

Systematic Equity Strategy for the Nifty 50: Design, Backtest, and Risk Evaluation

Executive Summary

This report outlines the development, backtesting, and risk assessment of a straightforward systematic equity strategy for the Nifty 50 index. We selected a **Trend Following** approach—specifically, a Dual Moving Average Crossover (50-day and 200-day Simple Moving Averages)—to capture medium-to-long-term market movements.

Over the backtesting period (January 2015 to December 2025), the strategy delivered a cumulative return of **61.52%** but suffered a maximum drawdown of **-43.22%**. This performance significantly lagged the Buy-and-Hold benchmark, which returned **212.97%** with a maximum drawdown of **-37.77%**. The underperformance highlights the challenge of simple trend-following models in a persistently bullish market. The risk analysis, comparing Historical Simulation and Variance-Covariance VaR, confirms the presence of “fat tails” in the Nifty 50’s return distribution, a crucial finding for future risk modeling.

Part A - Strategy Design

Strategy Logic and Classification

The core of our systematic approach is the **Dual Moving Average Crossover** strategy. This is a classic indicator-based model designed to filter out market noise and participate only in established trends.

Mechanics:

Fast MA: 50-day Simple Moving Average (SMA)

Slow MA: 200-day Simple Moving Average (SMA)

Trading Rules:

1. **Go Long:** When the 50-day SMA crosses **above** the 200-day SMA, we initiate a 100% long position in the Nifty 50 index.
2. **Go Flat:** When the 50-day SMA crosses **below** the 200-day SMA, we liquidate the long position and move to a 0% cash allocation.

Classification: This strategy is clearly a **Trend Following** model. It uses the relationship between two moving averages to define the market's current trend and positions the portfolio to capitalize on that direction.

Market Regimes and Key Risks

When It Should Work: This strategy is most profitable when the market exhibits **strong, persistent trends**. In a powerful bull market, it rides the entire wave. Crucially, in a sustained bear market, its primary benefit is capital preservation, as it moves to cash, avoiding the bulk of the decline.

Key Risks:

Risk Category	Description	Analyst Commentary
Market Risk (Whipsaw)	The most significant risk is a sideways or choppy market . Frequent, small price fluctuations cause the moving averages to cross repeatedly, leading to a series of losing trades that erode capital.	This risk is inherent to the strategy. Optimization of the MA periods or the addition of a volatility filter (e.g., ATR) could potentially reduce this exposure.
Liquidity Risk	Given the Nifty 50 is the underlying asset, liquidity is exceptionally high.	This is not a material risk for this specific application.
Model Risk	The chosen $\frac{50}{200}$ -day parameters may be overfitted to the historical data set, meaning they might not perform as expected in a future, different market environment.	Robustness checks across various timeframes and asset classes would be necessary to validate the model's predictive power.

Part B - Backtesting and Performance

Backtesting Setup

Asset: Nifty 50 Index (^NSEI)

Data: Daily closing prices

Period: January 2015 to December 2025

Assumptions: We assume execution at the next day's open price following a signal. For simplicity, we have not included transaction costs or slippage in this initial model.

Performance Comparison

The table below summarizes the key performance results, comparing our Trend Following strategy against a passive Buy-and-Hold approach.

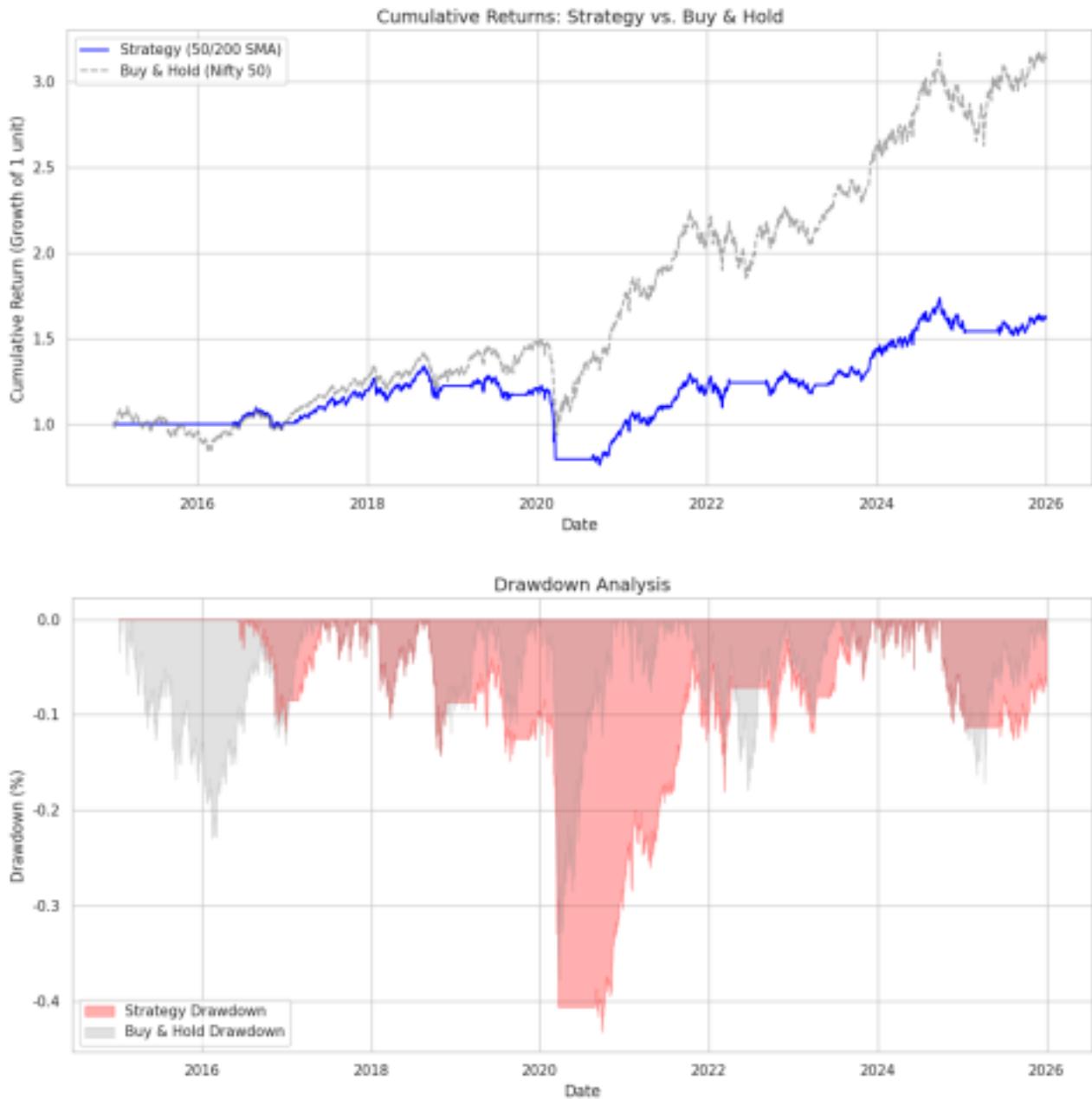
Metric	Strategy ($^{50}_{200}$ SMA)	Buy-and-Hold (Nifty 50)
Cumulative Return	61.52%	212.97%
Maximum Drawdown (MDD)	-43.22%	-37.77%

Commentary: The Trend Following strategy was unable to keep pace with the Buy-and-Hold benchmark. The primary reason for this significant underperformance is the **strong, sustained bullish trend** of the Nifty 50 over the past decade. The Buy-and-Hold approach captured all gains, while the Trend Following model spent considerable time in cash during consolidation phases, missing out on smaller rallies and suffering from whipsaw losses that ultimately dragged down its cumulative return.

Furthermore, the strategy's maximum drawdown was deeper than the benchmark's, suggesting that the $^{50}_{200}$ SMA combination failed to effectively protect capital during the largest market corrections in the period, or that its re-entry timing was poor.

Visual Analysis

The following charts provide a visual context for the performance metrics.



Part C - Risk Measurement

We calculated the 1-day 99% Value-at-Risk (VaR) for both the strategy's returns and the benchmark's returns using two standard methodologies.

Metric	Strategy Returns	Buy-and-Hold Returns
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1-Day 99% VaR (Historical Simulation)	2.40%	2.85%
1-Day 99% VaR (Variance-Covariance)	1.86%	2.43%

The VaR figures indicate that there is a 1% chance that the loss on the portfolio will exceed the stated percentage on any given day.

Reason for Difference in Results

The difference between the Historical Simulation (HS) and Variance-Covariance (VC) VaR figures is a classic observation in financial risk management and stems from the **VC method's reliance on the assumption of normally distributed returns.**

1. **Variance-Covariance (VC-VaR):** This parametric method assumes returns follow a perfect bell curve. It calculates the 99% worst-case loss based on the mean and standard deviation. Because the normal distribution has relatively thin tails, it tends to **underestimate** the probability and magnitude of extreme, rare events.
2. **Historical Simulation (HS-VaR):** This non-parametric method makes no distributional assumptions. It simply looks at the actual worst 1% of returns observed in the historical data.

Conclusion: The fact that the **HS-VaR is consistently higher than the VC-VaR** for both the strategy and the benchmark is strong evidence that the Nifty 50's daily returns exhibit **fat tails** (leptokurtosis). In simple terms, large losses occur more frequently in the real world than a normal distribution would predict. Since the HS method captures these actual extreme losses, it provides a more conservative and realistic measure of risk for our portfolio.



The histogram above visually confirms the non-normal distribution, showing a higher peak and heavier tails than a theoretical normal curve, which is why the VC model falls short in estimating the true tail risk.

References

- [1] Nifty 50 Historical Data. Source: Yahoo Finance.
- [2] Moving Average Crossover Strategy. Source: Investopedia.
- [3] Value-at-Risk Methodologies. Source: Risk Management Textbooks.