

Technical Report – Mean Reversion Trading Strategies on Nifty 50

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1. Introduction

In this project, I've explored two trading strategies based on **mean reversion**, applied to the Nifty 50 index over the past four years (2020–2023). The idea was to build simple but logical trading systems that can spot when the price is likely to bounce back after a temporary dip or rise.

2. Data and Preprocessing

- **Index Used:** Nifty 50 ($\hat{\text{NSEI}}$)
- **Source:** Yahoo Finance using the `yfinance` Python library
- **Period:** January 1, 2020 – December 31, 2023
- **Frequency:** Daily (business days only)
- **Data Cleanup:** I used linear interpolation to fill any missing dates and made sure the data was smooth and continuous for backtesting.

3. Strategy 1 – Bollinger Bands Reversion

How It Works

This strategy uses 10-day Bollinger Bands:

- Buy when the price drops below the lower band (oversold).
- Sell when the price goes above the upper band (overbought).
- Only one position at a time, and it's closed before opening a new one.

Why This Strategy

Bollinger Bands are great for capturing volatility. When the price drops below the lower band, it often means it's stretched too far — a bounce back toward the mean is likely.

4. Strategy 2 – SMA Crossover + Bollinger Band Exit

How It Works

This combines momentum and mean reversion:

- Entry: Buy when the 5-day SMA crosses above the 20-day SMA (bullish momentum).
- Exit: Sell when the price hits the upper Bollinger Band (taking profit on strength).

Why This Combo

Crossover gives a reliable signal that a new trend might be starting. But instead of holding too long, I exit when the price stretches too far — using the Bollinger Band as a volatility-based exit.

5. Performance Summary

Metric	Bollinger Bands	SMA + BB Exit
Cumulative Return (%)	1.37	3.94
Annualized Return (%)	0.23	0.67
Sharpe Ratio	0.17	0.41
Sortino Ratio	0.22	0.55
Max Drawdown (%)	-4.57	-4.62
Win Rate (%)	72.73	50.00
Profit Factor	1.45	2.43
Avg Profit ()	608.15	4114.48
Avg Loss ()	-1051.52	-2087.52
Max Profit ()	1210.00	6468.40
Max Loss ()	-2142.75	-3005.60
Total Trades	11	4

Table 1: Strategy Performance Comparison

6. Key Observations

- The SMA + BB Exit strategy was more profitable, with fewer trades but higher average profits and a stronger profit factor.

- Both strategies kept drawdowns below 5%, which means risk was tightly controlled.
- The Bollinger strategy had a higher win rate, but the gains per trade were smaller.
- When comparing with Buy & Hold (Nifty returned approximately 97%), these strategies lag in overall return but shine in capital preservation and risk-adjusted performance.

7. Visual Insights

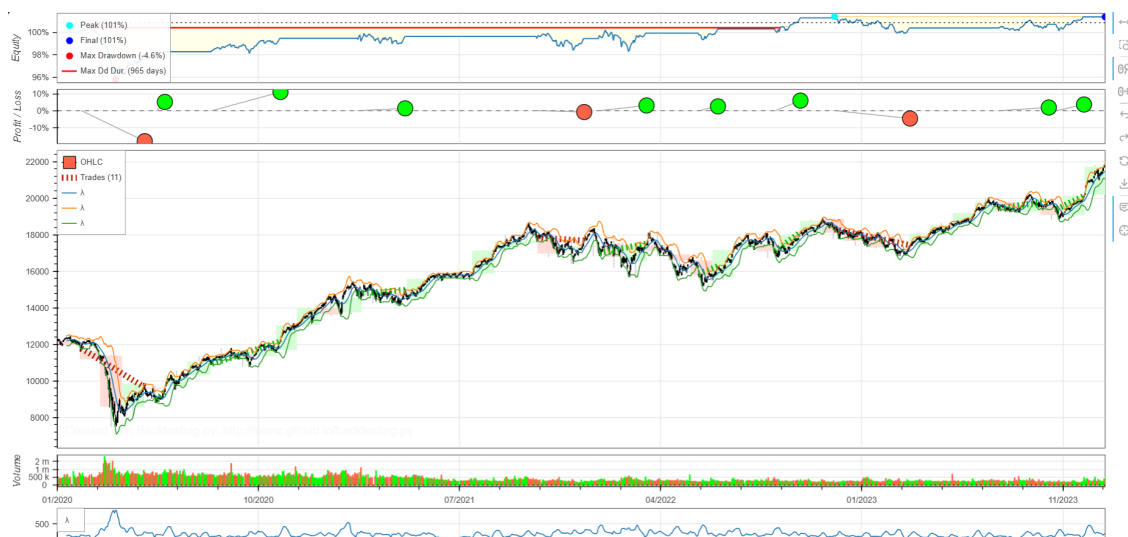


Figure 1: Bollinger Band Strategy Performance: Equity Curve, Trade Signals, and Price Chart on Nifty 50 (2020–2023)

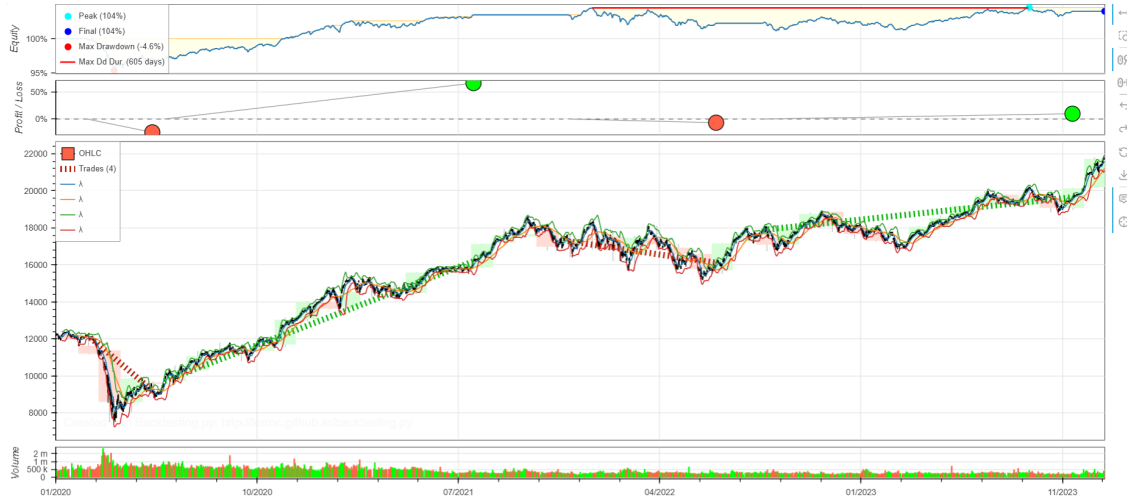


Figure 2: SMA Crossover with Bollinger Band Exit Strategy on Nifty 50: Equity curve, trade signals, and price chart with SMA and Bollinger Bands (2020–2023)

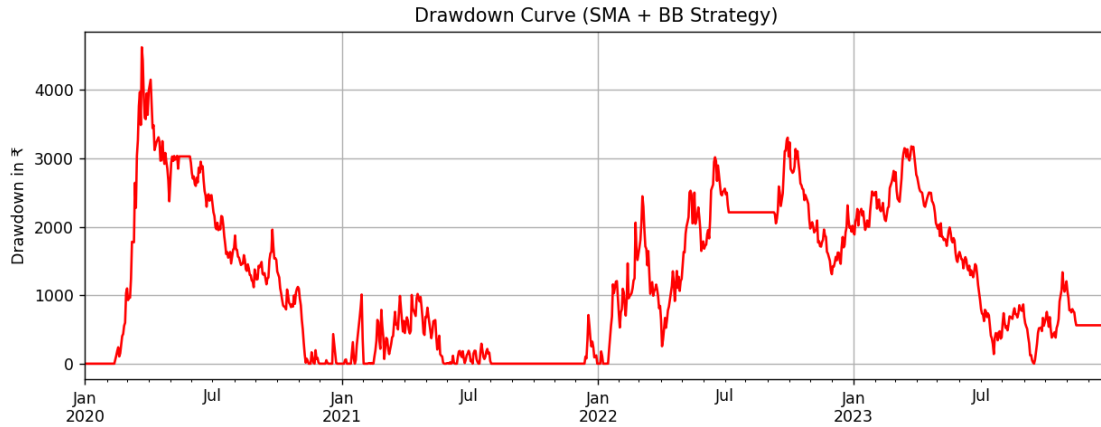


Figure 3: Drawdown Curve for SMA + BB Strategy

These visuals clearly show how each strategy behaved over different market phases — avoiding big losses during volatile times and reacting reasonably during sideways and bullish phases.

8. Tools and Resources Used

- `Backtesting.py` – for strategy simulation
- `yfinance`, `pandas`, `matplotlib` – for data handling and plotting

- Ideas and inspiration from Investopedia and several trading blogs around SMA, BB, and reversion techniques

9. Final Thoughts

While the absolute returns were modest, these strategies did well in managing risk. The SMA + BB strategy stood out for its balanced approach — catching upward momentum but locking in profits when prices spiked.

For future improvements, I'd consider testing the strategies on individual Indian stocks, tuning parameters, or layering in filters like RSI or ATR to make entries and exits smarter.