	Formula
Total Return	(Final Portfolio – Initial Capital) / Initial Capital × 100
Sharpe Ratio	(Mean Return – Risk-Free Rate) / Std. Dev. × √252
Sortino Ratio	(Mean Return – Risk-Free Rate) / Downside Deviation × √252
Max Drawdown	Largest peak-to-trough drop in portfolio value
Calmar Ratio	CAGR / Max Drawdown
Spread Margin	(Strike Difference × Lot Size × Lots) – Net Credit
Margin Required	Max Loss × Broker Margin % (typically 40–60%)

Margin Calculation:

Maximum Loss Formula:
Max Loss = (Difference between strike prices) × (Lot Size) × (Number of Lots) − (Net Credit Received)

Margin Requirement:
Indian brokers typically require 40% to 60% of the maximum loss amount to be blocked as margin upfront. This amount is released when the position closes or expires.

Example Calculation (From Trade Log):

Short 19250 CE @ ₹192.9, Long 19350 CE @ ₹137.5, 53 lots

- Strike Difference = 100 points
- Lot Size = 50 (Standard for Nifty)
- Number of Lots = 53
- Net Credit = 2686.9

Calculated Max Loss = (100 × 50 × 53) − 2686.9 = 265,000 − 2686.9 = 262,313.1
Assuming 50% margin, Margin Required = 0.5 × 262,313.1 = 131,156.55

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Combined Strategy Performance

₹37L

Final Portfolio

From ₹10L initial capital

270%

Total Return

Strong growth over 19 months

₹1.24L

Max Drawdown

Controlled risk exposure

3.11

Sharpe Ratio

Excellent risk-adjusted return

6.62

Sortino Ratio

High reward relative to downside risk

10.01

Calmar Ratio

Balance of return vs drawdown

976

Total Trades

673 wins, 303 losses

₹2,767

Avg P&L

Consistent profit per trade

₹1.46L

Best Trade

Top single trade profit

₹-18K

Worst Trade

Strict loss control applied

Appendix

Code:

Configuration Parameters:

The strategy initializes with a **capital base of ₹10,00,000** and a **fixed lot size of 50** contracts, aligning trade sizing with defined risk levels.

Key technical parameters include a **10-period Average True Range (ATR)** and a **multiplier of 2.5 for trailing stops** and stop-loss calculations.

Brokerage fees are modeled as a fixed **₹20 per order**, and a **slippage of 0.1%** accounts for realistic execution costs.

Market and volatility regimes are gauged through VIX thresholds:

This strategy features an **adaptive VIX filter** that adjusts trade signals based on current volatility. It calculates the **rolling 10th and 90th percentile VIX levels** over the **past 252 trading days**, confirming trades only when the current VIX falls within this range, indicating normal volatility.

This filtering excludes extremely low or high volatility conditions, which are often linked to unreliable signals and increased risk.

Risk tolerance categories define maximum per-trade loss limits, ranging from **5% (high risk tolerance)** to **15% (low risk tolerance) of capital.**

Time constraints ensure **trades close before market close** at 15:25.

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Partial position booking is enabled at 20% of the booked size to manage realized profits flexibly.

These configuration settings underpin dynamic trade sizing, adaptive stop-loss placement, and tactical take-profit targets responsive to prevailing market conditions.

Appendix

Code:

Buy-Side :

- The buy-side utilizes 15-minute ATR trailing signals, ensuring trades are executed only with active signals and available data for consistency.
- Volatility filters, including an **adaptive VIX filter** and IVR threshold, prevent entries in volatile markets, refining timing to avoid destabilizing price spikes.
- Option strikes selected are **ATM nearest to spot** with the closest expiry, adhering to a strict liquidity filter that prioritizes high volume and open interest to minimize slippage.
- **Position sizing** is **risk-adjusted** based on cash availability, limiting exposure to one open position per contract.
- Dynamic take-profit (TP) targets adjust to VIX levels, with **partial profit-taking at 15%** gains and final targets ranging from 20% to 40%.
- A trailing stop based on ATR protects profits, while hard stop-loss thresholds cap losses between **₹15,000** and **₹18,000**.
- All positions are exited at end-of-day (15:25) to mitigate overnight risk, with a focus on realistic execution incorporating slippage and costs in performance simulations.

Appendix

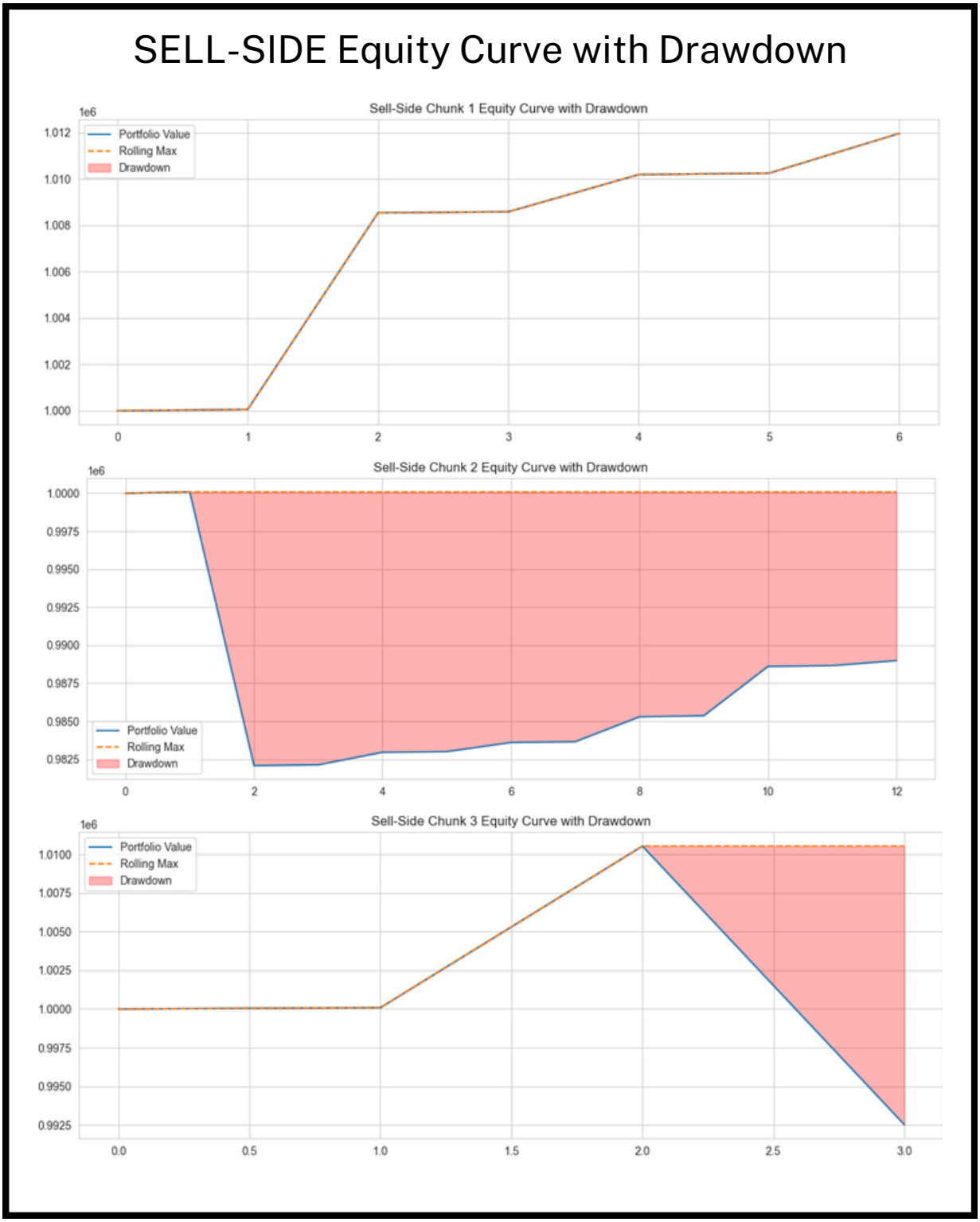
Code:

Sell-Side :

- The sell-side implements an options spread strategy using **bull put spreads for bullish views** and **bear call spreads for bearish outlooks**.
- Entry signals are based on 15-minute bars with a forward-fill approach.
- Trades are filtered through adaptive VIX analysis for volatility confirmation and a trend filter using the **SMA50**, reducing false entries and honing in on high-conviction setups.
- Spread construction features short ATM strikes with long out-of-the-money legs ±100 points away, ensuring liquidity to mitigate execution risks.
- Position sizing adjusts based on VIX and margin requirements, limiting to one active spread at a time to protect capital.
- Exits target both partial and full profit-taking relative to initial credits, with specific percentages for each.
- Strict risk controls, including hard stop-losses and no naked short selling, are enforced.
- Real-time mark-to-market monitoring and attention to execution fidelity help convert theoretical gains into practical outcomes.

Appendix

Visualisations:



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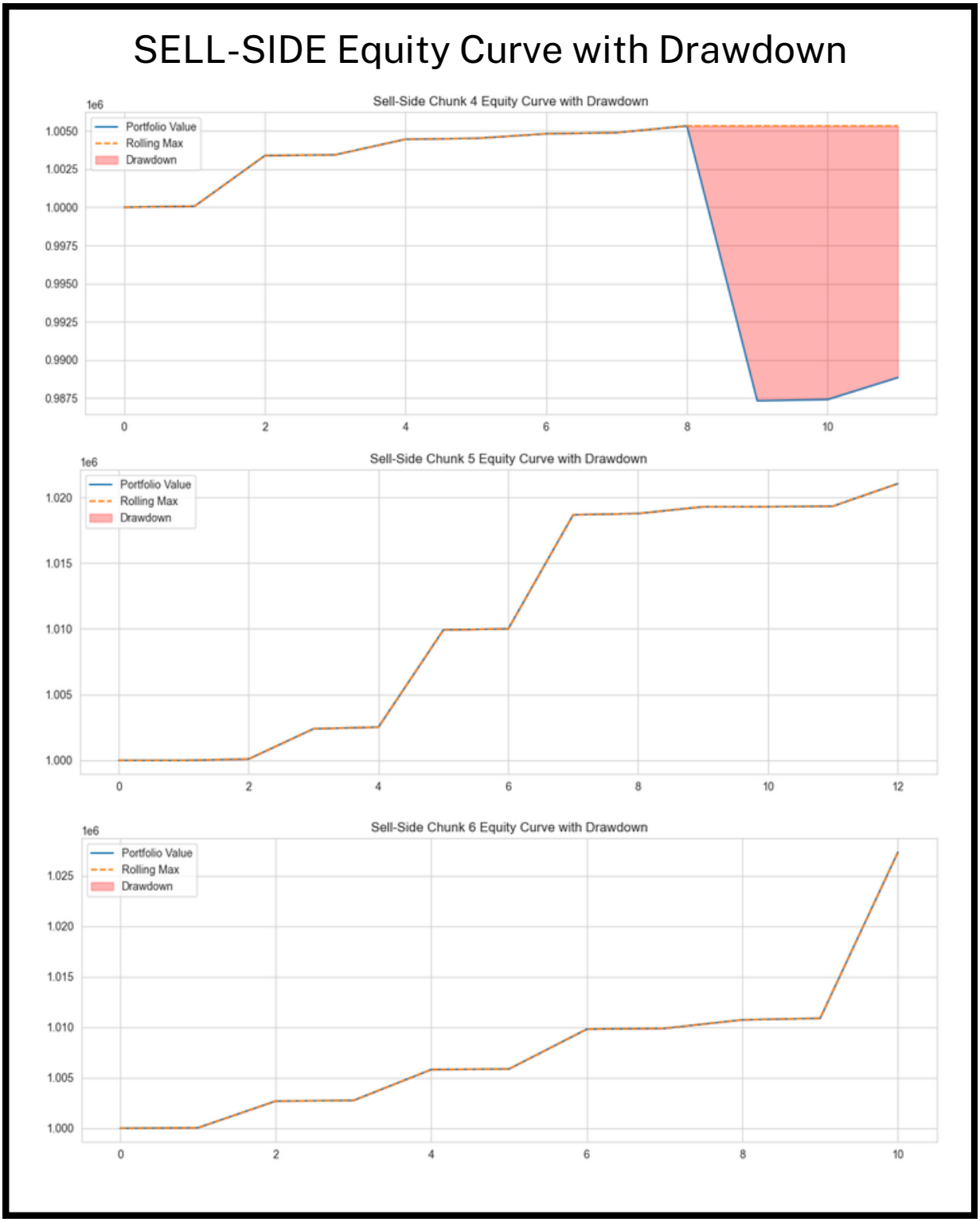

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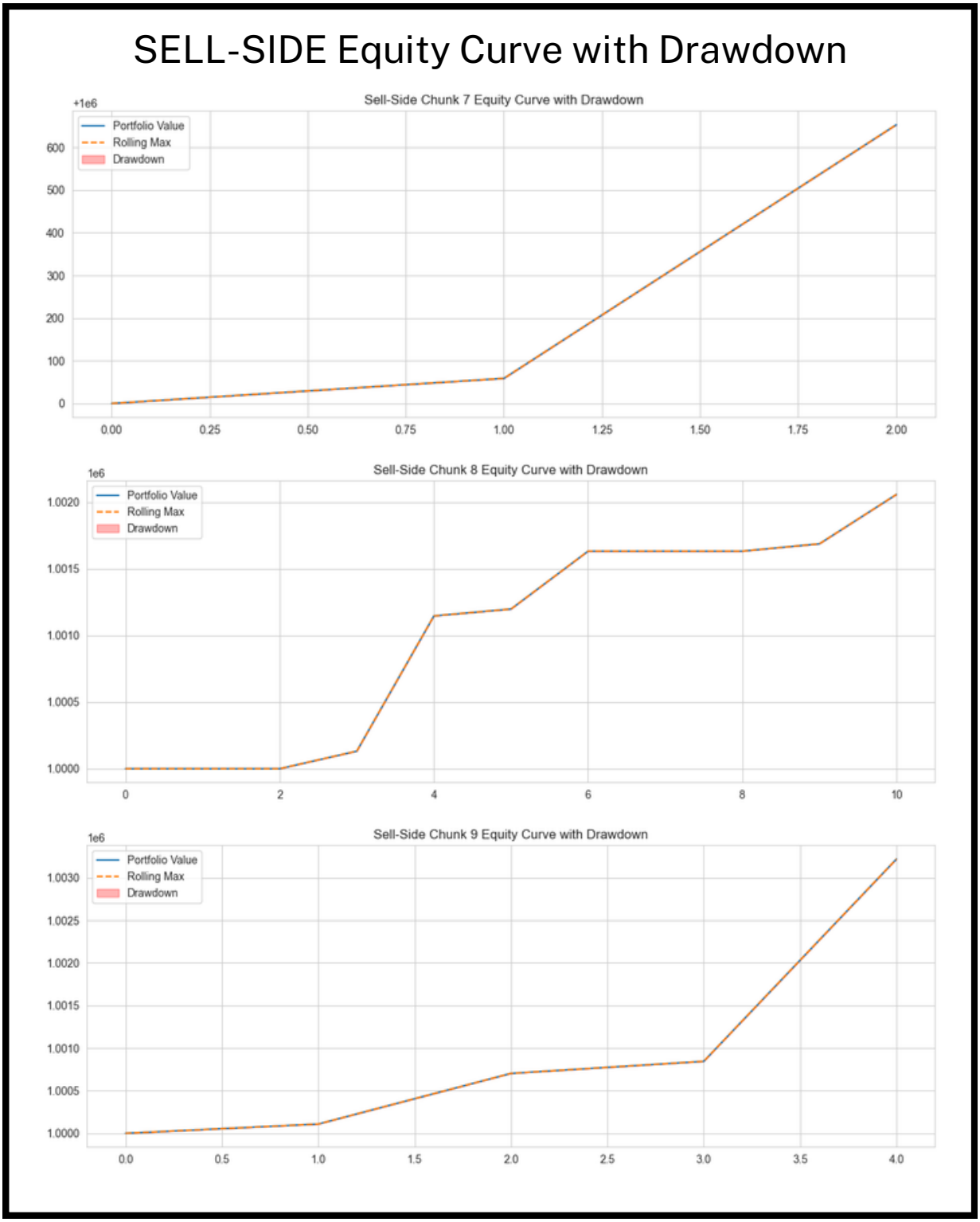

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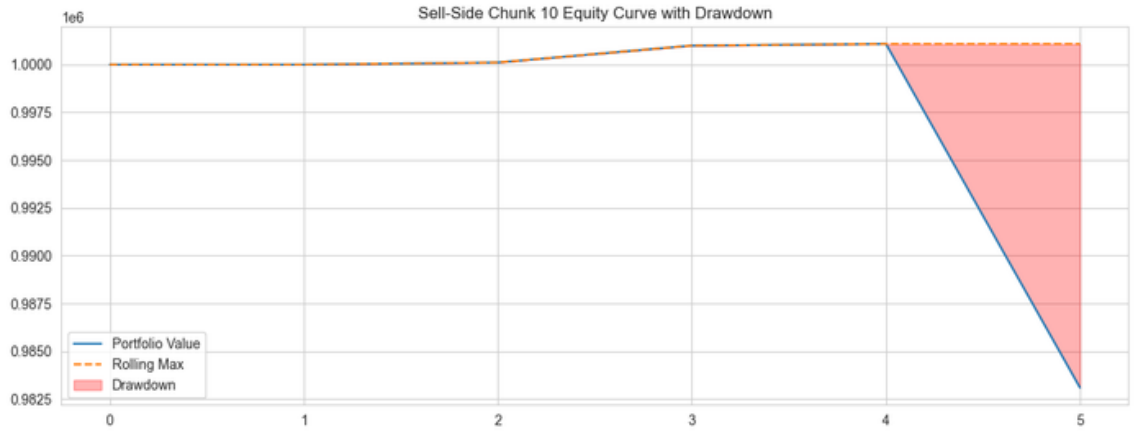
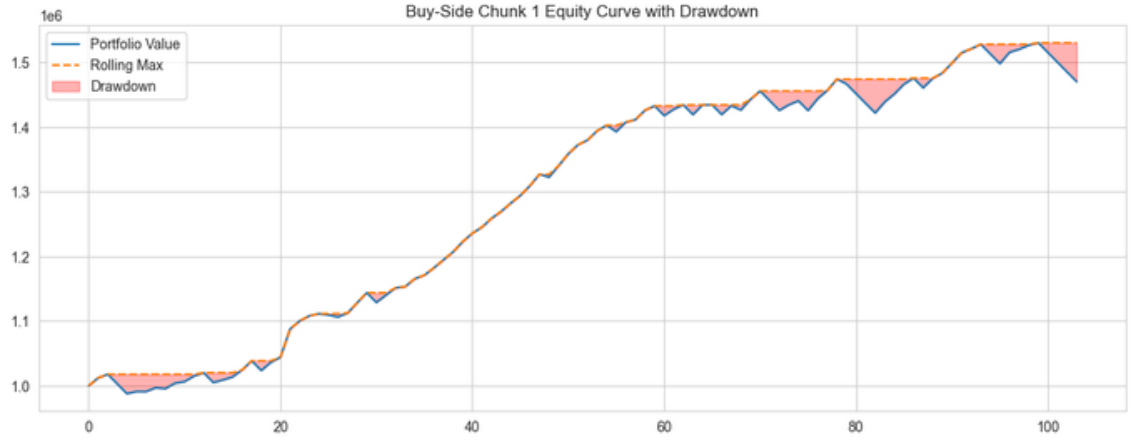
Visualisations:

SELL-SIDE Equity Curve with Drawdown



BUY-SIDE Equity Curve with Drawdown



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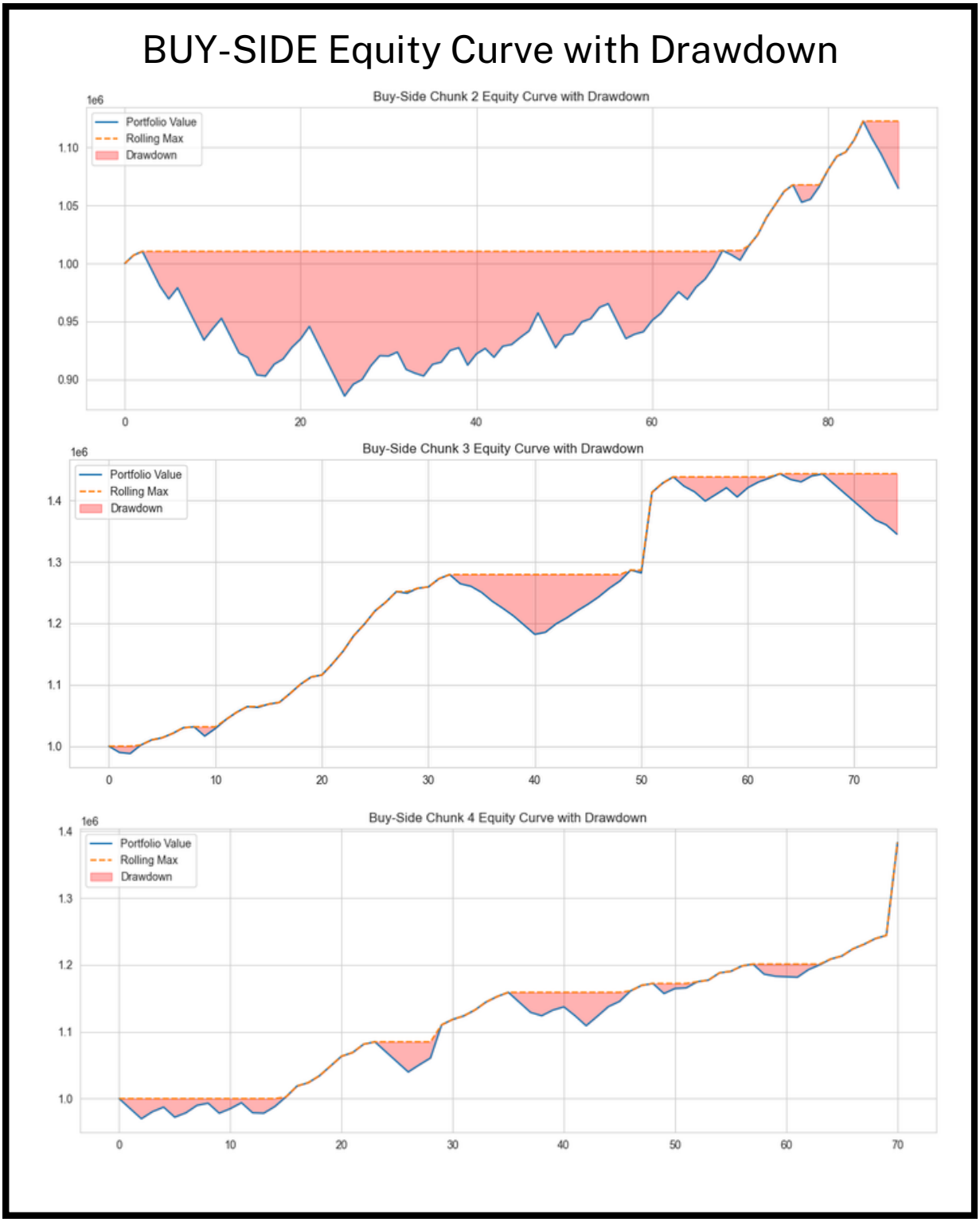

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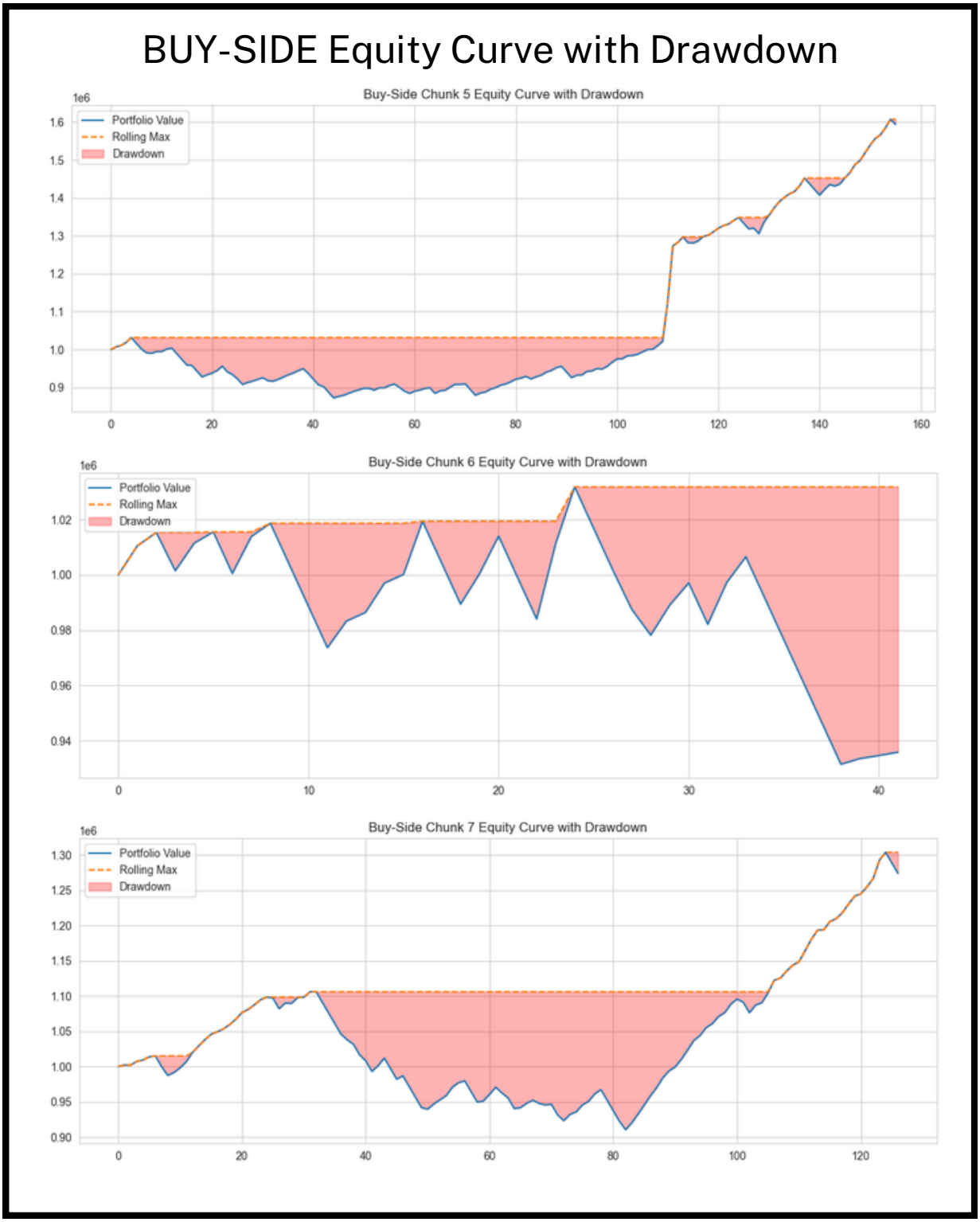

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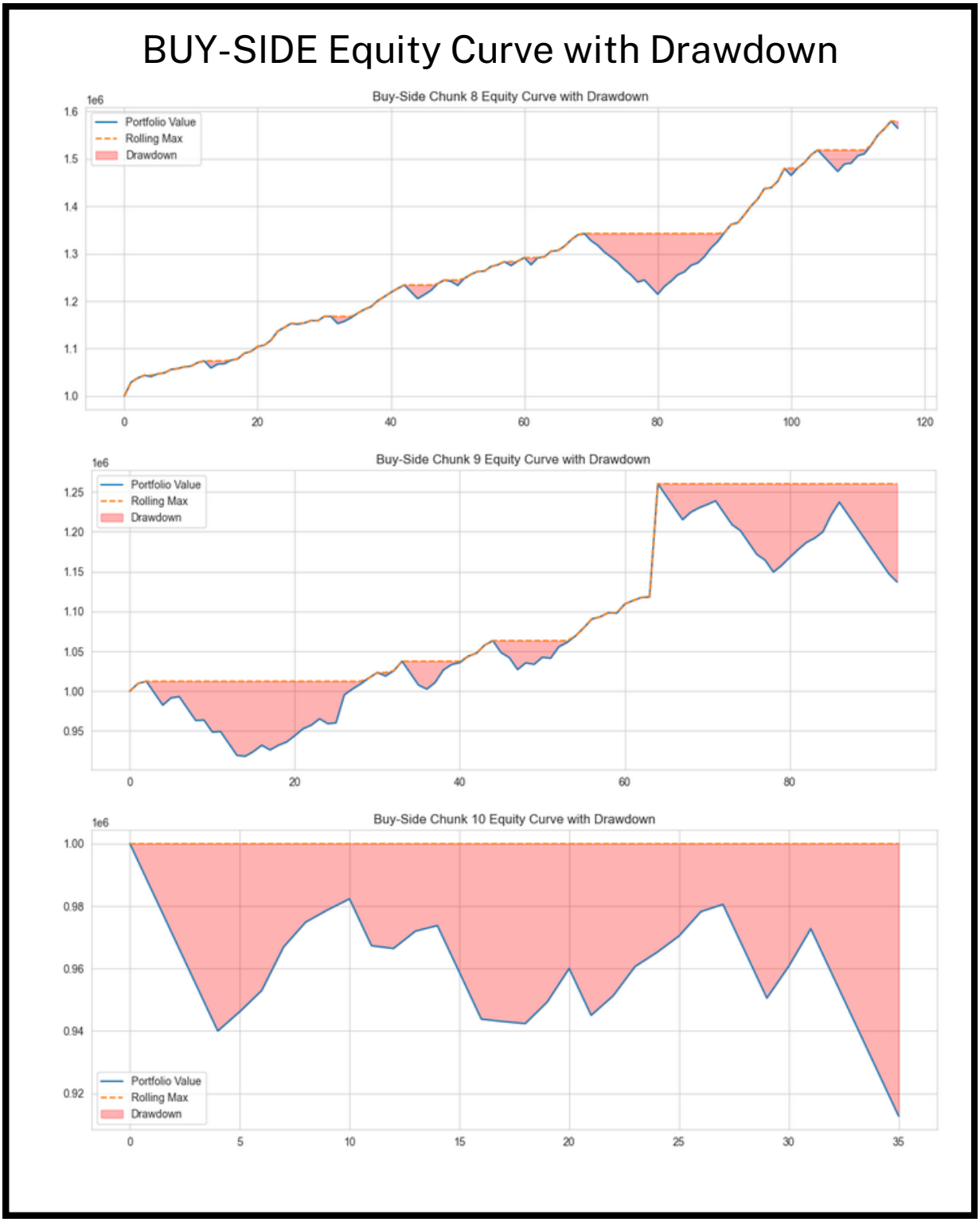
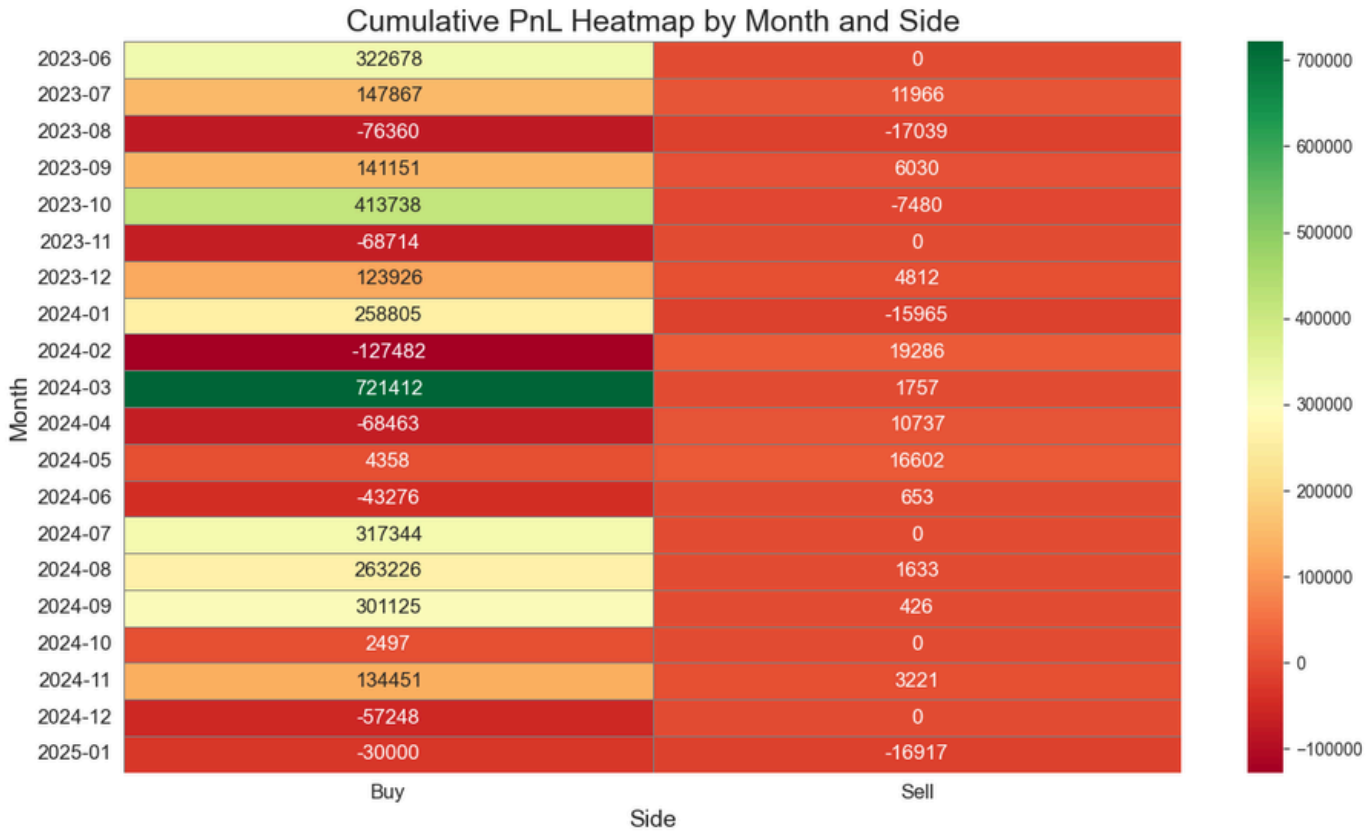


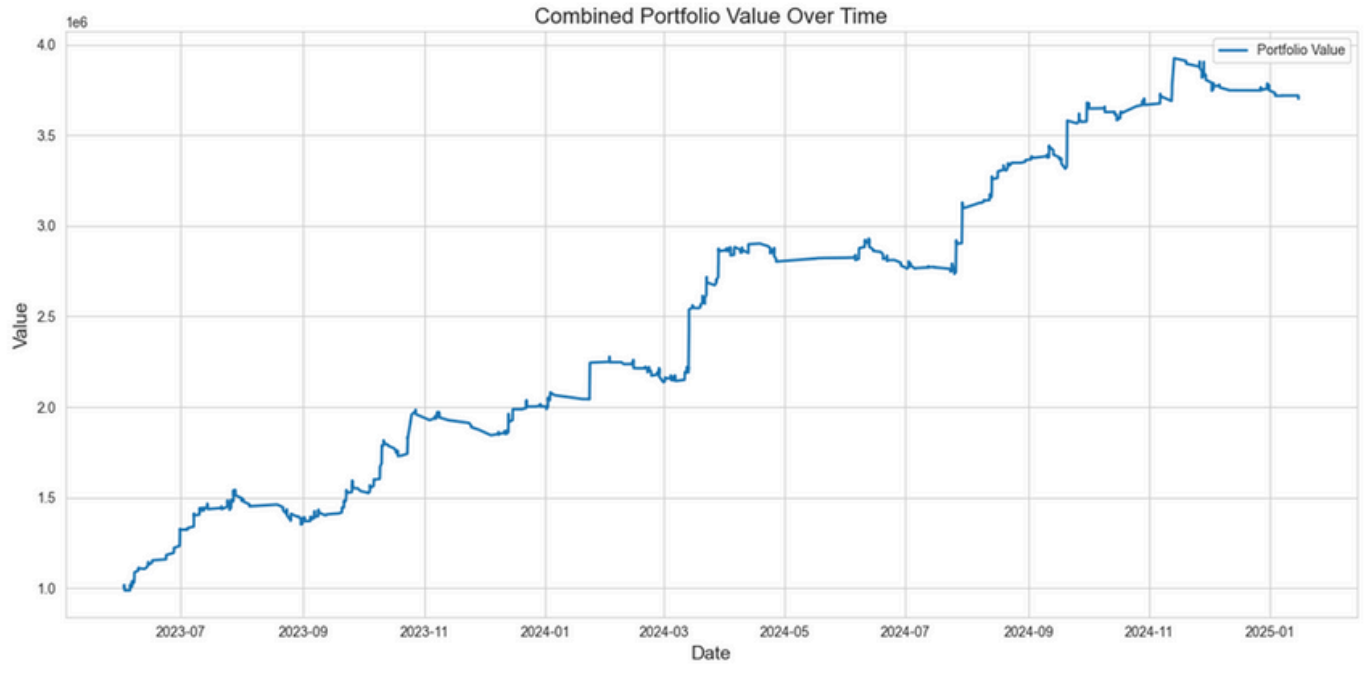
Appendix

Visualisations:

Monthly Heat-Map



Combined Portfolio



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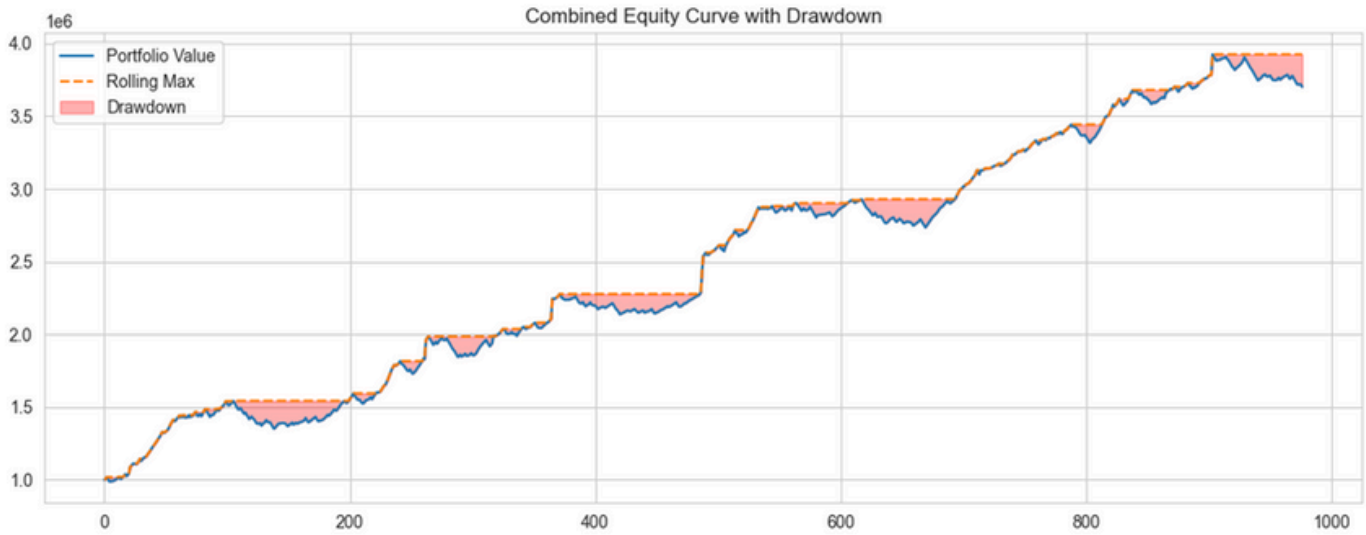
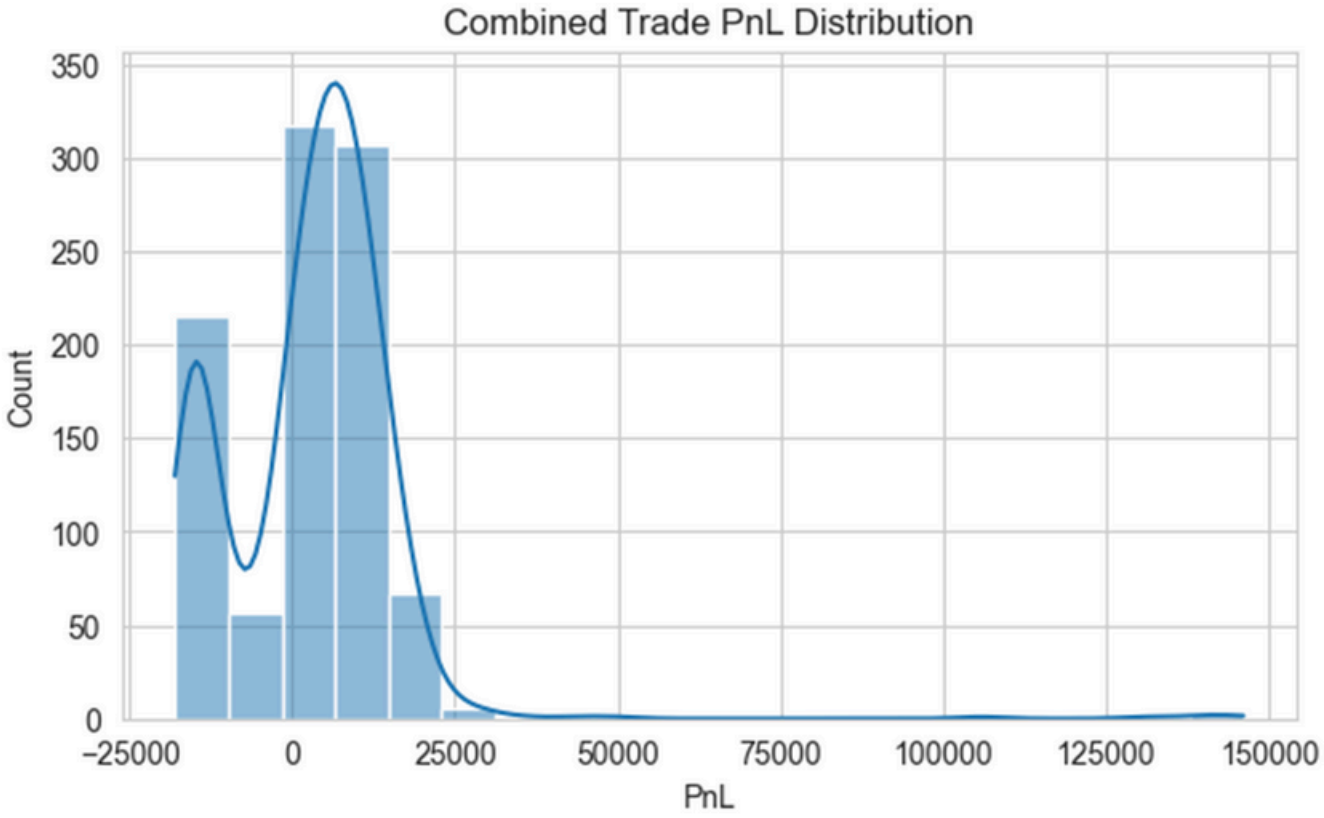
Equity Curve with Drawdown



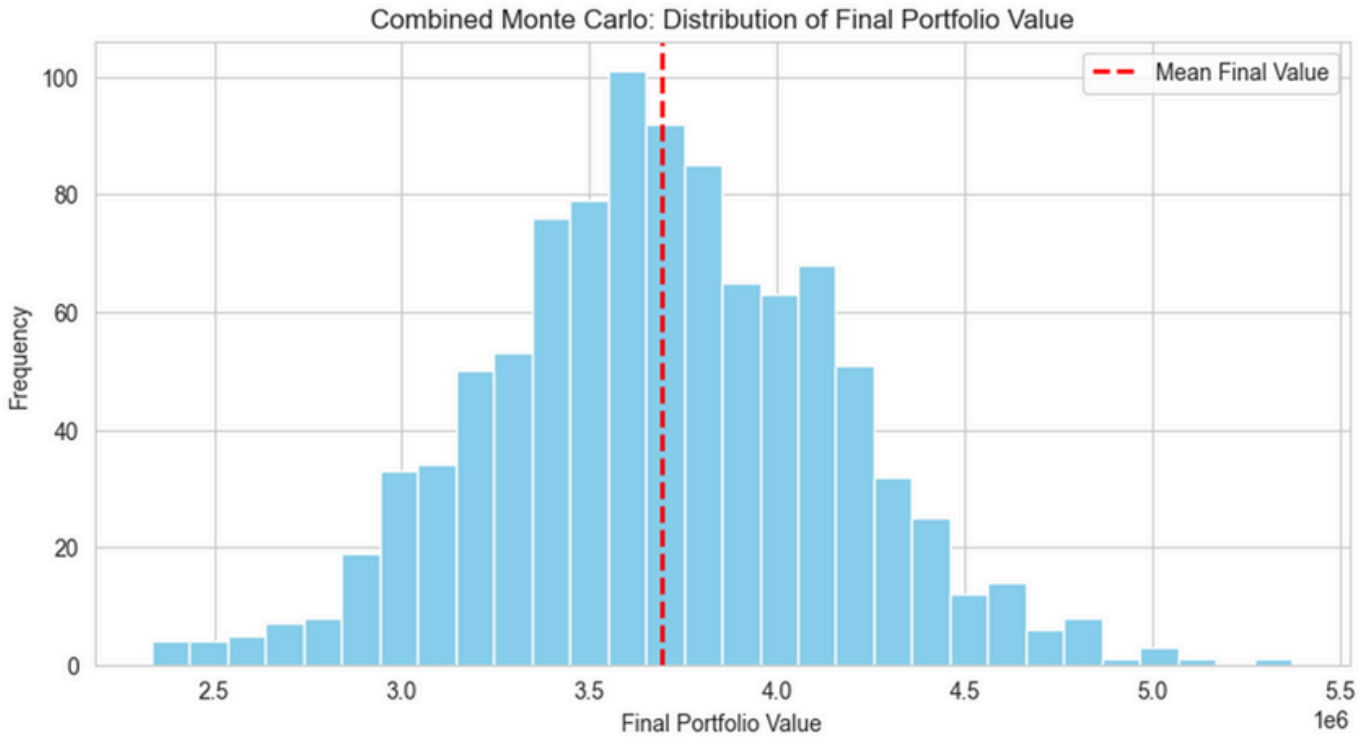
Combined Trade PnL Distribution



Appendix

Visualisations:

Monte-Carlo Distribution of Final Portfolio



Monte Carlo: Mean Final Value = 3,692,928.50,

5th Percentile = 2,948,773.02,

95th Percentile = 4,443,706.79

Github Repository

NIFTY50_Options-GoldenCross_ExtensiveBacktest

Drive Link

- AlgoBulls Chinmay Mandave Master Drive
- Trade Logs Backtest