

# 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  $\sigma_i$  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.