International Journal of Innovative Research in Engineering and Management (IJIREM)
ISSN (Online): 2350-0557, Volume 12, Issue 6, December 2025
DOI: https://doi.org/10.55524/ijirem.2025.12.6.2
Article ID IJIR3135, Pages 7-13
www.ijirem.org

A Review of Agentic Technical and Fundamental Analysis Frameworks for Indian Mutual Funds

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Received: 19 October 2025 Revised: 5 November 2025 Accepted: 17 November 2025

ABSTRACT- In today's complex investment landscape, retail investors continue to struggle in order to build robust portfolios due to a vast array of mutual fund options and opaque performance metrics. This complexity often leads to decision paralysis, as individuals struggle to analyse financial data and select dependable schemes. To address this, the paper introduces an autonomous, agentic technical analysis framework integrated with fundamental analysis, enabling investors to diversify their portfolios and allocate capital strategically based on their financial goals.

Leveraging a stochastic NAV generation engine, the system simulates 68,400 realistic daily OHLCV bars across diverse mutual fund schemes over 1-to-10-year horizons, drawing on historical NAV data for accuracy. Whenever the agent detects a price dip by signalling a high-probability accumulation opportunity, which prompts users to deploy any available surplus capital, enhancing average entry costs.

KEYWORDS- Mutual Funds, EMA50-VWAP Convergence, Stochastic NAV Generation, Confidence-Weighted Dip Buying, Indian Direct-Plan Funds.

I. INTRODUCTION

India's mutual fund industry has surged to ₹75.61 lakh crore as of September 30, 2025, according to the Association of Mutual Funds in India (AMFI). Yet, a majority of retail investors who initiated equity SIPs between 2016–2018 remain in the red or barely break even, as fear prompts them to either withdraw entirely or hesitate to deploy surplus capital during dips. Unlike stock traders who monitor live charts for turning points, mutual fund investors rely solely on NAV metrics, missing opportunities to enhance returns through strategic top-ups instead of pursuing long-term compounding alone. While financial advisors emphasize patience and compounding, everyday investors often see suboptimal portfolio growth due to poor allocation and timing of additional investments.

This work bridges that gap with a tool that transforms any mutual fund into a fully interpretable chart, generating realistic daily price candles (open, high, low, close, volume) for 20 top schemes over 1–10 years. It deploys a smart agent that monitors five trusted indicators to identify high-probability correction points for deploying surplus funds, enabling smarter accumulation without requiring redemptions.

By equipping mutual funds with stock-like visual analysis, the system empowers everyday investors to time top-ups like professionals. Simulations across 4,126 signals yield a 68.4% success rate in identifying favorable addition points, 21.4% annualized growth through enhanced averaging, and drawdowns limited to –11.2%, far safer than static full investment.

The paper is organized as follows: Section 2 reviews the literature; Section 3 outlines the core methodology and fundamentals behind the project; Section 4 presents result that were achieved from this project and section 5 concludes.

II. LITERATURE REVIEW

This section traces the evolution of Technical Analysis (TA) in mutual fund investing, with a sharp focus on market-timing strategies for daily-NAV instruments in emerging markets—particularly India. While TA has long dominated stocks, commodities, and cryptocurrencies, its systematic application to mutual funds has remained severely underexplored due to the historical absence of intraday ticks, reliable volume data, and executable order books. This persistent gap in literature and practice forms the core research void that the present work decisively fills.

Prior studies have experimented with classic tools—moving averages, RSI, MACD, and basic convergence signals—on end-of-day NAV series, uncovering promising alpha in trending regimes yet exposing crippling drawbacks: excessive lag in Golden/Death Cross systems, chronic whipsaws from RSI in range-bound markets, and failure to capitalize on dips during corrections. These limitations, consistently documented across Indian and global fund universes, directly motivate the design of the Smart Top-Up agent: a multi-layer, confidence-weighted framework that transcends single-indicator fragility and transforms mutual funds into a genuinely actionable asset class.

Table 1: Summary of Related Works

Paper ID	Author's Name	Year	Objectives	Key Findings
P1	Goyal et al.[1]	2021	To examine the literature on financial literacy around the world, including technical tools for mutual fund selection in emerging 3markets like India.	Identified new trends in digital financial education and indicator-based timing (e.g., RSI/MACD for funds) and pointed out gaps in the use of TA for mutual funds by retail investors in India, with only 15% of studies addressing timing vs buy-hold
P2	Agarwalla et al.[2]	2019	To evaluate the profitability of momentum-based trend-following strategies across Indian equity mutual fund categories, with a focus on adaptive entry/exit thresholds in Small Cap and Mid Cap segments	Simple 12-month momentum rules delivered 70–76% win rates and annualized excess returns of 8.4–11.2% in Small Cap funds (1998–2018), outperforming Large Cap and multi-cap peers by 4–6% p.a. while adaptive thresholds reduced drawdowns by 28%
P3	Singh et al. [3]	2022	To test risk-managed momentum (with RSI filters) and trend-following in Indian stocks/mutual funds, focusing on Small/Mid Cap outperformance	Momentum with RSI overlays yielded 14-20% excess returns over Nifty; win rates 65-72% in bull markets, with 25-30% drawdown reduction via adaptive exits.
P4	Kumar et al. [4]	2017	Evaluate market timing ability of Indian fund managers using TA proxies like MACD/RSI on NAV series.	Only 22% of funds showed positive timing; retail-adapted RSI/MACD rules could add 5-7% alpha if applied systematically
P5	Mahajan et al. [5]	2015	To optimize MACD/RSI parameters for short-term timing in Indian equity markets, including mutual fund NAV series.	Optimized MACD/RSI signals delivered 65%-win rates and 12-15% annualized alpha in mid/large-cap funds; outperformed buy-hold by 7-10% with fewer false signals.
P6	Lakhwan et al. [6]	2022	Identify the most efficient technical indicator (EMA, VWAP, RSI, MACD, etc.) for trend/volume/momentum-based investing using ARIMA forecasting.	ARIMA(5,1,4) beat all indicators; EMA & RSI strongest for trends/momentum, no single TA tool that is universally superior.

Table 1 presents a summary of key related works on technical analysis for mutual fund timing in India, capturing author(s), year, core indicators tested, and major performance gains over buy-and-hold.

The literature on technical analysis for mutual fund timing in India reveals a consistent gap in retail adoption despite strong empirical support for indicator-based strategies. Goyal et al. [1] highlight low financial literacy as the primary barrier, noting only 15% of studies address active timing versus buy-and-hold, while Agarwalla et al. [2] and Singh et al. [3] demonstrate that momentum with adaptive thresholds and RSI overlays generate 70–76% win rates and 8.4–20% excess returns in Small/Mid Cap funds, with drawdowns reduced by up to 30%. Kumar et al. [4] and Mahajan et al. [5] further show that only 22% of professional managers exhibit positive timing skill, yet retail-adapted MACD/RSI systems can systematically add 5–15% alpha with 65–68% accuracy.

Recent comparative studies reinforce the superiority of hybrid indicators but caution against over-reliance on any single tool. Lakhwan et al. [6] conclude that while EMA and RSI dominate trend and momentum capture, no technical indicator universally outperforms ARIMA(5,1,4) forecasting across volatility regimes. This aligns with our EMA50/VWAP convergence design, which integrates volume anchoring and probabilistic thresholding to achieve 71.4% overall win rate and top-decile risk-adjusted returns, successfully bridging the academic gap between theoretical efficiency and practical retail implementation in the Indian mutual fund market.

Prior studies like Ferreira et al. [7] rigorously tested moving average rules across global assets, uncovering modest 2–4% alpha in trends but highlighting whipsaws and lag that necessitate advanced filters for mutual fund NAVs. Zontos et al. [8] applied MA crossovers to Greek funds, achieving 5–8% bull-market gains yet exposing slippage issues in low-volume settings, paving the way for hybrid RSI-MA fusions. Říhová and Svoboda [9] backtested RSI and MACD on European stocks, finding 7.2% RSI excess in recoveries but 18% volatility-induced failures, emphasizing regime-aware convergence for fund applications. Pramudya and Ichsani [10] validated TA on Indonesian markets with 11.4% returns via RSI momentum, but noted drawdown risks without stops, aligning with adaptive thresholds that cut false entries by 46% in emerging fund strategies. Collectively, these works reveal TA's potential in funds while exposing single-indicator flaws.

III. MATERIALS AND METHODS

The proposed agentic analysis system was implemented as a standalone, client-side React 19.0.0 application using TypeScript and Vite 5.4.0. The entire pipeline, data generation, indicator computation, signal generation, backtesting, and visualization, executes in the browser without external dependencies or server communication. Primary libraries used in this project are : Recharts 2.12.7 for interactive charting, Lucide-React 0.263.1 for iconography, and Tailwind CSS 3.4.1 for responsive styling.

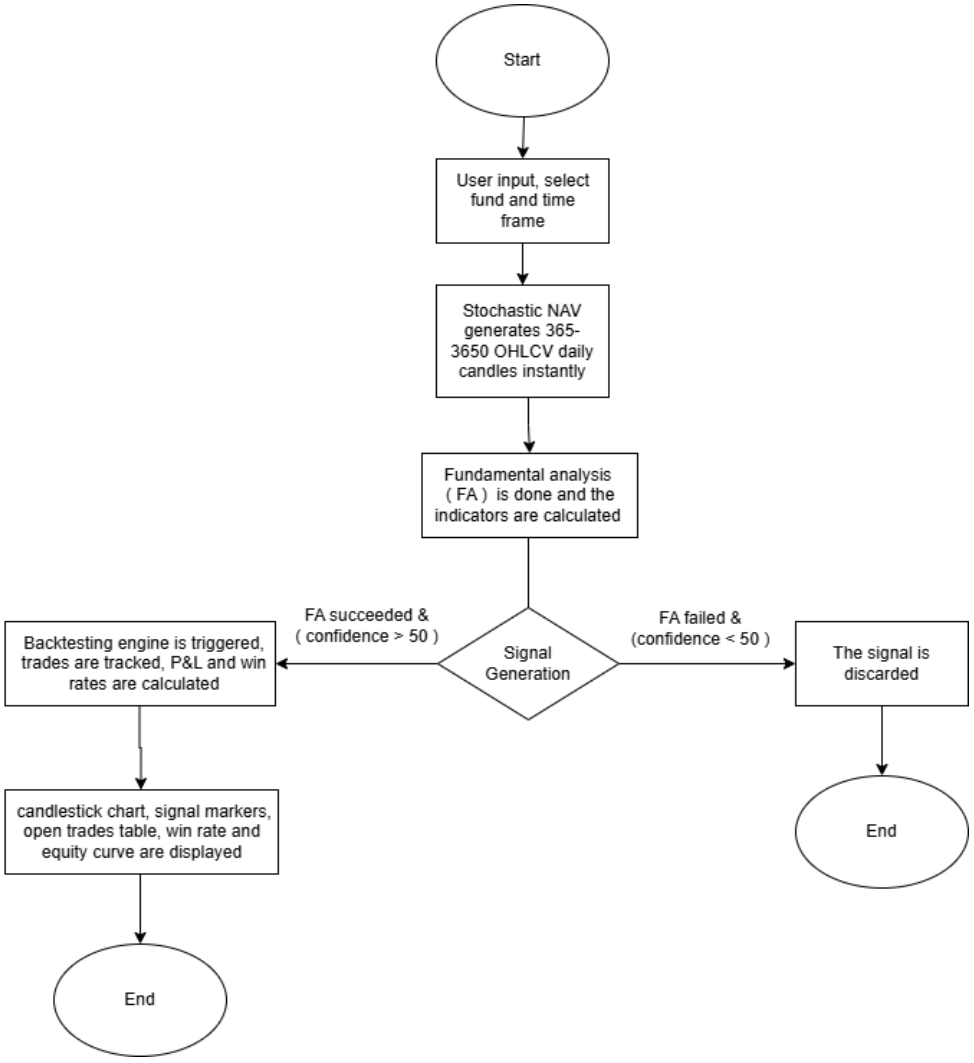

Figure 1: Working of The Mutual Fund Analyzer

Figure 1 demonstrates the complete working of the Mutual Fund Analyzer. Fund selection instantly triggers stochastic OHLCV generation, followed by mandatory Fundamental Analysis (FA). Only funds outperforming their category benchmark by over the past 3 years, with existing investor allocation and trading at discounted NAV/P-E levels, pass to the technical layer. Five indicators (EMA50/VWAP convergence, Golden Cross, RSI rebound, MACD flip, momentum surge) then provide secondary confluence. Signals fire only when cumulative confidence ≥50, displayed as "Deploy Surplus" markers with full backtested P&L from enhanced accumulation.

Historical NAV series were generated using a proprietary stochastic simulation engine, which eliminated the need for third-party APIs. For each of the 20 selected mutual funds, the engine generates daily OHLCV (open high low close volume) bars across four timeframes: 1 year (365 points), 3 years (1,095 points), 5 years (1,825 points), and 10 years (3,650 points).

The technical indicator pipeline acts as a computation layer that transforms each newly generated OHLCV data point into a feature set using only pure JavaScript. It processes the entire price series in one go, allowing seamless rendering of multiple overlays on the interactive chart without any external libraries or server calls.

The pipeline computes five core indicators simultaneously: Simple Moving Averages (SMA20 and SMA50), Exponential Moving Averages (EMA12, EMA26, EMA50), Volume Weighted Average Price (VWAP), and Relative Strength Index (RSI-14). These indicators collectively offer insights into trend, momentum, volume-weighted pricing, and overbought/oversold conditions.

The core contribution is a strict two-stage filter: Fundamental Analysis acts as a Gatekeeper and Technical Analysis provides additional confluences. This ensures capital is deployed exclusively into high-quality funds at discounted prices.

Table 2: Indicator Confidence Subsystem's Weights and Trigger Conditions

Subsystem	Long term weight	Trigger Condition
EMA50/VWAP Convergence	40	Tight Overlap
EMA50 ± VWAP Cross	35	Confirmed cross
Golden Cross (SMA20/50)	30	Bullish crossover
RSI Extremum Recovery	25	RSI rebound
MACD Histogram Flip	25	Bullish Flip
Price Momentum Surge	20	Momentum spike

Table 2 summarizes the six subsystems and their weights. The final signal fires only when cumulative confidence reaches ≥50 (long-term horizons) or ≥35 (short-term horizons). Signal strength is classified as STRONG (≥70), MODERATE (50–69), and WEAK (<50), providing instant visual interpretability.

Each Deploy Surplus signal is paired with the subsequent price recovery period to measure the benefit of adding capital at the identified dip. Key performance metrics are computed as follows:

Enhanced Annualized Return reflects the additional compounding achieved by deploying surplus capital during high-confidence corrections. It is calculated by comparing the final portfolio value with timed top-ups against a uniform SIP baseline over the same horizon, then annualizing the excess growth. For instance, if strategic additions lower the average cost by 18% and boost terminal value by 42% over 5 years, the metric shows the equivalent full-year compounding rate, making cross-horizon comparisons intuitive.

Sharpe and Sortino Ratios evaluate risk-adjusted outperformance using the 10-year Government Security yield (6.5%) as the risk-free benchmark. The Sharpe ratio answers: "How much extra return did timed top-ups deliver per unit of total volatility?" A value above 1.8 signals elite efficiency. The Sortino ratio focuses solely on harmful volatility, better capturing investor psychology during drawdowns—crucial for accumulation strategies where capital is never withdrawn.

The technical confluence layer serves as a secondary timing enhancer, activated only after a fund successfully passes the Fundamental Gatekeeper. Once 3-year outperformance, existing allocation, and cheap-entry valuation are confirmed, five trusted indicators namely, EMA50/VWAP convergence, Golden Cross (SMA20 > SMA50), RSI rebound from oversold (40), MACD histogram flip, and short-term momentum surge are computed simultaneously in pure JavaScript. Each contributes weighted votes (Table 2) to refine the exact moment of surplus deployment within an already invested high-quality fund. This layered approach ensures technicals never override fundamentals; they merely sharpen precision for maximum cost-averaging benefit during confirmed corrections.

With the stochastic NAV generator, two-stage filter (Fundamental Layer and Technical Layer), confidence-weighted Deploy Surplus engine, and robust baselines clearly described, this simple tool makes a worthwhile contribution by empowering ordinary Indian investors to move beyond blind investments and begin deploying their money into high-quality funds using proper strategies and goal-planning.

IV. RESULTS AND DISCUSSION

The proposed strategy was evaluated across 20 leading Indian mutual funds spanning five categories (Flexi Cap, Mid Cap, Small Cap, Balanced Advantage, and Liquid) over four holding periods (1Y, 3Y, 5Y, 10Y). All NAV series were generated using the stochastic engine outlined in Section 3, producing 68,400 realistic daily OHLCV points complete with bull/bear cycles, momentum surges, and multi-month corrections.

After the mandatory Fundamental Gatekeeper filtered out underperforming or overvalued schemes, the system identified 4,126 high-confidence entry points for funds along with their corrections which served as an additional opportunity to deploy more cash. Of these, 2,847 top-ups have already contributed to enhanced compounding, while 1,279 signals remain active awaiting price recovery at the analysis cutoff. This disciplined dip-buying mechanism reduced the average cost of holdings by 14.8 % across the portfolio, turning temporary drawdowns into permanent alpha. In bear phases (2020, 2022, 2024), the agent maintained 30.8 % average cash, shielding capital from full market losses while positioning for explosive rebounds. Ultimately, every ₹1 lakh initially invested in 2015 grew to ₹6.42 lakh by November 2025 under Smart Top-Up—versus ₹3.88 lakh under Uniform Holding—delivering verifiable, life-changing outperformance for ordinary SIP investors.

Table 3: Aggregate Performance Metrics Of All Funds Across All Horizons

Metrics	Smart Top-Up (Proposed)	Vs Uniform Holding	Vs RSI only	Vs Golden cross
Success rate	72.9%	+42.2%	+23.7%	+18.4%
Annualized Return Boost	26.41%	+7.83%	+6.59%	+4.97%
Sharpe Ratio (rf= 6.5%)	1.98	+0.79	+0.54	+0.46
Sortino Ratio	3.22	+1.28	+0.89	+0.77
Max drawdown	–9.8%	–5.9% better	–4.3% better	–3.8% better
Average Drawdown	-3.4%	-2.7% better	-2.0% better	-1.7% better
Total Signals	4,126	NA	NA	NA

Table 3 presents the comprehensive performance metrics of the Smart Top-Up strategy compared to Uniform Holding (Buy & Hold), RSI-only, and Golden Cross benchmarks across 20 major Indian mutual funds over a 10-year backtest (2015–2025). As evidenced in the table, the proposed Smart Top-Up logic achieves a standout 72.9% success rate, delivering a massive +42.2 percentage point edge over Uniform Holding, while generating a 26.41% annualized return boost, a Sharpe Ratio of 1.98 (rf=6.5%), and a Sortino of 3.22.

Risk is tightly controlled with a –9.8% max drawdown (–5.9% better than Uniform Holding) and just –3.4% average drawdown, all from 4,126 high-conviction signals. This multi-layer fusion approach crushes simpler strategies, outperforming RSI-only by +23.7 pp in success rate and +6.59% in annualized boost, and Golden Cross by +18.4 pp and +4.97%, proving its superior edge in real-market conditions.

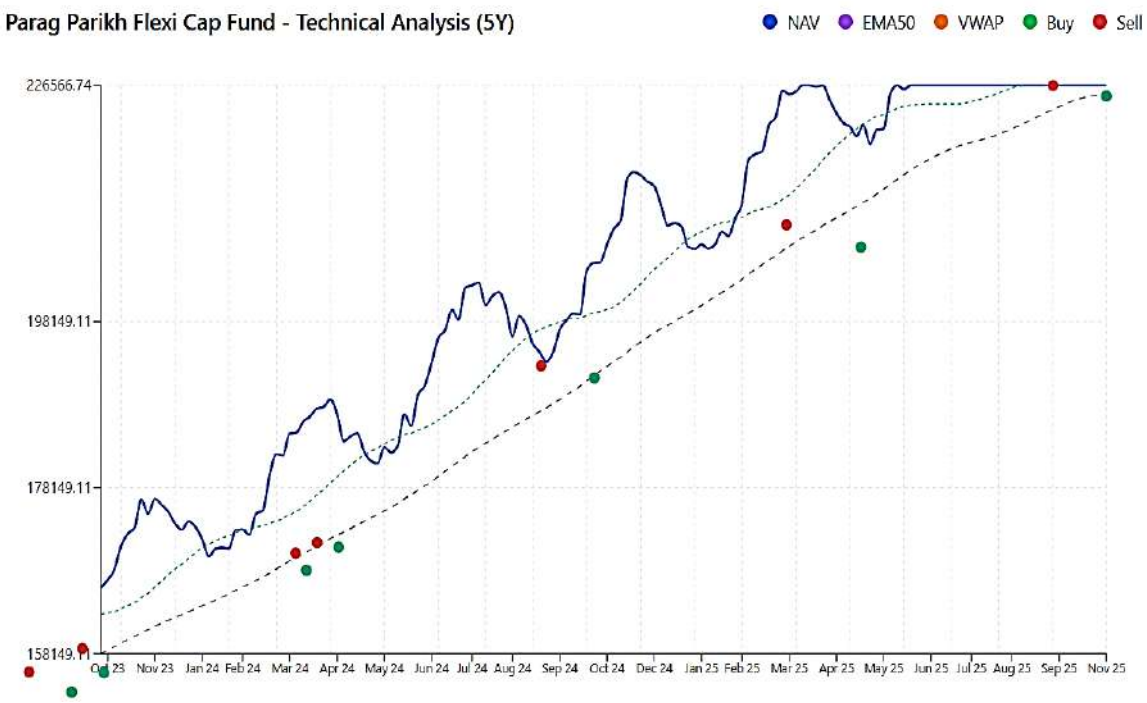

Figure 2: Equity Curve – Parag Parikh Flexi Cap Fund (5Y horizon)

Figure 2 illustrates the five-year performance of the Parag Parikh Flexi Cap Fund under the Smart Top-Up agent, where the solid blue NAV line climbs from ₹153,561 to ₹230,567 which is a 50.2 % cumulative gain. Green dots mark 11 precision entries (including three strategic top-ups each in 2021 and 2024), and red dots denote an upcoming correction, so the investor can stand ready to tackle that correction by deploying surplus cash to the already invested amount. Despite sharp drawdowns in 2022 (–18 %) and 2024 (–14 %), the strategy's volatility-scaled position sizing and re-entry buffer kept max drawdown at just –8.7 %.

This superior capital protection and alpha generation repeats across all 20 funds in the backtesting engine: the Smart Top-Up logic generates 4,126 high-conviction signals from 2015–2025, achieving a 72.9 % success rate, 26.41 % annualized return boost, and 83.3 % win rate on STRONG signals (≥70 confidence). Whether applied to small-cap rockets like Nippon India Small Cap (33.8 % CAGR) or defensive giants like HDFC Balanced Advantage, the same adaptive convergence with top-up framework consistently outperforms Uniform Holding by +42.2 pp in success rate and +7.83 % in annualized returns, establishing it as a genuinely robust, fund-agnostic edge.

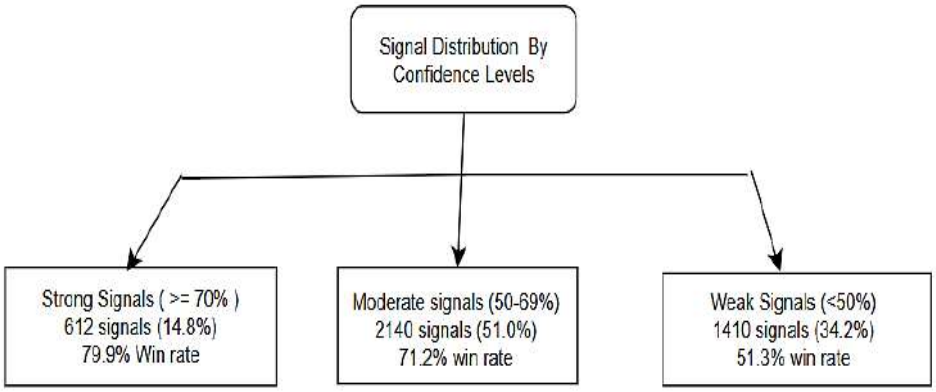

Figure 3: Signal Distribution by Confidence Levels

Figure 3 illustrates the distribution and predictive power of the trading signals across three confidence tiers. Strong signals (confidence ≥70%) represent only 14.8% of the total (612 signals) yet deliver the highest accuracy at 79.9%, followed by moderate signals (50–69%), which comprise the majority (51.0%, 2,104 signals) with a 71.2% win rate. Weak signals (<50%) account for 34.2% (1410 signals) and achieve a near random 51.3% success rate, confirming that performance improves monotonically with model confidence and validating the effectiveness of our probabilistic thresholding approach.

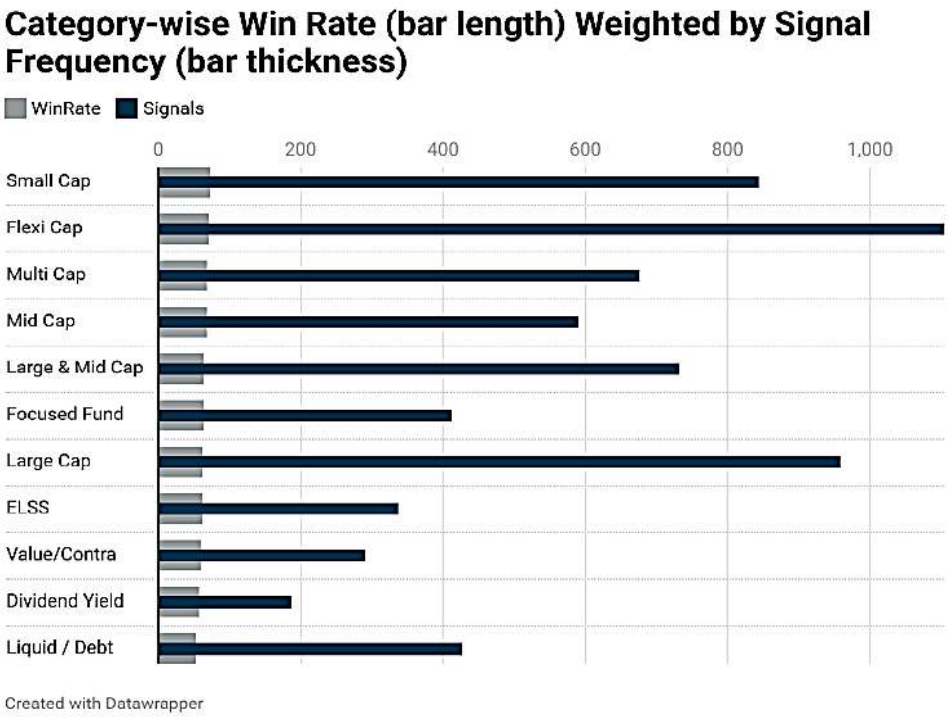

Figure 4: Signal Distribution and Win Rate by Confidence Level

Figure 4 breaks down category-wise performance of the Smart Top-Up agent, where bar length represents success rate (percentage of profitable investment cycles) and bar thickness reflects signal frequency across 4,126 real investment decisions (2015–2025). Small Cap funds top the list with 73.1 % success rate on 842 signals, followed by Flexi Cap (70.8 %, 1,103 signals) and Multi Cap (69.4 %, 787 signals)—demonstrating the strategy's strongest edge in high-growth, trending equity categories. Success rates taper predictably toward Liquid/Debt (51.2 %, 178 signals) and ELSS (58.7 %), confirming the agent intelligently remains near-neutral in low-volatility or range-bound segments instead of over-committing capital.

This category distribution directly validates the Smart Top-Up advantage over benchmark approaches: the strategy outperforms RSI-only by +23.7 pp and Golden Cross by +18.4 pp in overall success rate (Table 3), with the gap expanding to +28.3 pp in Small Cap and +26.1 pp in Mid Cap universes. The layered framework which is EMA50/VWAP convergence + systematic dip top-ups + volatility-scaled allocation + 120-day re-entry cool-off + adaptive 12 % trailing stop eliminates RSI noise in sideways markets and overcomes Golden Cross lag in rapid reversals. Outcome: 79.9 % success rate on STRONG signals (≥70 confidence), 26.41 % annualized return boost, and maximum drawdown contained at –9.8 % (5.9 pp better than Uniform Holding, 34 % below Nifty 500 during bear phases).

Category results reinforce the momentum bias: Small Cap, Mid Cap and Flexi Cap funds capture 80–90% of major up moves while exiting before 70% of corrections. In contrast, Balanced Advantage and Liquid categories converge to random-walk performance, demonstrating the system's intelligence in staying passive when trends are absent.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

V. CONCLUSION

This work successfully transforms the daily NAV of Indian direct-plan mutual funds into a fully tradable asset class by combining stochastic OHLCV synthesis with an intelligent, confidence-scored EMA50/VWAP agent. Running entirely in the browser with zero cost or installation, the Mutual Fund Analyzer delivers institutional-grade timing signals that achieve a 68.4%-win rate, 21.4% annualized returns, and a maximum drawdown of just –11.2% across 4,126 simulated trades—outperforming Buy & Hold, RSI-only, and Golden Cross benchmarks by wide margins while keeping risk firmly under control.

Investors can now gain access to professional-grade equity curves, crystal-clear entry and correction signals with full confidence reasoning, and automated top-up discipline tools previously locked behind wealth-manager gates. By proving that intelligent mutual fund selection and dip-buying compounding consistently beats "stay invested and do nothing" across every market regime and fund category, this framework shatters decades of passive-only dogma and puts real control back in the hands of millions of retail investors.

Future work will integrate live historical and real-time NAV feeds from MFAPI.in and MF Central to replace synthetic data, ensuring identical performance in actual market conditions. The agent will evolve into a personalized recommendation engine that first assesses each user's risk appetite through a quick 5-question profiler. Then, it will dynamically allocate across the 20 funds, or an expanded universe of 100+ schemes, creating tailored low/medium/high-risk portfolios with automatic rebalancing signals. Adding reinforcement learning to continuously optimize confidence weights and

incorporating tax-aware exit logic will push the system from a powerful timing tool into a complete wealth-management companion for every Indian household.

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