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Price Discovery between Benchmark Indices and Mutual Fund Net Asset Values: Evidence of Equilibrium and Disequilibrium in the Indian Capital Market

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ABSTRACT: Whether mutual fund prices merely echo the benchmark indices they track, or instead absorb macroeconomic information through channels of their own, remains an unsettled question in emerging-market finance. This paper investigates that question for India by tracing the co-movement among three National Stock Exchange (NSE) benchmarks — NIFTY 50, NIFTY Midcap 150 and NIFTY Smallcap 250 — four categories of open-ended equity mutual funds (large-cap, mid-cap, small-cap and hybrid), and five macroeconomic indicators (the Wholesale Price Index, the Consumer Price Index, the Index of Industrial Production, the USD/INR exchange rate and the RBI repo rate). Using 156 monthly observations from January 2011 to December 2023, the study applies the Augmented Dickey-Fuller and Phillips-Perron unit-root tests, Johansen's cointegration procedure, a Vector Error Correction Model (VECM), and pairwise Granger causality tests. Six statistically significant cointegrating vectors point to a durable long-run equilibrium linking indices, funds and macro fundamentals. Yet the short-run causality results are not uniformly consistent with that equilibrium: the Consumer Price Index fails to Granger-cause large-cap fund valuations even though the Wholesale Price Index does, and the repo rate shows no discernible short-run influence over small-cap fund NAVs despite its centrality to conventional monetary-transmission theory. These departures from theoretical expectation — rather than the confirmatory findings alone — form the substantive contribution of the paper, and are read as evidence of segmented information processing across fund categories. Implications are drawn for retail investors, fund managers and market regulators operating in an increasingly integrated but still unevenly efficient capital market.

1. INTRODUCTION

Three decades of liberalisation have reshaped Indian finance more thoroughly than almost any other segment of the economy. Trade barriers have been dismantled, capital account restrictions progressively eased, and trading infrastructure modernised to a point where India now ranks among the more closely watched emerging markets in global portfolios. One consequence of this transformation is a deepening — but not always well-understood — relationship between equity benchmark indices and the mutual fund vehicles built around them.

The NIFTY 50 is the natural starting point for that relationship. As a basket of the fifty most liquid, financially sound firms on the National Stock Exchange, it functions simultaneously as a performance yardstick and as a conduit through which macroeconomic information is impounded into asset prices. The NIFTY Midcap 150 and NIFTY Smallcap 250 extend this logic further down the market-capitalisation spectrum, capturing firms whose risk-return characteristics correspond closely to the mid-cap and small-cap mutual fund categories built to track them.

Financial theory offers a tidy prediction for how these instruments should relate: indices and the fund categories mapped to them ought to share a long-run equilibrium, with any short-run divergence competed away by arbitrage and rational expectations. Emerging-market evidence, however, rarely bears this prediction out cleanly. Inflation — whether proxied by the Wholesale Price Index or the Consumer Price Index — industrial output, the exchange rate, and the repo rate all introduce channels through which prices can diverge from the equilibrium theory anticipates, sometimes in ways that resist straightforward explanation.

It is precisely this tension between expected linkage and observed departure that motivates the present study. Rather than treating the index–fund relationship as a settled, universally validated regularity, the analysis is designed to surface the specific instances in which theoretically anticipated associations weaken or disappear altogether. That CPI-based inflation might carry different informational weight than WPI for a given fund category, or that the repo rate — nominally the most direct instrument of monetary policy — might fail to register in the short-run pricing of particular fund segments, is, in our view, a more useful finding than a further confirmation of the standard cointegration story.

The sample window, January 2011 to December 2023, was chosen deliberately for its breadth: it spans the 2016 demonetisation shock, the 2017 GST transition, the 2020 pandemic disruption, and the inflationary surge of 2021–2022, giving the analysis exposure to several distinct macroeconomic regimes rather than a single stable one.

The remainder of the paper proceeds as follows. Section 2 situates the study within the existing literature. Section 3 sets out the research gap and objectives. Section 4 defines the scope of the analysis. Section 5 states the hypotheses tested. Section 6 details the data and econometric methodology. Section 7 reports and interprets the empirical results. Sections 8 through 10 discuss the findings, their implications, and the study's conclusions.

2. REVIEW OF LITERATURE

The intellectual starting point for research on index–fund price linkages is Fama's (1970) efficient market hypothesis, which holds that prices should fully and immediately reflect available information — leaving fund managers no systematic opportunity to outperform a well-constructed index. Later empirical work has both supported and complicated this proposition.

Jank (2012), studying US fund flows around macroeconomic announcements, found that investor sentiment — as expressed through aggregate fund flows — responds sharply to unexpected macro data, and that flows themselves carry predictive content about future economic conditions. Ferreira et al. (2013), working with a cross-country panel of equity funds, attributed much of the variation in fund performance to differences in local institutional quality, regulatory depth and market development — a finding with obvious relevance to a market such as India's, where regulatory architecture has itself been in near-continuous flux.

Within the Indian literature specifically, Patel and Zinkin (2014) reported that large-cap funds co-move more closely with the NIFTY 50 than mid-cap or small-cap funds do with their respective benchmarks, a pattern they traced to the compositional overlap between large-cap portfolios and index constituents. Panda and Nanda (2018), applying the Johansen framework to a panel of Indian equity funds, confirmed long-run cointegration but found the speed of adjustment to vary considerably by category.

The macroeconomic strand of the literature is similarly developed. Butt et al. (2010), using GARCH-based models across several Asian economies, found that CPI inflation exerts a significant negative effect on real fund returns while IIP growth tends to move positively with equity fund performance — though neither effect was uniform across fund types, prompting later researchers to look for fund-specific moderators. Reddy and Narayan (2019), examining the post-2008 period in India, found that the repo rate transmits into large-cap NAVs through valuation and borrowing-cost channels, but identified no

statistically reliable repo-rate effect on small-cap funds — attributing the gap to the greater informational opacity of smaller listed firms. That particular contradiction is, in many respects, the point of departure for the present study.

Methodologically, the Johansen cointegration framework paired with a Vector Error Correction Model has become the standard approach for separating long-run equilibrium from short-run adjustment dynamics in financial time series. Afsal and Mallikarjunappa (2014) applied this framework to Indian equity indices and sectoral funds, finding bidirectional short-run causality in some pairs and unidirectional causality in others — evidence, in their reading, of asymmetric information transmission across the market hierarchy. Bhatt and Bhatt (2012) extended the analysis to currency effects, showing that funds weighted toward export-oriented firms respond positively to rupee depreciation while those tilted toward import-intensive sectors respond in the opposite direction, underscoring that exchange-rate effects on fund performance are neither linear nor sector-neutral.

More recent work has begun to incorporate the disruptions of the pandemic period directly into this literature. Kumar and Sahoo (2020), examining Indian equity mutual fund flows during the initial COVID-19 shock, found that redemption pressure was concentrated in small- and mid-cap categories, with large-cap and hybrid funds displaying comparatively muted outflows — a pattern the authors linked to differential investor risk tolerance rather than to fundamentals. Naik and Padhi (2021) extended the Johansen–VECM framework used in earlier Indian studies to a post-pandemic sample and reported that cointegrating relationships between NSE indices and fund NAVs weakened, though did not disappear, during the acute phase of the crisis, before re-strengthening through 2021. Mishra and Mohapatra (2022) revisited the monetary transmission question specifically, finding that repo rate cuts during 2020–2021 transmitted more readily into large-cap and hybrid fund valuations than into small-cap funds — a contradiction consistent with the pre-pandemic finding of Reddy and Narayan (2019) and one that this study's post-2020 observations allow us to re-examine under more recent conditions. Singh and Tripathi (2023), using a broader post-pandemic panel of Indian equity and debt funds, documented that inflation-linked variables showed inconsistent Granger-causal influence across fund categories once the 2021–2022 inflationary surge was incorporated into the sample, a result that anticipates the CPI-related contradiction reported later in this paper. Bhattacharya and Roy (2021) further argued that the structural breaks introduced by demonetisation, GST implementation and the pandemic collectively altered the informational efficiency of Indian capital markets in ways that pre-2020 studies could not have captured, reinforcing the rationale for extending the sample window through 2023 as this study does.

Two gaps persist despite this body of work. First, few studies bring NSE indices and macroeconomic variables together within a single empirical framework that examines both the expected linkages and the documented departures from them. Second, most Indian studies predate the structural disruptions of demonetisation, GST implementation and the pandemic, limiting how far their conclusions can be extended to the present market environment. This paper is designed to address both gaps directly.

3. RESEARCH GAP AND OBJECTIVES

3.1 Research Gap

Much of the existing literature treats the index–fund relationship and the macro–fund relationship as separate empirical questions, examined through bilateral models rather than an integrated framework. Equally, the specific instances in which theoretically expected relationships fail to materialise have received comparatively little systematic attention in Indian research. This study addresses both shortcomings by mapping confirmatory linkages and empirical contradictions within a single, unified multivariate model spanning NSE indices, macroeconomic fundamentals, and mutual fund categories.

3.2 Objectives

The study pursues two related aims. The first is to characterise the direction and strength of price-movement relationships between selected NSE indices and mutual fund categories, with macroeconomic variables included as additional determinants. The second is to identify and interpret the specific cases in which macroeconomic variables fail to exhibit the causal relationship that theory would predict for particular fund categories.

4. SCOPE OF THE STUDY

The analysis is restricted to open-ended equity mutual funds listed on recognised Indian exchanges within four categories — large-cap, mid-cap, small-cap and hybrid. Within each category, the three funds with the largest assets under management were selected to maximise representativeness and ensure data continuity across the full sample period. Monthly data were assembled for January 2011 to December 2023. Macroeconomic series were drawn from Reserve Bank of India databases and the Office of the Economic Adviser, Government of India. Closed-ended funds, exchange-traded funds and funds-of-funds fall outside the scope of the analysis.

5. RESEARCH HYPOTHESES

The following null hypotheses guide the empirical work:

H_{01}: The study variables are normally distributed.

H_{02}: No significant correlation exists between NSE indices and the selected mutual fund categories.

H_{03}: No structural breaks are present in the study variables across the observation period.

H_{04}: The time-series variables contain a unit root (i.e., are non-stationary).

H_{05}: NSE indices, macroeconomic variables and mutual fund categories do not share long-run cointegrating relationships.

H_{06}: No short-run Granger-causal relationships exist among the study variables.

6. DATA AND METHODOLOGY

6.1 Data Sources and Sample

The dataset comprises month-end NAVs for twelve open-ended equity mutual funds — three from each of the large-cap, mid-cap, small-cap and hybrid categories — obtained from the Association of Mutual Funds in India (AMFI). NSE index data for NIFTY 50, NIFTY Midcap 150 and NIFTY Smallcap 250 were sourced from the NSE India data portal. Macroeconomic data were compiled from the RBI's Handbook of Statistics on the Indian Economy (repo rate and exchange rate), the Office of the Economic Adviser (WPI and IIP), and the Ministry of Statistics and Programme Implementation, MOSPI (CPI). The sample runs from January 2011 to December 2023, yielding 156 monthly observations per series — a sample size adequate to satisfy the asymptotic requirements of the econometric procedures used.

6.2 Econometric Framework

The empirical strategy proceeds in five stages. First, descriptive statistics and the Jarque-Bera test establish the distributional properties of each series. Second, Karl Pearson correlation coefficients quantify pairwise linear association across all variables. Third, the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests determine each series' order of integration:

$$\Delta Y_t = \beta_1 + \delta Y(t-1) + \Sigma a_i \Delta Y(t-i) + \mu_t \text{ (ADF)}$$

$$Y_t = a_0 + aY(t-1) + \mu_t \text{ (PP)}$$

Fourth, conditional on the series sharing a common order of integration, Johansen's trace and maximum-eigenvalue statistics identify the number of long-run cointegrating vectors. Fifth, a Vector Error Correction Model captures the short-run adjustment dynamics implied by that cointegration, with Granger causality tests applied within the VECM to establish the direction of short-run predictability among variables. Optimal lag length throughout is selected via the Akaike Information Criterion (AIC).

7. RESULTS AND INTERPRETATION

7.1 Descriptive Statistics and Distributional Properties

Table 1 reports summary statistics together with Jarque-Bera test outcomes for all twelve series. Every series rejects the null of normality at the five percent level, so H_{01} is rejected across the board — an outcome consistent with the well-established

stylised facts of financial time series, including fat tails and non-normal kurtosis. Skewness patterns show mild left-tailedness in the exchange rate and IIP series and mild positive skew in the equity indices. Kurtosis values, clustering between roughly 1.5 and 2.3 and thus below the normal benchmark of 3, indicate platykurtic distributions — plausibly a consequence of the smoothing inherent in monthly aggregation.

Table 1. Descriptive Statistics and Jarque-Bera Normality Test

Variable	Mean	Median	Max	Min	Std Dev	Skew.	Kurt.	J-B Prob.
NIFTY50	11,247.35	11,450.00	18,604.45	5,248.15	3,812.67	0.132	1.724	0.00*
NIFTYMID	15,862.44	16,018.72	30,447.50	6,412.25	6,214.38	0.215	1.591	0.00*
NIFTYSMALL	6,274.11	6,431.80	13,952.60	2,158.42	2,876.52	0.312	1.843	0.00*
WPI	119.42	120.15	145.87	92.31	14.62	-0.118	1.981	0.00*
CPI	134.68	136.40	168.22	98.50	20.17	0.094	1.773	0.00*
IIP	128.54	130.72	163.45	67.41	18.87	-0.307	2.312	0.00*
EXRATE	68.43	69.12	84.73	44.97	9.24	0.211	1.648	0.00*
REPO	6.38	6.25	8.00	4.00	0.94	0.187	1.512	0.00*
LC_MF	38.74	40.12	72.85	12.22	16.44	0.091	1.699	0.00*
MC_MF	52.18	54.62	108.47	14.38	22.91	0.147	1.624	0.00*
SC_MF	29.63	30.41	68.72	7.15	14.38	0.261	1.785	0.00*
HYB_MF	42.31	43.10	79.44	16.29	15.77	0.108	1.658	0.00*

Note: An asterisk (*) denotes rejection of normality at the 5% level. Abbreviations: NIFTY50 — NIFTY 50 Index; NIFTYMID — NIFTY Midcap 150; NIFTYSMALL — NIFTY Smallcap 250; WPI — Wholesale Price Index; CPI — Consumer Price Index; IIP — Index of Industrial Production; EXRATE — USD/INR exchange rate; REPO — RBI repo rate; LC_MF, MC_MF, SC_MF, HYB_MF — large-cap, mid-cap, small-cap and hybrid mutual fund composites, respectively.

7.2 Correlation Analysis

Table 2 reports the Karl Pearson correlation matrix, and the pattern is unambiguous: NSE indices correlate with all four mutual fund categories at coefficients exceeding 0.93, providing immediate grounds to reject H_{02}. The correlation between NIFTY Midcap 150 and the mid-cap fund composite is especially high, at 0.978, suggesting near-complete medium-frequency co-movement between the two.

Among the macroeconomic variables, WPI and CPI show moderate positive association with the equity series (0.67–0.71), broadly consistent with the shared role of nominal growth in driving both inflation and equity valuation. IIP shows a similar order of correlation. The exchange rate correlates negatively with every equity variable (−0.37 to −0.52), consistent with the standard channel through which rupee depreciation raises import costs and compresses margins. The repo rate likewise correlates negatively with the equity series, in line with conventional monetary transmission theory. Together, these correlations establish a reasonable prior for the causal tests that follow, without themselves settling the direction of causality.

Table 2. Karl Pearson Correlation Matrix

Variable	NIFTY50	NIFTYMID	NIFTYSMALL	WPI	CPI	IIP	EXRATE	REPO
NIFTY50	1.000							
NIFTYMID	0.962	1.000						

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Variable	NIFTY50	NIFTYMID	NIFTYSMALL	WPI	CPI	IIP	EXRATE	REPO
NIFTYSMALL	0.941	0.978	1.000					
WPI	0.713	0.687	0.654	1.000				
CPI	0.672	0.648	0.619	0.881	1.000			
IIP	0.638	0.612	0.587	0.714	0.683	1.000		
EXRATE	-0.524	-0.498	-0.472	-0.431	-0.408	-0.372	1.000	
REPO	-0.447	-0.419	-0.388	-0.362	-0.341	-0.307	0.618	1.000

Note: All NSE index–mutual fund correlations are significant at the 1% level.

7.3 Unit-Root Testing

Table 3 reports ADF and PP results at levels and first differences. At levels, none of the twelve series reject the unit-root null, confirming non-stationarity — an expected property of financial and macroeconomic series. After first differencing, all series become stationary at the five percent level under both tests, establishing uniform I(1) integration. H_{04} is accordingly rejected for the differenced series, and the common order of integration satisfies the precondition for Johansen cointegration testing.

Table 3. Augmented Dickey-Fuller and Phillips-Perron Unit-Root Tests

Variable	ADF — Level	ADF — 1st Diff.	PP — Level	PP — 1st Diff.
NIFTY50	-1.224	−17.943*	-1.307	−79.482*
NIFTYMID	-0.984	−18.112*	-1.021	−78.914*
NIFTYSMALL	-1.103	−17.663*	-1.147	−77.341*
WPI	-1.874	−14.219*	-1.903	−56.207*
CPI	-1.762	−13.881*	-1.814	−54.693*
IIP	-2.013	−15.442*	-2.108	−61.375*
EXRATE	-0.847	−16.588*	-0.912	−65.201*
REPO	-1.632	−12.773*	-1.657	−49.834*
LC_MF	-0.912	−17.228*	-0.948	−53.641*
MC_MF	-0.876	−16.842*	-0.902	−51.882*
SC_MF	-0.941	−17.114*	-0.977	−52.317*
HYB_MF	-0.863	−16.619*	-0.889	−50.944*

Note: An asterisk (*) denotes stationarity at the 5% level. Critical values follow MacKinnon (1996). "1st Diff." denotes first difference.

7.4 VAR Lag-Order Selection

Lag-order selection was carried out using five information criteria — the Likelihood Ratio (LR) test, Akaike's Final Prediction Error (FPE), the Akaike Information Criterion (AIC), the Schwarz Information Criterion (SIC), and the Hannan-Quinn Criterion (HQ). The AIC — chosen for its comparative tolerance of richer lag structures in moderately large samples — selected a six-month optimal lag ($p = 6$), consistent with a relatively gradual transmission of macroeconomic information into fund NAVs at monthly frequency. The VAR stability check confirms that all inverse roots of the characteristic polynomial lie within the unit circle, supporting the dynamic stability of the model and the validity of the subsequent VECM estimation.

7.5 Johansen Cointegration Test

Table 4 reports the Johansen results. Both the trace and maximum-eigenvalue statistics identify six cointegrating equations at the five percent level, giving clear grounds to reject H_{05}. The presence of multiple cointegrating vectors indicates that the eleven-variable system is bound by several simultaneous long-run equilibrium relationships rather than a single one. At $r = 0$, the trace statistic (1,124.66) far exceeds its five percent critical value (364.77); successive rejections through $r \leq 4$ confirm the richness of this equilibrium structure.

Cointegration between NSE indices and mutual fund categories is unsurprising on theoretical grounds — price-discovery mechanisms, common exposure to systematic risk, and direct portfolio overlap all work against persistent divergence between index and fund prices. The more substantive result is that macroeconomic variables also enter this long-run equilibrium, implying that inflation, industrial output and monetary policy are not peripheral to fund pricing but structurally embedded in it. This extends the cross-country evidence of Butt et al. (2010) to the specific institutional setting of post-liberalisation India.

Table 4. Johansen Cointegration Test Results

Hyp. CE(s)	Eigenvalue	Trace Stat.	5% CV (Trace)	Max-Eigen Stat.	5% CV (Max)
r = 0	0.1142	1124.66	364.77*	318.41	83.37*
r ≤ 1	0.0874	806.25	311.52*	241.88	77.14*
r ≤ 2	0.0613	564.37	262.29*	168.42	70.67*
r ≤ 3	0.0481	395.95	218.11*	131.74	64.00*
r ≤ 4	0.0362	264.21	178.63*	98.37	57.36*
r ≤ 5	0.0247	165.84	143.56	67.11	51.15
r ≤ 6	0.0183	98.73	111.78	49.62	44.89
r ≤ 7	0.0094	49.11	83.94	25.41	38.33

Note: An asterisk (*) denotes significance at the 5% level. Critical values follow MacKinnon-Haug-Michelis (1999). Lag length = 6 (AIC-selected).

7.6 Vector Error Correction Model

Table 5 reports the VECM adjustment coefficients. Negative and statistically significant error-correction terms (ECTs) for the NSE indices and mutual fund categories confirm the equilibrium-restoring mechanism implied by cointegration theory. NIFTY 50 shows the largest adjustment speed (−0.7214), meaning roughly 72 percent of any short-run deviation from equilibrium is corrected within a single month — a velocity that reflects the index's comparatively high liquidity and informational efficiency.

Among the fund categories, mid-cap funds (MC_MF) show the largest adjustment coefficient (−0.5117), ahead of small-cap (−0.4662) and large-cap (−0.3412) composites. Hybrid funds adjust most slowly (−0.2817), consistent with the dampening effect of their cross-asset diversification on equity-driven price correction. Adjusted R^2 values for the index and fund equations range from roughly 32 to 47 percent — a reasonable level of explanatory power given the noise inherent in monthly NAV data.

The more consequential result concerns the macroeconomic block. The ECT coefficients for WPI, CPI, IIP, EXRATE and REPO are all statistically insignificant. The positive coefficients on exchange rate (0.2241) and repo rate (0.1712), while numerically plausible, fall short of the five percent significance threshold. This pattern suggests that these macroeconomic variables behave as weakly exogenous drivers of the system: they help determine the long-run equilibrium but do not themselves adjust in response to short-run deviations from it — an asymmetry in their informational role that the causality tests below help to unpack further.

Table 5. Vector Error Correction Model — Adjustment Coefficients

Variable	ECT Coeff.	Std. Error	t-Statistic	R^2	Adjusted R^2
NIFTY50	−0.7214	0.2841	−2.5392*	0.4817	0.4631**
NIFTYMID	−0.6438	0.2512	−2.5629*	0.4623	0.4448**
NIFTYSMALL	−0.5874	0.2301	−2.5527*	0.4386	0.4218**
LC_MF	−0.3412	0.1214	−2.8103*	0.3862	0.3714**
MC_MF	−0.5117	0.1887	−2.7116*	0.4114	0.3952**
SC_MF	−0.4662	0.1742	−2.6756*	0.3978	0.3801**
HYB_MF	−0.2817	0.1038	−2.7138*	0.3344	0.3182**
WPI	−0.1124	0.0884	−1.2714	0.0712	0.0581
CPI	−0.0981	0.0791	−1.2402	0.0648	0.0504
IIP	−0.1346	0.1021	−1.3183	0.0894	0.0724
EXRATE	0.2241	0.1638	1.3681	0.0542	0.0408
REPO	0.1712	0.1284	1.3333	0.0477	0.0342

Note: An asterisk (*) denotes significance at the 5% level; a double asterisk (**) flags the equations with the strongest explanatory power. All variables enter in first difference. The macroeconomic rows (WPI through REPO) are weakly exogenous — they shape the equilibrium without themselves adjusting toward it.

7.7 Granger Causality Analysis

Table 6 reports the pairwise Granger causality results, which form the analytical core of the paper's contribution. Three patterns stand out. First, all three NSE indices Granger-cause their corresponding fund categories at conventional significance levels, establishing clear unidirectional short-run predictability. The absence of reverse causality — from funds back to indices — is consistent with an informational hierarchy in which broad indices lead rather than follow fund NAVs.

Second, a partial exception appears between NIFTY Midcap 150 and the mid-cap fund composite. A weak reverse-causality result ($F = 3.214$, $p = 0.092$) hints at a tentative feedback channel through which mid-cap fund flows may anticipate, or reinforce, movements in the mid-cap segment of the index — a pattern broadly consistent with documented herding behaviour among institutional investors in that space, and a modest departure from strict informational exogeneity.

Third, and most substantively, the macroeconomic causality results surface the study's central contradictions. WPI shows weak but discernible causal influence on large-cap fund NAVs ($F = 2.841$, $p = 0.096$), plausibly reflecting the transmission of wholesale price movements into corporate input costs and, from there, into large-cap earnings expectations. CPI, despite being the more direct proxy for the erosion of purchasing power and investor sentiment, does not reach even the ten percent threshold in its relationship with large-cap funds ($F = 2.314$, $p = 0.128$). That asymmetry — a retail inflation measure showing less informational traction than its wholesale counterpart in institutional fund pricing — is not what standard theory would predict, and it is treated here as a genuine empirical puzzle rather than a footnote.

A second contradiction concerns monetary policy: the repo rate shows no significant causal influence on small-cap fund NAVs ($F = 1.124$, $p = 0.321$). Conventional theory holds that interest-rate changes, transmitted via discount rates and borrowing costs, should register more rather than less strongly in smaller, more leveraged firms. That the data show the opposite pattern may reflect the structural opacity of the small-cap segment, where information often moves through non-price channels, or the dominance of liquidity-driven retail flows that can override monetary-policy signals in the short run.

Table 6. Pairwise Granger Causality Tests (Lag = 6)

Causal Pair	F-Statistic	p-Value	Inference
NIFTY50 → LC_MF	7.412	0.001*	Unidirectional
LC_MF → NIFTY50	1.218	0.284	No causality
NIFTY50 → MC_MF	6.837	0.002*	Unidirectional
MC_MF → NIFTY50	0.974	0.381	No causality
NIFTY50 → SC_MF	8.211	0.000*	Unidirectional
SC_MF → NIFTY50	1.341	0.241	No causality
NIFTYMID → MC_MF	9.104	0.000*	Bidirectional (partial)
MC_MF → NIFTYMID	3.214	0.092***	Weak reverse
WPI → LC_MF	2.841	0.096***	Weak causality
CPI → LC_MF	2.314	0.128	No causality (contradiction)
IIP → MC_MF	4.217	0.018**	Unidirectional
EXRATE → MC_MF	3.441	0.063***	Weak causality
REPO → SC_MF	1.124	0.321	No causality (contradiction)
NIFTY50 → HYB_MF	5.612	0.006*	Unidirectional
HYB_MF → NIFTY50	0.874	0.416	No causality

Note: Asterisks (, ,) denote significance at the 1%, 5% and 10% levels, respectively. Rows marked "contradiction" identify cases where a theoretically expected causal relationship is empirically absent.

8. FINDINGS

1. Every study variable — NSE indices, mutual fund categories and macroeconomic indicators — rejects normality at the five percent level under the Jarque-Bera test, consistent with the fat-tailed, asymmetric character typical of financial and macroeconomic monthly data.

2. NSE indices correlate strongly ($r > 0.93$) with all four mutual fund categories, confirming systematic co-movement and warranting rejection of H_{02}. Macroeconomic variables show moderate positive association with the equity series, while the exchange rate and repo rate show negative association, consistent with their conventional role as constraint variables.

3. All twelve series are integrated of order one, I(1), under both the ADF and PP tests, satisfying the precondition for Johansen cointegration analysis.

4. The Johansen test identifies six cointegrating equations, confirming multiple long-run equilibrium relationships linking NSE indices, mutual fund categories and macroeconomic variables within a single price-discovery system.

5. NIFTY 50 shows the fastest equilibrium-adjustment speed (72.14%), followed by NIFTY Midcap 150 — consistent with the comparatively high informational efficiency of the large-cap segment. Hybrid funds adjust most slowly, reflecting their multi-asset structure.

6. Granger causality confirms robust unidirectional price leadership from NSE indices to their corresponding fund categories. A partial bidirectional relationship between NIFTY Midcap 150 and mid-cap funds points to emerging institutional herding dynamics in that segment.

7. Two empirical contradictions are identified: (a) CPI does not Granger-cause large-cap fund NAVs even though WPI does, indicating that the two inflation measures carry different informational weight in fund pricing; and (b) the repo rate shows no significant short-run causality over small-cap fund categories, at odds with standard monetary-transmission theory and suggestive of structural segmentation within India's capital market.

8. IIP and the exchange rate show moderate causal influence over mid-cap fund categories, consistent with the sensitivity of medium-sized firms to industrial-output cycles and currency movements, and broadly in line with the export–import composition typical of mid-cap portfolios.

9. IMPLICATIONS

For retail investors, the strong and consistent causal dominance of NSE indices over fund NAVs suggests that tracking index movements — NIFTY 50 and NIFTY Midcap 150 in particular — offers a low-cost, accessible signal for anticipating fund performance. The roughly six-month informational lag embedded in the VECM structure translates into a practical, econometrically grounded timing signal for individual investors.

For institutional fund managers, the uneven responsiveness of different fund categories to macroeconomic variables argues for category-specific risk management rather than a single macro overlay applied uniformly across a fund family. The finding that WPI, rather than CPI, carries more predictive weight for large-cap fund valuations suggests that large-cap allocation decisions might reasonably place more emphasis on producer-price dynamics and input-cost pressure than on headline retail inflation. The apparent irrelevance of CPI in this context — counterintuitive as it may seem — could reflect the pricing power of large-cap firms, which allows them to pass inflationary costs through to consumers and thereby partially insulate fund NAVs from short-run retail inflation shocks.

The repo-rate contradiction for small-cap funds carries a distinct operational implication. If monetary tightening does not reliably show up in small-cap fund pricing within a conventional short-run window, fund managers may be underweighting liquidity and sentiment channels relative to the earnings and discount-rate channels through which policy typically operates. A more granular decomposition of repo-rate effects — separating direct borrowing-cost transmission from investor risk appetite and foreign institutional flow dynamics — could sharpen how interest-rate sensitivity is managed within small-cap portfolios specifically.

At the regulatory level, the presence of weakly exogenous macroeconomic variables within the equilibrium system is directly relevant to how market regulators monitor price formation. The absence of CPI causality and repo-rate transmission may reflect genuine market segmentation, but it could equally point to informational inefficiencies or disclosure gaps concentrated in smaller, less liquid fund categories. Measures that improve disclosure standards, trading frequency and liquidity provision in the mid- and small-cap fund segments could, over time, narrow the contradictions this study documents.

10. LIMITATIONS

The study's reliance on category-level composites, rather than fund-by-fund analysis, may mask heterogeneity within each category that a more granular dataset could reveal. Monthly-frequency data, while adequate for the asymptotic requirements of the econometric procedures used, cannot capture higher-frequency dynamics that might matter for short-horizon investment decisions. Finally, the macroeconomic variables used here are official, revised series; real-time (unrevised) data, which better reflect the information actually available to market participants at the time, might alter the strength — though probably not the direction — of some of the causality results reported above.

11. CONCLUSION

This study has examined the price-movement relationships among NSE indices, macroeconomic variables and open-ended equity mutual fund categories in India, using monthly data from 2011 to 2023 and a multivariate framework combining Johansen cointegration, VECM estimation and Granger causality testing. The resulting picture is a differentiated one — it confirms the long-run equilibrium and short-run predictive relationships that rational-expectations and efficient-market theory would anticipate, while also documenting specific, well-defined departures from that theory that resist simple explanation.

The cointegration and causality results linking NSE indices to mutual fund categories are unambiguous: domestic benchmarks lead fund NAVs in the short run and share a long-run equilibrium with them, giving fund managers and investors a validated basis for incorporating index signals into performance forecasting. That adjustment speeds differ systematically across categories — fastest for NIFTY 50 and large-cap funds — adds a further layer of practical detail to how different market segments absorb price information.

The contradictions matter just as much. The absence of CPI causality over large-cap funds, and the absence of repo-rate causality over small-cap funds, indicate that India's capital market does not behave as a uniformly efficient conduit for macroeconomic signals. Instead, it appears segmented — by information environment, investor base and fund-category structure — in ways that produce asymmetric transmission of macroeconomic impulses. Mapping these contradictions carefully is not simply an academic exercise: it has direct bearing on the construction of more accurate pricing models, more resilient investment strategies, and more precisely targeted regulatory interventions in a market that continues to deepen its integration with global capital flows.

Future work could extend this framework along several lines: disaggregating fund categories to a sectoral level to capture industry-specific heterogeneity; incorporating asymmetric GARCH specifications to study volatility transmission alongside price transmission; and applying the same framework to comparable emerging markets to determine whether the contradictions identified here are specific to India or a more general feature of emerging-market capital-market structure.

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