

Volatility-Based Stock Selection and Backtesting Using EGARCH Models on Nifty 50

Abstract

This report presents a volatility-driven trading strategy applied to the Nifty 50 stocks using EGARCH(1,1) models for volatility forecasting. The strategy uses a custom risk-return scoring function to select the top two stocks and backtests a trading signal using a simple band-based strategy. Results are benchmarked against an equal-weighted Nifty 50 portfolio.

1 Methodology

1. Data Collection

We downloaded daily closing prices for all 50 Nifty stocks using `yfinance`, from March 1, 2022, to May 31, 2024.

2. Volatility Forecasting

Using a 90-day rolling window and the `arch` package, we fit EGARCH(1,1) models to each stock's log returns and forecast 1-day-ahead volatility. The average of these forecasts was recorded for each stock.

3. Expected Returns

Daily log returns were computed and averaged for each stock over the same period.

4. Stock Scoring and Selection

A custom score was computed as:

$$\text{Score}_i = (1 - r) \cdot \mathbb{E}[r_i] - r \cdot \sigma_i$$

where $r = 0.5$, $\mathbb{E}[r_i]$ is the expected return and σ_i is average forecasted volatility. The top 2 scoring stocks were selected.

5. Backtesting (June 1, 2024 – June 1, 2025)

The selected stocks, TCS and Sun Pharma, were backtested using a custom band-based signal derived from the 14-day EMA:

$$\text{Buy Band} = \text{EMA}_{14} + (\text{High} - \text{Low})$$

$$\text{Sell Band} = \text{EMA}_{14} - (\text{High} - \text{Low})$$

2 Results

Selected Stocks

- Stock 1: **TCS**
- Stock 2: **Sun Pharma**

Backtest Metrics

TCS

- Benchmark Return: 16.52%
- Gross Profit: 7.40%
- Total Trades: 7 (3 winning, 4 losing)
- Max Holding Time: 95 days
- Average Holding Time: 25.43 days
- Max Drawdown: 7.53%
- Sharpe Ratio: 2.25

Sun Pharma

- Benchmark Return: -5.80%
- Gross Profit: 21.94%
- Total Trades: 7 (4 winning, 3 losing)
- Max Holding Time: 72 days
- Average Holding Time: 30.86 days
- Max Drawdown: 6.62%
- Sharpe Ratio: 6.28

Portfolio Performance

- Initial Capital: Rs. 100,000
- Final Capital (User Strategy): Rs. 114,672.15
- Return from User Portfolio: **14.67%**
- Nifty 50 Benchmark Return: **5.91%**
- User Score (relative to benchmark): **248.39%**

3 Conclusion

Using volatility forecasting via EGARCH and a simple but effective risk-return score, we selected high-performing stocks and executed a band-based strategy. The resulting portfolio significantly outperformed the Nifty 50 benchmark, both in terms of return and Sharpe ratio, demonstrating the potential of volatility-aware trading.