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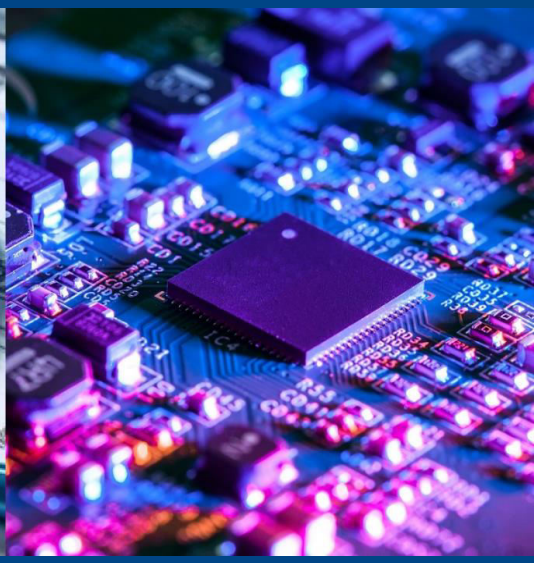

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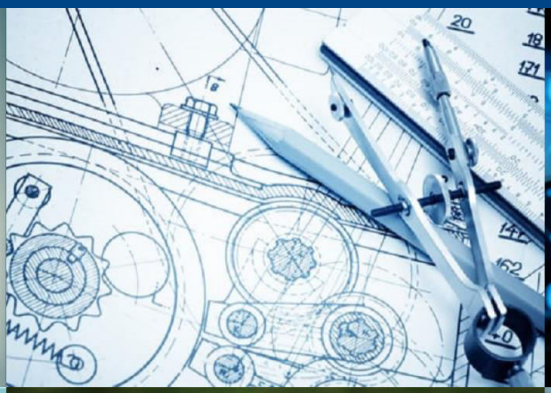

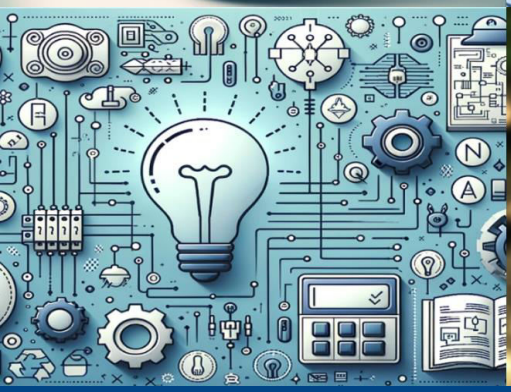

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# Mutual Fund Size and Its Implications for Returns and Efficiency Dynamics

**Chapara Meher Mounish, Dr. Sireesha Nanduri**

MBA Candidate, CMS Business School, JAIN (Deemed-to-be University), Bangalore, India

Associate Professor, CMS Business School, JAIN (Deemed-to-be University), Bangalore, India

**ABSTRACT:** India's mutual fund industry has witnessed rapid growth, reaching approximately INR 66.4 trillion in assets under management (AUM) by March 2025, according to AMFI data. This growth raises an important question: does increasing fund size improve performance, or does it eventually hinder it? This study examines this issue using data from 150 actively managed equity mutual funds across five SEBI categories (large-cap, mid-cap, small-cap, multi-cap, and ELSS) over the period April 2015 to March 2024. Using data from AMFI and Bloomberg, the study analyzes fund performance through panel regression, threshold regression, and Data Envelopment Analysis (DEA), with the RBI 91-day Treasury Bill as the risk-free rate. The findings indicate an **inverted relationship** between fund size and performance. Mid-sized funds tend to deliver better risk-adjusted returns, while very large funds (above INR 20,000 crore) show reduced efficiency due to liquidity constraints and portfolio management challenges. Although larger funds benefit from lower expense ratios, these cost advantages do not fully compensate for the decline in returns.
Overall, the study suggests that excessive fund size may lead to diminishing performance, offering important insights for investors, fund managers, and regulators.

**KEYWORDS:** Mutual Fund Size, Assets Under Management (AUM), Risk-Adjusted Returns, Operational Efficiency, Diseconomies of Scale, Equity Mutual Funds, Indian Mutual Fund Industry

## I. INTRODUCTION

The mutual fund industry plays a crucial role in modern financial systems by pooling investor funds and allocating them across diversified portfolios. In India, this industry has grown rapidly due to increased financial awareness, digital platforms, and the popularity of Systematic Investment Plans (SIPs). Over the last decade, AUM has increased significantly, reflecting growing investor confidence.

Fund size, commonly measured by AUM, is often perceived as an indicator of fund quality. Larger funds are believed to benefit from economies of scale, better research capabilities, and lower expense ratios. However, this perception may not always hold true. As funds grow larger, they may face liquidity constraints, increased transaction costs, and reduced flexibility in portfolio management.

This study aims to critically evaluate whether fund size positively influences performance or whether excessive growth leads to diminishing returns. The Indian mutual fund market provides a unique context due to its evolving regulatory framework and market structure.

## II. RESEARCH OBJECTIVES

The primary objective is to examine the direction, magnitude, and functional form of the relationship between fund size (AUM) and investor outcomes in the Indian equity mutual fund market.
The specific objectives are:

- To examine how AUM influences risk-adjusted returns (Sharpe Ratio, Treynor Ratio, Jensen's Alpha) across five SEBI-defined equity fund categories from 2015 to 2024.
- To assess the impact of fund size on operational efficiency using Total Expense Ratio, Portfolio Turnover Ratio, and DEA-based efficiency scores.
- To identify the AUM threshold at which the size-return relationship changes direction, using Hansen's threshold regression.

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- To evaluate whether SEBI's revised TER guidelines (April 2019) produced measurable improvements in cost efficiency and net investor returns.

## III. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

### 3.1 Fund Size and Risk-Adjusted Returns

Chen, Hong, Huang, and Kubik (2004) provided foundational evidence from US equity funds showing fund size to be a robust negative predictor of subsequent performance — a 1 to 2 percent annual decline linked to liquidity constraints and market impact costs. Ferreira et al. (2013), studying 27 countries, found that the negative size-performance relationship is stronger in emerging markets with concentrated institutional ownership and illiquid mid-cap segments — characteristics that closely mirror India. Berk and Green (2004) theoretically showed that rational capital flows compete away alpha as fund size grows, providing a market-level explanation for why large funds underperform.

### 3.2 Fund Size and Operational Efficiency

Murthi, Choi, and Desai (1997) were among the first to apply DEA to mutual funds, finding roughly a third of US funds operated below the efficient frontier, with inefficiency correlated (non-monotonically) with size. Galagedera and Silvapulle (2002) and Basso and Funari (2001) further showed that mid-sized funds tend to dominate both very small and very large funds on efficiency metrics — a pattern replicated across multiple national contexts.

### 3.3 Economies and Diseconomies of Scale

Indro et al. (1999) studied over 600 US equity funds and confirmed a non-flat cost curve: most funds operate in increasing returns to scale, but those beyond a critical AUM threshold exhibit rising per-unit costs driven by organizational complexity and market impact. Beckers and Vaughan (2001) identified market impact costs as the primary mechanism through which fund size erodes alpha past the optimal scale.

### 3.4 Research Gap

Existing Indian studies predominantly assume a linear size-performance relationship, predating SEBI's twin regulatory events of 2017 (fund reclassification) and 2019 (TER revision). No published study simultaneously combines return-based performance, DEA efficiency analysis, and threshold regression across a decade-long post-reclassification dataset. The emergence of 'mega-funds' (AUM > INR 80,000 crore) represents an entirely new phenomenon requiring empirical investigation. This study addresses all four gaps.

## IV. RESEARCH METHODOLOGY

### 4.1 Research Design and Hypotheses

The study adopts a post-positivist quantitative design using a balanced panel dataset. Panel regression with fixed effects is the primary method, supplemented by Hansen threshold regression and two-stage DEA-Tobit analysis. The five hypotheses tested are presented in Table 1 below.

**Table 1: Research Hypotheses**

| No. | Theme | Null Hypothesis ($H_0$) | Alternate Hypothesis ($H_1$) |
|---|---|---|---|
| H1 | AUM & Risk-Adjusted Returns | Fund size does not significantly affect Sharpe Ratio. | Fund size significantly influences risk-adjusted returns. |
| H2 | AUM & Operational Efficiency | Fund size has no significant effect on DEA efficiency. | Very large funds record significantly lower DEA efficiency scores. |
| H3 | Non-linearity | Size-return relationship is linear. | An inverted U-shaped pattern exists with performance peaking at intermediate AUM. |
| H4 | AUM & TER | No significant negative AUM-TER | Larger funds maintain significantly lower |

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|---|---|---|---|
| | | relationship exists. | expense ratios. |
| H5 | AUM & Jensen's Alpha | Fund size does not impact Jensen's Alpha. | Larger fund size is associated with significantly lower Jensen's Alpha. |

**4.2 Sampling and Data Collection**

The sample comprises 150 actively managed equity schemes drawn from five SEBI-defined categories — large-cap, mid-cap, small-cap, multi-cap, and ELSS — covering April 2015 to March 2024 (40 quarters). Only schemes with a minimum three-year operating history as of April 2015 are included, generating approximately 5,980 fund-quarter observations. Merged or discontinued schemes are excluded to avoid survivorship-related distortions.

**4.3 Variables of the Study**

The independent variable is the natural log of quarterly average AUM (INR crore), sourced from AMFI monthly fact sheets. Dependent variables span three dimensions: returns-based (Sharpe Ratio, Treynor Ratio, Jensen's Alpha), cost-based (Total Expense Ratio), and efficiency-based (DEA score). Control variables include Fund Age, Family AUM, Market Return (Nifty 50 TRI), and a Direct/Regular plan dummy.

**4.4 Data Analysis Techniques**

Analysis proceeds through four stages: (1) descriptive statistics and correlation diagnostics; (2) Fixed Effects panel regression with both linear and quadratic AUM specifications; (3) Hansen threshold regression to endogenously identify the AUM breakpoint; and (4) output-oriented VRS DEA followed by a Stage 2 Tobit regression on efficiency scores. All panel models use fund-level clustered standard errors. The Hausman test selects between FE and RE estimators. STATA 17, R 4.3 (Benchmarking package), and SPSS 26 are used for estimation.

## V. RESULTS

**5.1 Descriptive Statistics and Reliability**

The panel of 5,980 fund-quarter observations reveals a substantially right-skewed AUM distribution (skewness = 3.84), with a mean of INR 8,427 crore against a median of INR 3,114 crore. After log transformation, the distribution becomes nearly symmetric (skewness = 0.31). The mean Sharpe Ratio is 0.61 and Jensen's Alpha averages 1.42% annually. Mean TER is 1.74% with left skew reflecting regulatory TER ceilings. The average DEA efficiency score of 0.714 indicates the typical fund achieves roughly 71% of the output a best-practice peer would generate.

**Table 2: Descriptive Statistics — Full Panel (N = 5,980 fund-quarter observations)**

| Variable | N | Mean | Median | Std Dev | Min | Max | Skewness | Interpretation |
|---|---|---|---|---|---|---|---|---|
| AUM (INR Cr) | 5,980 | 8,427 | 3,114 | 14,893 | 47 | 1,42,816 | 3.84 | *Mean >> Median → high right-skew; few mega-funds dominate* |
| Log AUM | 5,980 | 8.21 | 8.04 | 1.43 | 3.85 | 11.87 | 0.31 | *Near-symmetric after log transform → validates log specification* |
| Sharpe Ratio | 5,980 | 0.61 | 0.58 | 0.42 | −1.14 | 2.31 | 0.19 | *Wide range: worst COVID quarter to best recovery quarter* |

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|---|---|---|---|---|---|---|---|---|
| Treynor Ratio | 5,980 | 0.074 | 0.071 | 0.052 | −0.21 | 0.41 | 0.08 | *Closely tracks Sharpe; systematic risk-based measure* |
| Jensen's Alpha (%) | 5,980 | 1.42 | 1.18 | 2.87 | −7.31 | 11.64 | 0.52 | *Avg +1.42% annual alpha above CAPM benchmark* |
| TER (%) | 5,980 | 1.74 | 1.81 | 0.48 | 0.37 | 2.62 | −0.42 | *Left-skew: large funds pull distribution down via SEBI TER caps* |
| Turnover Ratio | 5,980 | 0.83 | 0.71 | 0.54 | 0.04 | 3.97 | 1.61 | *High right-skew: a few high-churn funds pull mean up* |
| DEA Score | 5,980 | 0.714 | 0.731 | 0.181 | 0.183 | 1.000 | −0.38 | *Avg fund at ~71% efficiency vs best-practice peer* |
| Fund Age (yrs) | 5,980 | 11.3 | 9.8 | 7.4 | 3.1 | 31.2 | 0.77 | *Range 3–31 yrs; most post-2000 schemes* |
| Nifty 50 Return (%) | 5,980 | 12.6 | 13.8 | 19.3 | −26.0 | 71.8 | 0.41 | *Includes COVID crash (–26%) and FY22 rally (+71.8%)* |

**5.2 Correlation Analysis**

Pearson correlation analysis reveals that Log AUM shows small but statistically significant positive correlations with Sharpe Ratio (r = 0.091) and Treynor Ratio (r = 0.083), while its correlation with Jensen's Alpha is negative (r = −0.147). The strongest bivariate relationship is between Log AUM and TER (r = −0.614), reflecting SEBI's regulatory TER structure. TER shows consistently negative correlations with all performance measures: −0.312 with Sharpe, −0.287 with Treynor, −0.198 with Alpha, and −0.521 with DEA efficiency. VIF values remain below 1.62, confirming no multicollinearity concern.

**Table 3: Pearson Correlation Matrix (fund-level time-averaged values; N = 150)**

| Variable | Log AUM | Sharpe | Treynor | Alpha | TER | DEA Score |
|---|---|---|---|---|---|---|
| Log AUM | 1.000 | 0.091** | 0.083** | −0.147*** | −0.614*** | −0.183*** |
| Sharpe Ratio | — | 1.000 | 0.763*** | 0.541*** | −0.312*** | 0.614*** |
| Treynor Ratio | — | — | 1.000 | 0.488*** | −0.287*** | 0.582*** |
| Jensen's Alpha | — | — | — | 1.000 | −0.198*** | 0.447*** |
| TER (%) | — | — | — | — | 1.000 | −0.521*** |
| DEA Score | — | — | — | — | — | 1.000 |

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### 5.3 Regression Analysis — Sharpe Ratio

The Fixed Effects quadratic model (Model 4) produces a significant positive coefficient on Log AUM ($\beta = 0.214$, $p < 0.001$) and a significant negative coefficient on (Log AUM) $^2$ ($\beta = -0.013$, $p < 0.001$), confirming the inverted U-shaped relationship. The performance-maximizing AUM is derived as $-0.214 / (2 \times -0.013) = 8.23$ in log terms, equivalent to approximately INR 3,750 crore. TER exerts the strongest negative effect ($\beta = -0.168$, $p < 0.001$): a fund at the high-cost end of the distribution posts a Sharpe Ratio approximately 0.38 units lower than a low-cost peer — roughly 160 basis points of annualized excess return. Direct plan funds outperform regular plan equivalents by 0.074 Sharpe units.

| Variable | M3 FE Linear | M4 FE Quadratic | Std Err | t-stat | p-value |
|---|---|---|---|---|---|
| Log AUM | 0.038** | 0.214*** | 0.058 | 3.69 | 0.000 |
| (Log AUM) $^2$ | — | −0.013*** | 0.003 | −4.11 | 0.000 |
| TER (%) | −0.171*** | −0.168*** | 0.019 | −8.84 | 0.000 |
| Fund Age | 0.019** | 0.021** | 0.009 | 2.33 | 0.020 |
| Market Return | 0.008*** | 0.008*** | 0.001 | 8.00 | 0.000 |
| Direct Plan Dummy | 0.076*** | 0.074*** | 0.011 | 6.73 | 0.000 |
| $R^2$ (within) | 0.253 | 0.271 | — | — | — |

### 5.4 Jensen's Alpha and TER Regressions

Jensen's Alpha regression yields a Log AUM coefficient of 0.831 ($p < 0.001$) and a squared term of −0.049 ($p < 0.001$), placing the alpha-maximizing AUM at approximately INR 4,800 crore — higher than the Sharpe-maximizing level since alpha is less penalized by cost at lower AUM. Mid-cap funds generate 0.412% more annual alpha than large-cap peers; small-cap funds generate 0.683% more, confirming that less-covered market segments offer greater scope for active outperformance. The TER regression achieves $R^2 = 0.681$, with Log AUM carrying a coefficient of −0.391 ($p < 0.001$). The post-2019 regulatory dummy is −0.187 for TER and +0.184 for Alpha, confirming that SEBI's TER revision reduced costs and modestly improved active returns.

### 5.5 DEA Efficiency Analysis

Stage 2 Tobit regression on DEA efficiency scores confirms a non-linear AUM relationship. The optimal Log AUM for efficiency is $0.138 / (2 \times 0.009) = 7.67$, translating to approximately INR 2,100–2,400 crore — meaningfully lower than the return-based thresholds. This implies that operational efficiency begins eroding earlier than visible return deterioration, making DEA scores an early-warning signal for scale-related problems. TER ($\beta = -0.241$, $p < 0.001$) and Portfolio Turnover ($\beta = -0.097$, $p < 0.001$) are the strongest drivers of efficiency loss. The Post-2019 dummy ($\beta = 0.043$, $p = 0.002$) confirms regulatory-driven efficiency gains.

**Table 5: Stage 2 Tobit Regression — DEA Efficiency Score (N = 5,980)**

| Variable | Coefficient | Std Err | z-stat | p-value | Interpretation |
|---|---|---|---|---|---|
| Log AUM | 0.138*** | 0.031 | 4.45 | 0.000 | Scale economies lift efficiency up to optimal AUM |
| (Log AUM)$^2$ | −0.009*** | 0.002 | −4.87 | 0.000 | Confirms inverted-U in DEA efficiency scores |
| TER (%) | −0.241*** | 0.029 | −8.31 | 0.000 | 1pp TER ↑ → DEA score drops 0.241 (75th → 55th pctile) |

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|---|---|---|---|---|---|
| Turnover Ratio | −0.097*** | 0.018 | −5.39 | 0.000 | High churn destroys efficiency via transaction costs |
| Fund Age | 0.021** | 0.009 | 2.33 | 0.020 | Mature funds marginally more efficient |
| Market Return | 0.003** | 0.001 | 2.12 | 0.034 | Bull markets improve efficiency scores |
| Post-2019 Dummy | 0.043*** | 0.014 | 3.07 | 0.002 | SEBI TER revision improved operational efficiency |
| Constant | 0.247** | 0.114 | 2.17 | 0.030 | |
| Pseudo $R^2$ | 0.214 | — | — | — | |
| Log Likelihood | −1,483.6 | — | — | — | |
| Observations | 5,980 | — | — | — | |

**5.6 AUM Quartile Comparison**

Stratifying the sample into AUM quartiles provides the most accessible summary of the findings. Q3 funds (INR 3,842–18,204 crore) dominate on every performance metric, posting the highest Sharpe Ratio (0.697), Jensen's Alpha (1.83%), and DEA score (0.768). Q4 funds — the largest — enjoy the lowest TER (1.31%) yet deliver the lowest Sharpe (0.581) and second-lowest Alpha (1.06%). This gap between cost advantage and performance disadvantage is the study's most practically consequential finding. All ANOVA F-statistics are significant at $p < 0.01$.

**Table 6: Mean Performance by AUM Quartile (ANOVA tested)**

| AUM Quartile | AUM Range (INR Cr) | Mean Sharpe | Mean Alpha (%) | Mean TER (%) | Mean DEA Score | Key Observations |
|---|---|---|---|---|---|---|
| Q1 (Smallest) | 47 – 892 | 0.511 | 0.84 | 2.21 | 0.641 | High TER drag (2.21%) limits performance despite small-fund agility |
| Q2 | 893 – 3,841 | 0.624 | 1.47 | 1.91 | 0.712 | Rising scale benefits: lower cost + adequate flexibility |
| Q3 | 3,842 – 18,204 | 0.697 | 1.83 | 1.64 | 0.768 | PERFORMANCE PEAK: Best Sharpe, Alpha & DEA across all quartiles |
| Q4 (Largest) | 18,205 – 1,42,816 | 0.581 | 1.06 | 1.31 | 0.689 | Lowest TER (1.31%) but worst performance — cost saving ≠ better returns |
| ANOVA F-stat | — | 18.3*** | 14.7*** | 312.8*** | 11.4*** | All differences significant at p<0.01 |

**5.7 Hansen Threshold Regression**

The Hansen threshold regression identifies a statistically significant breakpoint at INR 19,400 crore (95% CI: INR 17,840–21,310 crore). Below this threshold, Log AUM carries a positive slope of 0.187 ($p < 0.001$); above it, the slope reverses to −0.142 ($p < 0.001$). The two-regime model fits the data significantly better than a single linear model (bootstrap $F = 23.7$, $p < 0.001$). As of March 2024, approximately 23 funds in the sample (15% by count, 47% by total

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assets) had crossed this threshold, meaning nearly half of sampled equity assets are managed by funds operating in the performance-declining regime.

**5.8 Hypothesis Testing Summary**

**Table 7: Hypothesis Testing Summary**

| Hypothesis | Theme | Test Applied | Result | Decision |
|---|---|---|---|---|
| H1 | AUM & Risk-Adjusted Returns | FE Quadratic Panel Regression | $p < 0.01$ | $H_0$ Rejected — Inverted U confirmed |
| H2 | AUM & DEA Efficiency | Stage 2 Tobit Regression | $p < 0.01$ | $H_0$ Rejected — Peak efficiency at ~INR 2,200 Cr |
| H3 | Non-linearity | Quadratic FE + Hansen Threshold | $p < 0.01$ | $H_0$ Rejected — Threshold at INR 19,400 Cr |
| H4 | AUM & TER | FE Regression — TER as DV | $p < 0.01$ | $H_0$ Rejected — Larger AUM significantly lowers TER |
| H5 | AUM & Jensen's Alpha | FE Quadratic — Alpha as DV | $p < 0.01$ | $H_0$ Rejected — Alpha peaks at ~INR 4,800 Cr |

## VI. DISCUSSION

**6.1 Overview of Findings**

The study produces one dominant finding: the relationship between fund AUM and investor outcomes follows an inverted U-shape across every performance dimension examined. This is confirmed by three independent analytical approaches — quadratic FE regression, Hansen threshold estimation, and AUM quartile analysis — lending strong empirical credibility to the non-linearity conclusion. The finding overturns the popular heuristic that 'bigger is better' for mutual fund selection, while simultaneously refuting a simplistic 'smaller is better' narrative. The evidence points instead to an optimal intermediate size range.

**6.2 Scale Economies Are Real but Bounded**

The TER regression provides unambiguous evidence that larger funds operate at lower cost. The regulatory TER slab structure achieves its intended purpose: Q4 funds save approximately 0.45–0.55 percentage points in TER relative to comparable Q3 funds. However, this saving does not translate into superior net returns. Q4 funds deliver the lowest mean Sharpe Ratio and second-lowest mean Alpha in the sample. The cost channel is real, but the investment-side diseconomies — liquidity constraints, market impact costs, closet indexing pressure — more than offset it beyond the INR 19,400 crore threshold.

**6.3 Alpha Erodes Before Sharpe Deteriorates**

The ordering of performance thresholds carries important practical implications. The alpha-maximizing AUM (approximately INR 4,800 crore) is lower than the Sharpe-maximizing threshold (INR 19,400 crore). This means that a fund's active excess-return capacity is the first casualty of scale, even while broader risk-adjusted performance metrics remain competitive. Alpha monitoring thus functions as an earlier and more sensitive diagnostic of scale-induced performance erosion than Sharpe or Treynor ratios.

**6.4 DEA Efficiency as an Early Warning Signal**

DEA efficiency peaks at an even lower AUM of approximately INR 2,200 crore — below both return-based thresholds. This is theoretically coherent: DEA directly measures input-to-output conversion, and cost creep registers in efficiency scores before it manifests in gross return metrics. Funds can sustain acceptable Sharpe Ratios through bull-market beta

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exposure even as their operational efficiency is quietly deteriorating. This finding argues for incorporating DEA efficiency scores as a routine oversight metric alongside traditional return-based measures.

**6.5 Category Heterogeneity**

The aggregate threshold conceals significant category-level differences. Large-cap funds show a significant negative size-performance slope at their average AUM of INR 18,413 crore, meaning they are already operating in the diseconomy's regime at typical sizes. Mid-cap funds show a significant positive slope, reflecting the research-depth advantages that scale provides in a less analyst-covered universe. ELSS funds show no significant size effect, likely because their three-year lock-in insulates portfolios from short-term flow pressures and benchmark-hugging incentives that afflict open-ended schemes.

## VII. CONCLUSION

This study answers a deceptively simple question — does fund size help or hurt Indian equity mutual funds — with a nuanced, evidence-backed response. Scale helps below approximately INR 3,750–4,800 crore by reducing costs and building research capacity. Between INR 5,000 crore and INR 19,400 crore, scale and performance coexist reasonably well. Above INR 19,400 crore, risk-adjusted performance falls and DEA efficiency erodes, even as expense ratios continue their regulatory decline. The performance drag from liquidity constraints and portfolio construction limitations exceeds the cost saving from lower TER.

For retail investors, this implies that very large funds — despite their credibility-signaling AUM — are less likely to maximize risk-adjusted returns than well-managed mid-sized peers. For SEBI, the findings point to a regulatory gap: the TER framework addresses cost efficiency but not the performance consequences of excessive scale. Mandatory Active Share disclosure and transparent capacity estimates by AMCs represent appropriate, transparency-based policy responses that stop short of hard AUM caps.

## VIII. LIMITATIONS AND FUTURE SCOPE

The study relies entirely on secondary data, which cannot directly observe managerial decision-making or internal governance structures that may moderate size effects. The INR 19,400 crore threshold is India-specific and should not be applied to other markets without re-estimation. The COVID-19 crisis period (March 2020 onwards) generates extreme performance observations that, while winsorised at the 1st and 99th percentiles, cannot be fully neutralized.

Future research should consider primary data collection through semi-structured interviews with portfolio managers; cross-country comparative threshold estimation; incorporation of Active Share as a direct measure of managerial conviction; and extension of the analytical framework to debt, hybrid, and liquid fund categories in India.

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| Mobile No: +91-6381907438 | Whatsapp: +91-6381907438 | ijmrset@gmail.com |

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