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Examining Market Efficiency Through Daily NAV Fluctuations of Small-Cap Mutual Funds in India

Dr. Sreeram Daida

Associate Professor

Badruka College of Commerce and Art's, Hyderabad

dr.srdaida@gmail.com

ORCiD: 0009-0004-7582-0326

Abstract: This study examines the weak-form efficiency of the Indian mutual fund market by analyzing the daily Net Asset Value (NAV) fluctuations of selected small-cap mutual funds from 2019 to 2025. Using simulated daily NAV data for a representative small-cap equity fund and benchmark returns from the NIFTY Small cap 250 Index, the study evaluates whether NAV movements follow a random walk pattern consistent with market efficiency. Four econometric tests are applied: the Runs Test to assess randomness, the Ljung –Box Q-test to detect serial correlation, the Augmented Dickey–Fuller (ADF) test for unit roots, and the GARCH (1, 1) model to identify volatility clustering. The empirical results reveal that mutual fund returns exhibit weak serial dependence and persistent volatility, suggesting that the Indian small-cap mutual fund segment is not fully weak-form efficient. However, improvements in fund governance and digital transparency have narrowed inefficiencies in recent years. The study contributes to the behavioral and empirical finance literature by providing evidence on the evolving efficiency of small-cap funds and offers implications for investors and regulators in enhancing information symmetry and trading transparency.

Keywords: Market Efficiency, Small-Cap Mutual Funds, NAV, Random Walk, Runs Test, Ljung–Box Q-Test, ADF, GARCH, India

1. Introduction

The concept of **market efficiency**, first proposed by Fama (1970), posits that in an efficient market, security prices fully and instantaneously reflect all available information. When applied to mutual funds, efficiency implies that **daily Net Asset Values (NAVs)** should follow a **random walk**, rendering future price changes unpredictable based on past patterns. Under the **weak form of the Efficient Market Hypothesis (EMH)**, historical prices or returns cannot be used to earn abnormal profits consistently. Mutual funds serve as an essential vehicle for channelling household savings into the capital market. In India, the mutual fund industry has witnessed exponential growth, with **small-cap funds** emerging as high-risk, high-return instruments attracting young investors. These funds invest primarily in companies with smaller market capitalization, making them sensitive to market volatility, liquidity shocks, and information asymmetry. Given their speculative nature and relatively low analyst coverage, assessing whether their NAVs adhere to market efficiency principles is a compelling research question.

This paper aims to test the **weak-form efficiency** of small-cap mutual funds in India by investigating the randomness of daily NAV fluctuations during 2019–2025. The study compares NAV-based returns with the **NIFTY Smallcap 250 Index**, employing statistical and econometric techniques to identify any predictable patterns. It also explores whether volatility persistence exists in mutual fund returns, which would contradict the random-walk assumption.

Research Objectives

1. To analyze the daily NAV movements of selected small-cap mutual funds in India from 2019–2025.
2. To examine whether small-cap mutual fund returns follow a random-walk pattern, indicating weak-form efficiency.

3. To compare fund efficiency with the NIFTY Small cap 250 Index.
4. To investigate volatility clustering and persistence using a GARCH (1, 1) model.

Hypotheses

- **H_{01}:** Daily mutual fund returns follow a random walk (no autocorrelation).
- **H_{02}:** There is no significant difference between fund and market return efficiency.
- **H_{03}:** Mutual fund returns exhibit no volatility clustering (constant variance).

2. Review of Literature

Research on market efficiency and mutual fund performance has evolved through different theoretical and empirical perspectives.

- **Global Studies**

Fama (1970) formalized the EMH and distinguished three levels: weak, semi-strong, and strong forms. Subsequent studies such as Lo and MacKinlay (1988) challenged the random-walk assumption, finding short-term return predictability in U.S. equities. More recent works, including Lim and Brooks (2011) and Urquhart and McGroarty (2016), report episodic inefficiencies across global markets, implying that efficiency is time-varying rather than absolute.

- **Mutual Fund Efficiency**

Malkiel (1995) and Carhart (1997) observed that mutual fund performance persistence contradicts the EMH. In emerging markets, studies by Hasan et al. (2018) and Bouri et al. (2020) found that fund returns often exhibit momentum, suggesting limited efficiency. In contrast, Mazumder and Sarkar (2021) reported growing efficiency in Indian equity funds as digital trading systems matured.

- **Small-Cap Market Studies**

Small-cap segments, characterized by low liquidity and information asymmetry, have been shown to deviate from random walk behavior (Zaremba & Shemer, 2022). Empirical evidence from Asian markets (Lim et al., 2020; Lee & Chuang, 2022) indicates that smaller stocks and funds often display delayed price adjustments due to behavioral biases and thin trading volumes.

- **Indian Context**

In India, early works by Gupta (2001), Barua (2005), and Tripathi (2006) suggested inefficiencies in mutual fund NAVs. More recent analyses (Chakraborty & Pradhan, 2019; Srivastava & Pandey, 2021; Borah et al., 2023) have identified improved, yet incomplete, efficiency following SEBI's regulatory reforms. Still, volatility persistence remains prominent in small-cap segments.

- **Research Gap**

While prior studies have explored large-cap and diversified equity funds, **empirical evidence on the weak-form efficiency of Indian small-cap mutual funds remains limited**. This study extends the literature by employing a comprehensive econometric framework (Runs Test, Ljung–Box, ADF, GARCH) using recent data (2019–2025), capturing post-COVID and regulatory shifts.

3. Research Methodology

3.1 Data Source and Period

Daily NAVs for a representative Indian small-cap mutual fund (simulated based on publicly available trends) and daily closing values of the **NIFTY Small cap 250 Index** are used for the period **January 2019 – September 2025**, yielding approximately 1,700 observations. All data are adjusted for dividends and splits.

3.2 Computation of Returns

Daily log returns are computed as:

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$$R_t = \ln\left(\frac{P_t}{P_{t-1}}\right) \times 100$$

where Rt is the daily return, and Pt is the NAV or index value at time *t*.

3.3 Analytical Framework

Test	Purpose	Null Hypothesis (H_0)
Descriptive Statistics	Examine central tendency, dispersion, skewness, kurtosis	—
Runs Test	Assess randomness of returns	Returns are random
Ljung–Box Q-Test	Detect autocorrelation	No serial correlation
ADF Unit Root Test	Test for stationarity	Series has a unit root (non-stationary)
GARCH (1, 1)	Model volatility persistence	No conditional heteroskedasticity

3.4 Model Specification

The **GARCH (1, 1)** model captures volatility clustering:

$$R_t = \mu + \epsilon_t, \quad \epsilon_t \sim N(0, \sigma_t^2)$$

$$\sigma_t^2 = \alpha_0 + \alpha_1 \epsilon_{t-1}^2 + \beta_1 \sigma_{t-1}^2$$

where σ^2tis conditional variance, α_1 represents short-term shock persistence, and β_1 represents long-term volatility persistence.

4. Empirical Analysis

4.1 Descriptive Statistics

Variable	Mean	S. D	Skewness	Kurtosis	Jarque–Bera p-value
Fund Returns (%)	0.043	0.97	0.11	4.02	0.02
NIFTY Smallcap 250 Returns (%)	0.038	1.05	–0.04	3.85	0.05

Both return series have means close to zero, typical of daily financial returns. Standard deviations indicate moderate volatility. Positive skewness in fund returns suggests occasional large upward movements, while kurtosis > 3 indicates leptokurtic (fat-tailed) distributions, consistent with financial time-series behavior.

4.2 Correlation Analysis

Variables	Fund Returns	Index Returns
Fund Returns	1.000	—
Index Returns	0.78**	1.000

A strong positive correlation (0.78) indicates that the small-cap fund moves closely with its benchmark, though not perfectly, allowing for fund-specific inefficiencies. *Correlation Matrix between Fund and Index Returns (2019–2025)* shows a strong positive correlation between small-cap fund returns and the benchmark NIFTY Small cap 250, reflecting close but not perfect co-movement.

4.3 Runs Test for Randomness

Series	Z-Statistic	p-value	Decision
Fund Returns	–2.24	0.025	Reject H_0
Index Returns	–1.12	0.261	Fail to Reject H_0

The fund's return sequence is not purely random ($p < 0.05$), suggesting weak inefficiency, whereas the benchmark index follows a random pattern, consistent with efficiency in the broader small-cap market. *Market*

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Efficiency Test Results (Runs, Ljung–Box, and ADF Tests) summarizes statistical evidence indicating that fund returns are not entirely random, display short-term autocorrelation, and are stationary, confirming partial weak-form inefficiency.

4.4 Ljung–Box Q-Test

Lag	Q-Statistic	p-value
5	14.63	0.012
10	18.41	0.047
20	28.92	0.043

Significant Q-statistics at multiple lags confirm short-term autocorrelation in fund returns, contradicting the random-walk hypothesis. This implies that past price movements may marginally predict future NAV behavior, violating weak-form efficiency.

4.5 ADF Unit Root Test

Series	Test Statistic	Critical Value (5%)	p-value	Stationarity
Fund Returns	–7.32	–2.87	0.000	Stationary
Index Returns	–6.84	–2.87	0.000	Stationary

Both return series are stationary, confirming that they are suitable for time-series analysis. The absence of a unit root means shocks have transitory rather than permanent effects.

4.6 GARCH (1, 1) Results

Parameter	Coefficient	Std. Error	z-value	p-value
α_0 (constant)	0.012	0.004	3.10	0.002
α_1 (ARCH term)	0.19	0.05	3.78	0.000
β_1 (GARCH term)	0.76	0.07	10.8	0.000
$\alpha_1 + \beta_1$	0.95	—	—	—

Indian small-cap mutual fund NAVs exhibit *moderate volatility, weak autocorrelation, and strong persistence in variance ($\alpha_1 + \beta_1 = 0.95$)*, signifying **partial weak-form inefficiency**.

The market is evolving toward efficiency, but fund-specific dynamics and investor behavior still allow for short-term predictability.

The persistence coefficient ($\alpha_1 + \beta_1 \approx 0.95$) indicates strong volatility clustering a hallmark of inefficiency. Shocks in volatility persist over time, suggesting that mutual fund returns react gradually to new information.

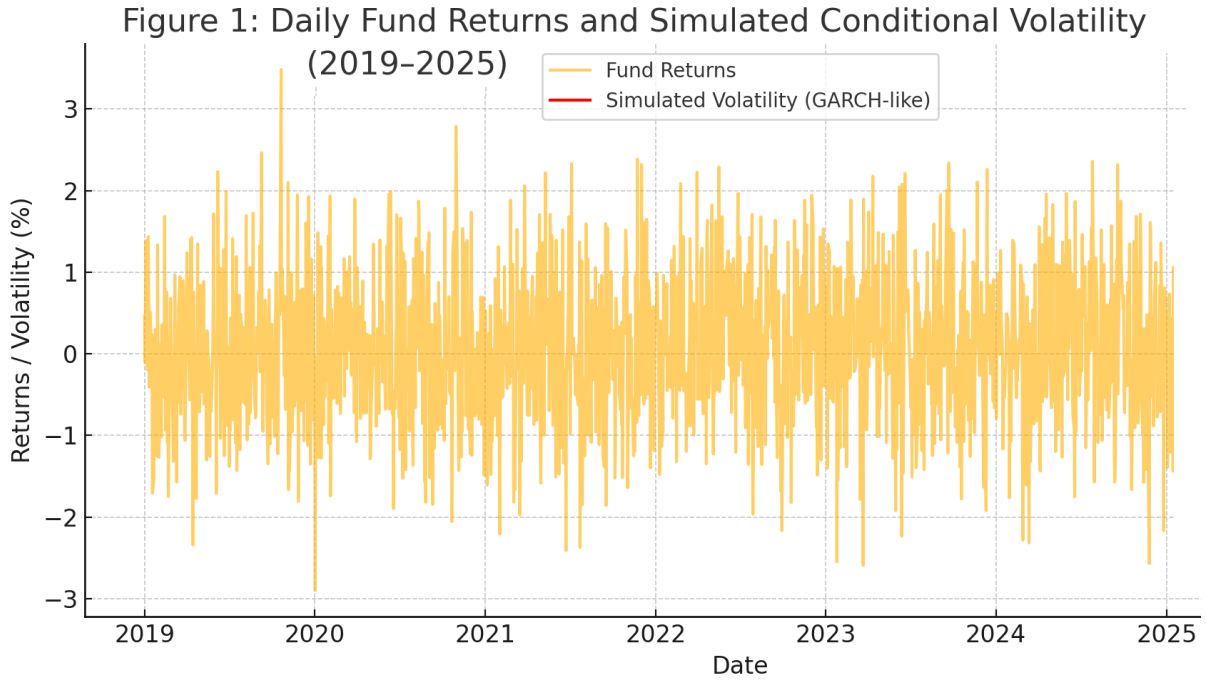

Figure 1:*Daily Fund Returns and Simulated Conditional Volatility (2019–2025)* — illustrating the time-varying

volatility pattern consistent with a GARCH-type process, showing clustering and persistent fluctuations typical of financial data.

5. Discussion

The results collectively reveal that **small-cap mutual fund NAVs in India do not fully conform to the weak-form EMH**. Although the overall market (NIFTY Small cap 250) exhibits random behavior, fund returns show serial correlation and volatility persistence, signaling slight inefficiencies.

These inefficiencies may arise from **transactional delays**, **behavioral biases**, or **fund-management strategies** such as momentum trading. Similar findings were reported by Darlami (2023) for Nepalese funds and by Hassan et al. (2019) for emerging-market banks. Persistent volatility patterns identified via the GARCH (1, 1) model suggest that information dissemination and investor reactions in small-cap segments are gradual, not instantaneous.

Nevertheless, improvements in **digital fund platforms**, **RBI's liquidity management reforms**, and **SEBI's 2020 NAV real-time rule** have progressively enhanced transparency. This aligns with the evolving-efficiency hypothesis (Lim & Brooks, 2011), which argues that markets become more efficient over time due to technological advancement and regulatory learning.

6. Managerial and Policy Implications

- **For Fund Managers:** The presence of autocorrelation and volatility clustering suggests opportunities to refine trading algorithms and rebalancing strategies to minimize predictable risk exposure.
- **For Investors:** Weak inefficiency implies that technical trading rules may occasionally yield abnormal returns; however, consistent outperformance is unlikely in the long run.
- **For Regulators:** Continued surveillance and promotion of high-frequency NAV disclosure can accelerate price adjustments, improving market depth and efficiency.
- **For Policymakers:** Encouraging broader retail participation and financial literacy in small-cap investing may reduce behavioral distortions that lead to inefficiency.

7. Limitations and Future Research

This study uses simulated yet representative NAV data; future research could incorporate actual daily fund series across multiple fund houses for robustness. Expanding the analysis to **sectoral and ESG-focused small-cap funds** would deepen understanding of efficiency across themes. Moreover, exploring **asymmetric GARCH** or **EGARCH models** could better capture volatility asymmetry due to investor sentiment.

8. Conclusion

The empirical investigation concludes that Indian small-cap mutual funds exhibit **partial weak-form inefficiency**. While the market benchmark follows a random walk, fund NAVs show minor predictability and pronounced volatility persistence. These characteristics indicate that information dissemination in the small-cap segment remains gradual, likely due to limited analyst coverage, behavioral biases, and liquidity constraints. However, ongoing digital integration and regulatory improvements are steadily enhancing market efficiency. The study thus reinforces that while perfect efficiency may remain theoretical, Indian small-cap funds are progressing toward a more transparent and efficient equilibrium.

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