Do Indian Sectoral Indices Follow a Random Walk? Empirical Evidence from Random Walk Tests

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ABSTRACT

This study examines the weak-form market efficiency of major sectoral indices in the Indian stock market using daily return data. The analysis employs descriptive statistics, the Augmented Dickey–Fuller (ADF) unit root test, autocorrelation analysis, and the Variance Ratio (VR) test. Descriptive statistics reveal non-normality, volatility clustering, and fat-tailed distributions across all sectors. The ADF test confirms stationarity of sectoral return series at the level, indicating that returns do not follow a unit root process. Autocorrelation results largely suggest weak or insignificant linear dependence, whereas the Variance Ratio test strongly rejects the random walk hypothesis across all sectors and holding periods. Overall, the findings provide robust evidence against weak-form market efficiency in Indian sectoral indices and indicate the presence of mean-reverting behaviour and short-term predictability.

Keywords

Market Efficiency, Sectoral Indices, Indian Stock Market, Random Walk Hypothesis, Variance Ratio Test, ADF Test

1. Introduction

The concept of market efficiency plays a central role in financial economics, as it determines whether investors can consistently earn abnormal returns by using available information. According to the Efficient Market Hypothesis (EMH), stock prices fully and instantaneously reflect all relevant information, implying that past price movements cannot be used to predict future returns. Among its three forms—weak, semi-strong, and strong—the weak form is the most fundamental, asserting that current prices already incorporate all historical price information.

In emerging markets such as India, the validity of weak-form efficiency remains an open empirical question. The Indian stock market has experienced a rapid structural transformation in recent years, marked by increased retail participation, sectoral expansion, technological advancements, and heightened exposure to global shocks. These developments raise important questions regarding the informational efficiency of different market segments, particularly at the sectoral level, where firm behaviour and risk characteristics may vary substantially.

Most prior studies on market efficiency in India have focused on broad market indices such as the Sensex or Nifty 50. While these indices provide useful aggregate insights, they may conceal inefficiencies present within specific sectors. Sectoral indices represent more homogeneous groups of firms and are therefore better suited to capture differential adjustment processes, information dissemination, and investor behaviour. Against this backdrop, the present study empirically examines weak-form market efficiency across major NSE sectoral indices using a battery of econometric tests.

2. Literature Review

Pankunni and Lesaoana (2025), *"Measuring and Comparing the Market Efficiency of NSE and BSE",* examined weak-form and strong-form efficiency using the runs test and SML model. Their findings indicated that stock price movements were non-random and did not follow a normal distribution, suggesting that both exchanges were weak-form and strong-form inefficient. Manisha and Sony (2024), *"A Study on Efficiency of the Indian Stock Market",* tested the Sensex and Nifty daily returns and found predictable behaviour inconsistent with random walk theory, concluding that the Indian stock market does not demonstrate weak-form efficiency.

Yasa, Biswas, and Animela (2024), *"Examining the Random Walk Hypothesis: An Investigation of the Indian Stock Market"* tested eight Indian companies using the runs test and observed results partially supporting the Random Walk Hypothesis. Their findings suggested selective weak-form efficiency in certain stocks.Dutta (2023), *"The Weak-Form Efficiency of the Indian Stock Market: Fresh Evidence",* analysed eight sectoral indices using the unit root, runs test, and

variance ratio test. The results showed that price movements did not follow a random walk, indicating that the market remained weak-form inefficient.

Elangoavan and Parayitam (2022), *"Testing the Market Efficiency in the Indian Stock Market: Evidence from Bombay Stock Exchange Broad Market Indices",* examined nine BSE indices using unit root tests, descriptive statistics, autocorrelation, and runs tests. Their study revealed that prices did not move randomly and confirmed weak-form inefficiency.

Empirical evidence on weak-form market efficiency in India is largely mixed. Several studies, such as Dutta (2023) and Pankunni and Lesaoana (2025), report persistent weak-form inefficiency, attributing it to non-random price movements and predictable return patterns. Studies using sectoral indices (Elangoavan & Parayitam, 2022) further highlight that inefficiency is not uniform across sectors.

International evidence also suggests that emerging markets tend to exhibit lower levels of efficiency compared to developed markets (Akbar & Bhutto, 2023; Lee & Choi, 2023). More recent studies adopting time-varying frameworks argue that efficiency is dynamic and sensitive to crises, such as the COVID-19 pandemic (Syed Moudud-Ul-Huq & Rahman, 2025; Shaik, 2024).

3. Objectives of the Study

The present study is undertaken with the following specific objectives:

1. To examine the descriptive characteristics of returns of Indian sectoral indices.
2. To test the stationarity properties of sectoral return series using the Augmented Dickey–Fuller (ADF) test.
3. To analyse the presence of linear dependence in sectoral returns through autocorrelation and Ljung–Box Q-statistics.
4. To test the Random Walk Hypothesis and weak-form market efficiency of sectoral indices using the Variance Ratio test.
5. To draw sector-wise inferences regarding market efficiency in the Indian stock market.

4. Data and Sample Description

The study is based on daily closing price data of the NIFTY index and major sectoral indices of the Indian stock market, namely Auto, Energy, Financial Services, FMCG, IT, Media, Metal, Pharma, and Realty. The sample consists of approximately 990–991 daily observations for each index. Daily logarithmic returns are computed from closing prices to conduct the empirical analysis. The selected period, is 1st January 2022 to 31st December 2025, captures diverse market conditions, including phases of volatility and structural changes, making it suitable for testing market efficiency.

5. Methodology

To examine weak-form market efficiency, the study employs the following econometric methods using EViews software:

- **Descriptive Statistics**: Mean, standard deviation, skewness, kurtosis, and the Jarque–Bera test are used to understand the distributional properties of sectoral returns.
- **Augmented Dickey–Fuller (ADF) Test**: The ADF test is applied at the level with intercept only and with intercept and trend to examine the stationarity of the return series.
- **Autocorrelation Analysis**: Autocorrelation (AC), partial autocorrelation (PAC), and Ljung–Box Q-statistics are employed to detect linear dependence in returns.
- **Variance Ratio (VR) Test**: The Lo and MacKinlay Variance Ratio test is applied for multiple holding periods (2, 4, 8, and 16) to test the Random Walk Hypothesis and weak-form market efficiency.

6. Empirical Results and Discussion

6.1 Descriptive Statistics

Table 1
Descriptive Statistic

Description	NIFTY	FS	AUTO	ENERGY	FMCG
Mean	0.000442	0.000498	0.001007	0.000520	0.000429
Median	0.000729	0.000712	0.000817	0.000904	0.000210
Maximum	0.038623	0.046376	0.047016	0.067727	0.043407
Minimum	-0.065913	-0.078636	-0.062631	-0.124652	-0.033338
Std. Dev.	0.008677	0.010214	0.011486	0.012577	0.008536
Skewness	-0.6158	-0.5724	-0.2494	-1.1512	0.1091
Kurtosis	8.6151	8.9714	5.2659	14.3792	4.5235
Jarque-Bera	1364.50	1524.94	222.06	5559.95	97.71
Probability	0.000	0.000	0.000	0.000	0.000
Sum	0.438392	0.493173	0.996450	0.514816	0.424850
Sum Sq. Dev.	0.074535	0.103173	0.130469	0.156446	0.072054
Observations	991	990	990	990	990

(Continuation….)

Statistic	IT	MEDIA	METAL	PHARMA	REALTY
Mean	0.000055	-0.000314	0.000823	0.000523	0.000727
Median	-0.000105	0.000372	0.001800	0.000484	0.001086
Maximum	0.066958	0.066303	0.068564	0.036874	0.067640
Minimum	-0.057370	-0.129338	-0.106324	-0.040308	-0.096246
Std. Dev.	0.013212	0.016292	0.016112	0.009428	0.016555
Skewness	0.0626	-0.6612	-0.6327	-0.0702	-0.4047
Kurtosis	5.1437	8.1872	7.2794	4.1887	5.6095
Jarque-Bera	190.20	1182.08	821.45	59.09	307.91
Probability	0.000	0.000	0.000	0.000	0.000
Sum	0.054099	-0.311089	0.814744	0.517308	0.720196
Sum Sq. Dev.	0.172634	0.262494	0.256752	0.087904	0.271043
Observations	990	990	990	990	990

Source: Authors Computation

Interpretation:

The mean returns across sectoral indices are generally small and positive, indicating modest average daily returns. In **Table 1**, the AUTO (0.001007), METAL (0.000823), REALTY (0.000727), and PHARMA (0.000523) sectors show relatively higher mean returns, suggesting comparatively better average performance over the study period. In contrast, the MEDIA (-0.000314) sector exhibits a negative mean return, indicating underperformance. The reason for the negative return is increased interest rates and liquidity crunch during the study period.

Standard deviation values vary considerably across sectors, implying heterogeneous risk profiles. MEDIA (0.016292), REALTY (0.016555), METAL (0.016112), and IT (0.013212) sectors exhibit the highest volatility, suggesting higher risk for investors. Conversely, FMCG (0.00853), NIFTY, and PHARMA (0.009428) show lower volatility, indicating relatively stable return behaviour and defensive characteristics. Most sectoral returns are negatively skewed, implying a higher probability of extreme negative returns than positive ones. The ENERGY (-1.1512) and MEDIA (-0.6612) sectors show

strong negative skewness, reflecting downside risk. A few sectors, such as FMCG (0.1091) and IT (0.0626), exhibit slight positive skewness, suggesting relatively balanced or favourable return distributions.

All sectors exhibit kurtosis greater than 3, indicating leptokurtic distributions. This implies the presence of fat tails and a higher likelihood of extreme returns compared to a normal distribution. The ENERGY and MEDIA sectors show exceptionally high kurtosis, reflecting frequent large shocks and heightened tail risk.The Jarque–Bera statistics are significant for all sectors with p values less than 0.05 significance level, leading to the rejection of the null hypothesis of normality. This states that sectoral return series, along with Nifty, are non-normally distributed, a common characteristic of financial return data.

6.2 Unit Root Test Results (ADF Test)

Table 2
ADF TEST

Indices	**At Level (With intercept only)**		**At Level(With intercept & trend)**	
	t-statistic	**P-value**	**t-statistic**	**P-value**
Nifty	-32.02482	0.0000	-32.01183	0.0000
Auto	-29.86468	0.0000	-29.84970	0.0000
Energy	-31.64889	0.0000	-31.65408	0.0000
Fins	-32.10267	0.0000	-32.09318	0.0000
FMCG	-31.21209	0.0000	-31.25017	0.0000
IT	-30.07343	0.0000	-30.08819	0.0000
Media	-31.82858	0.0000	-31.81971	0.0000
Metal	-31.76487	0.0000	-31.75142	0.0000
Pharma	-30.84259	0.0000	-30.84195	0.0000
Realty	-28.91841	0.0000	-28.90485	0.0000
Test critical value	1% level	-3.436742	1% level	-3.967355
	5% level	-2.864251	5% level	-3.414364
	10% level	-2.568266	10% level	-3.129308

Source: Authors Computation

The Augmented Dickey–Fuller (ADF) test was employed to examine the stationarity properties of sectoral indices at the level, both with intercept only and with intercept and trend.

Null hypothesis (H_0): The series has a unit root (non-stationary).

Alternative hypothesis (H_1): The series is stationary.

If the ADF t-statistic is more negative than the critical value and the p-value < 0.05, the null hypothesis is rejected. **Table 2** shows that all sectoral indices, Auto, Energy, Financial Services, FMCG, IT, Media, Metal, Pharma, and Realty, with Nifty, show ADF t-statistics that are far more negative than the 1%, 5%, and 10% critical values. Additionally, the p-values are 0.0000 for all indices. This indicates that all series are stationary at the level, even without including a deterministic trend.

When both intercept and trend are included, the ADF statistics remain highly significant for all indices. The calculated t-statistics again exceed the critical values at the 1% significance level, with p-values equal to 0.0000. This confirms that stationarity holds even after accounting for possible deterministic trends. Hence, the return data of all the sectors support inefficiency of the market and therefore, future returns cannot be predicted using previous returns

The ADF test results at the level, both with intercept only and with intercept and trend, reveal highly significant negative t-statistics for all sectoral indices. These values exceed the critical values at the 1% significance level, and the corresponding p-values are effectively zero. Consequently, the null hypothesis of a unit root is rejected for all indices, indicating that sectoral returns are stationary at level (I(0)). This confirms that return series do not follow a random walk driven by a unit root process.

6.3 Autocorrelation Analysis

TABLE 3.1
Autocorrelation test of Nifty

Lag	AC	PAC	Q-Stat	Prob
1	-0.019	-0.019	0.3495	0.554
2	0.024	0.024	0.9247	0.630
3	0.010	0.011	1.0283	0.794
4	0.017	0.017	1.3075	0.860
5	-0.033	-0.033	2.3903	0.793
6	-0.018	-0.020	2.7212	0.843
7	-0.043	-0.043	4.6023	0.708
8	-0.035	-0.035	5.8327	0.666
9	0.010	0.012	5.9312	0.747
10	-0.021	-0.018	6.3697	0.783
11	0.012	0.011	6.5058	0.838
12	0.026	0.025	7.1737	0.846
13	-0.030	-0.033	8.0657	0.839
14	-0.009	-0.014	8.1465	0.882
15	0.033	0.030	9.2656	0.863
16	-0.005	-0.004	9.2947	0.901

Source: Authors Computation

TABLE 3.2
Autocorrelation test of Nifty Auto

Lag	AC	PAC	Q-Stat	Prob
1	0.051	0.051	2.5801	0.108
2	0.017	0.014	2.8528	0.240
3	0.012	0.010	2.9867	0.394
4	-0.011	-0.013	3.1134	0.539
5	-0.035	-0.034	4.3025	0.507
6	0.026	0.029	4.9550	0.550
7	-0.101	-0.103	15.127	0.034
8	-0.047	-0.037	17.312	0.027
9	0.036	0.043	18.626	0.029
10	-0.001	-0.002	18.627	0.045
11	0.009	0.008	18.702	0.067
12	-0.013	-0.024	18.880	0.091
13	-0.019	-0.014	19.255	0.115
14	-0.007	-0.010	19.300	0.154
15	-0.008	-0.018	19.364	0.198
16	0.024	0.034	19.969	0.222

Source: Authors Computation

TABLE 3.3
Autocorrelation of Nifty Financial Services

Lag	AC	PAC	Q-Stat	Prob
1	-0.022	-0.022	0.4763	0.490
2	0.020	0.019	0.8664	0.648
3	0.005	0.006	0.8887	0.828
4	0.055	0.055	3.9184	0.417
5	-0.031	-0.029	4.9069	0.427
6	-0.036	-0.040	6.2159	0.399
7	-0.027	-0.029	6.9682	0.432
8	-0.057	-0.060	10.203	0.251
9	-0.007	-0.004	10.248	0.331
10	-0.059	-0.054	13.782	0.183
11	0.022	0.021	14.259	0.219
12	0.042	0.049	16.032	0.190
13	-0.030	-0.034	16.953	0.201
14	0.003	0.000	16.960	0.258
15	0.037	0.028	18.303	0.247
16	-0.014	-0.025	18.506	0.295

Source: Authors Computation

TABLE 3.4
Auto correlation of Nifty Energy

Lag	AC	PAC	Q-Stat	Prob
1	-0.008	-0.008	0.0682	0.794
2	0.021	0.021	0.5203	0.771
3	0.010	0.010	0.6126	0.894
4	0.002	0.002	0.6159	0.961
5	-0.027	-0.028	1.3628	0.928
6	0.002	0.002	1.3683	0.968
7	-0.042	-0.041	3.1497	0.871
8	-0.009	-0.009	3.2271	0.919
9	0.012	0.014	3.3796	0.947
10	0.037	0.038	4.7782	0.905
11	0.022	0.022	5.2436	0.919
12	0.020	0.016	5.6469	0.933
13	0.019	0.018	6.0277	0.945
14	0.024	0.022	6.5931	0.949
15	0.038	0.039	8.0528	0.922
16	0.049	0.050	10.437	0.843

Source: Authors Computation

TABLE 3.5
Auto correlation of Nifty FMCG

Lag	AC	PAC	Q-Stat	Prob
1	0.007	0.007	0.0456	0.831
2	0.010	0.010	0.1471	0.929
3	-0.010	-0.010	0.2518	0.969
4	-0.030	-0.030	1.1544	0.886
5	0.009	0.009	1.2324	0.942

6	0.018	0.018	1.5514	0.956
7	-0.042	-0.043	3.2770	0.858
8	0.009	0.009	3.3633	0.910
9	-0.046	-0.044	5.4804	0.791
10	0.084	0.085	12.619	0.246
11	0.008	0.005	12.688	0.314
12	0.010	0.008	12.782	0.385
13	0.001	0.001	12.783	0.465
14	-0.010	-0.007	12.891	0.535
15	0.035	0.037	14.102	0.518
16	0.011	0.004	14.227	0.582

Source: Authors Computation

TABLE 3.6
Auto correlation of Nifty IT

Lag	AC	PAC	Q-Stat	Prob
1	0.044	0.044	1.8850	0.170
2	-0.003	-0.005	1.8949	0.388
3	0.016	0.016	2.1441	0.543
4	0.011	0.009	2.2542	0.689
5	-0.013	-0.014	2.4246	0.788
6	-0.049	-0.048	4.8475	0.564
7	-0.048	-0.044	7.1028	0.418
8	-0.019	-0.016	7.4698	0.487
9	0.043	0.047	9.3586	0.405
10	0.015	0.014	9.5834	0.478
11	-0.017	-0.018	9.8745	0.542
12	0.048	0.045	12.205	0.429
13	0.013	0.002	12.365	0.498
14	-0.016	-0.019	12.634	0.556
15	0.004	0.007	12.649	0.629
16	0.022	0.025	13.144	0.662

Source: Authors Computation

TABLE 3.7
Auto correlation of Nifty Media

Lag	AC	PAC	Q-Stat	Prob
1	-0.013	-0.013	0.1572	0.692
2	0.006	0.005	0.1883	0.910
3	-0.006	-0.005	0.2185	0.975
4	-0.006	-0.006	0.2506	0.993
5	-0.032	-0.032	1.2486	0.940
6	-0.031	-0.032	2.2228	0.898
7	-0.011	-0.011	2.3352	0.939
8	0.001	0.000	2.3358	0.969
9	-0.006	-0.006	2.3668	0.984
10	0.042	0.041	4.1661	0.940
11	0.026	0.025	4.8283	0.939
12	-0.029	-0.031	5.6752	0.932

13	0.032	0.030	6.6803	0.918
14	0.014	0.015	6.8647	0.940
15	-0.072	-0.070	12.109	0.671
16	0.004	0.007	12.129	0.735

Source: Authors Computation

TABLE 3.8
Auto correlation of Nifty Metal

Lag	AC	PAC	Q-Stat	Prob
1	-0.011	-0.011	0.1137	0.736
2	0.031	0.030	1.0409	0.594
3	-0.007	-0.006	1.0902	0.779
4	0.003	0.002	1.0997	0.894
5	-0.059	-0.059	4.5859	0.468
6	-0.027	-0.028	5.2906	0.507
7	-0.016	-0.013	5.5481	0.593
8	-0.003	-0.003	5.5598	0.696
9	0.008	0.009	5.6262	0.777
10	-0.027	-0.030	6.3606	0.784
11	0.029	0.025	7.2125	0.782
12	0.004	0.004	7.2281	0.842
13	0.015	0.012	7.4443	0.878
14	-0.001	0.000	7.4450	0.916
15	0.002	-0.002	7.4507	0.944
16	0.022	0.024	7.9423	0.951

Source: Authors Computation

TABLE 3.9
Auto correlation of Nifty Pharma

Lag	AC	PAC	Q-Stat	Prob
1	0.018	0.018	0.3333	0.564
2	-0.007	-0.007	0.3775	0.828
3	0.035	0.036	1.6217	0.654
4	0.002	0.000	1.6243	0.804
5	-0.032	-0.031	2.6215	0.758
6	-0.000	-0.000	2.6217	0.855
7	0.008	0.008	2.6861	0.912
8	-0.040	-0.038	4.2756	0.831
9	-0.027	-0.025	4.9905	0.835
10	-0.083	-0.085	11.963	0.288
11	0.050	0.056	14.489	0.207
12	0.030	0.029	15.369	0.222
13	-0.061	-0.059	19.113	0.120
14	0.013	0.011	19.282	0.154
15	-0.011	-0.019	19.404	0.196
16	-0.004	0.003	19.420	0.247

Source: Authors Computation

TABLE 3.10
Auto correlation of Nifty Realty

Lag	AC	PAC	Q-Stat	Prob
1	0.083	0.083	6.7958	0.009
2	-0.006	-0.013	6.8295	0.033
3	0.028	0.030	7.5994	0.055
4	0.010	0.006	7.7078	0.103
5	-0.040	-0.041	9.2771	0.099
6	-0.011	-0.005	9.4061	0.152
7	-0.048	-0.048	11.694	0.111
8	-0.042	-0.032	13.450	0.097
9	-0.017	-0.010	13.726	0.132
10	0.047	0.050	15.902	0.102
11	0.021	0.015	16.337	0.129
12	-0.006	-0.010	16.369	0.175
13	-0.006	-0.010	16.401	0.228
14	0.025	0.020	17.008	0.256
15	0.024	0.020	17.565	0.286
16	-0.029	-0.032	18.394	0.301

Source: Authors Computation

Interpretation:

Table 3.1 shows that the AC and PAC values of NIFTY are very small at all lags. The Q-stat Prob values remain above 5% significance level. There is no significant autocorrelation, and the series is stationary and random, whereas **Table 3.2** states that Auto shows slight fluctuations at mid-lags (7–10), but no consistent pattern. The Q-stat probabilities are mostly above 0.05. There is weak short-run dependence, but statistically insignificant. **Table 3.3**, The Financial Services autocorrelation states AC and PAC values remain close to zero. The Ljung–Box test does not reject the null hypothesis. There is strong evidence of white noise behaviour. In **Table 3.4**, the Energy Sector has very low AC and PAC across all lags. It has High probability values with no memory effect. The returns are independent over time.

Table 3.5 shows that the FMCG Sector has slight spikes at lag 10, but not persistently. The Q-stat probabilities remain insignificant. It has Minor random shocks, but no systematic autocorrelation. In **Table 3.6**, the IT Sector has a small negative autocorrelation at a few lags. The Q-stat probabilities remain above 0.05. There exist Short-term adjustments, but no long-term dependence. **Table 3.7** shows that the Media Sector's AC and PAC are consistently low. The Ljung–Box statistics confirm no serial correlation. Therefore, returns follow a random walk pattern.

In **Table 3.8**, the Metal Sector shows uniformly low AC and PAC. It has very high Q-stat probabilities at all lags. There is strong evidence of white noise. Table **3.9**, Pharma Sector has Minor oscillations in AC/PAC. There is no statistically significant autocorrelation and the sector prices adjust quickly to information. Finally, The **Table** 3.10, the Realty Sector show significant autocorrelation at Lag 1 (Prob < 0.05). After lag 2, autocorrelation diminishes.

This indicates that prices adjust rapidly to new information, consistent with a degree of informational efficiency.

6.4 Variance Ratio Test Results

TABLE 4
VARIANCE RATIO TEST

Sector	Period	Variance Ratio	z-Statistic	Probability
Nifty	2	0.479829	-5.914577	0.0000
	4	0.242476	-5.404856	0.0000
	8	0.128468	-4.890192	0.0000
	16	0.062819	-4.264740	0.0000
Auto	2	0.518810	-9.184082	0.0000
	4	0.267732	-8.345091	0.0000
	8	0.139350	-6.996831	0.0000
	16	0.065279	-5.401053	0.0000
Financial Services	2	0.479617	-5.986183	0.0000
	4	0.231925	-5.575491	0.0000
	8	0.130621	-4.962473	0.0000
	16	0.063367	-4.295637	0.0000
Energy	2	0.486205	-4.733638	0.0000
	4	0.248841	-4.425799	0.0000
	8	0.126414	-4.166810	0.0000
	16	0.060291	-3.862852	0.0001
FMCG	2	0.499272	-11.23229	0.0000
	4	0.260661	-9.709891	0.0000
	8	0.126256	-7.902891	0.0000
	16	0.063451	-5.917094	0.0000
IT	2	0.524836	-10.22146	0.0000
	4	0.259571	-9.325288	0.0000
	8	0.134541	-7.684278	0.0000
	16	0.064998	-5.963793	0.0000
Media	2	0.492001	-7.949654	0.0000
	4	0.249669	-7.317002	0.0000
	8	0.124868	-6.532617	0.0000
	16	0.062639	-5.393543	0.0000
Metal	2	0.480034	-7.756525	0.0000
	4	0.247787	-6.771196	0.0000
	8	0.125257	-5.770002	0.0000
	16	0.061434	-4.812218	0.0000
Pharma	2	0.513729	-9.554596	0.0000
	4	0.255633	-8.387573	0.0000
	8	0.133940	-6.844260	0.0000
	16	0.065196	-5.488867	0.0000
Realty	2	0.549177	-7.196420	0.0000
	4	0.271094	-7.098228	0.0000
	8	0.143632	-6.202352	0.0000
	16	0.071284	-5.052528	0.0000

Source: Authors Computation

Interpretation:

The Variance Ratio test provides strong evidence against the random walk hypothesis for all sectoral indices and holding periods **(2, 4, 8, and 16)**. Variance ratio values are consistently less than unity and decline monotonically as the holding period increases, indicating mean-reverting behaviour rather than random walk dynamics. The associated z-statistics are negative and highly significant at the 1% level, leading to a decisive rejection of weak-form market efficiency.

Sector-wise analysis reveals that Realty, IT, FMCG, and Auto exhibit relatively higher variance ratios, suggesting stronger short-term dependence. In contrast, Energy, Metal, and Financial Services display lower variance ratios, reflecting stronger mean reversion. Notably, the VR test captures multi-period and non-linear dependence that is not detected by simple autocorrelation tests, making it a more powerful tool for assessing market efficiency.

7.Findings and Implications

The empirical analysis of Indian sectoral indices reveals several important insights into return behaviour and market efficiency. Descriptive statistics indicate that returns across all sectors are non-normally distributed, exhibiting negative skewness, excess kurtosis, and significant Jarque–Bera statistics. This suggests the presence of fat tails, volatility clustering, and frequent extreme price movements, highlighting higher downside risk and instability in sectoral returns. Such characteristics are typical of emerging markets and imply that investors face asymmetric risk and potential market shocks that are not adequately captured by normal distribution assumptions.

The Augmented Dickey–Fuller (ADF) test results confirm that all sectoral return series, including the NIFTY index, are stationary at level, both with intercept and with intercept and trend. The rejection of the unit root hypothesis indicates that returns do not follow a pure random walk process. While autocorrelation analysis shows that linear dependence in returns is generally weak and statistically insignificant across most sectors, minor short-term dependence is observed in certain cases, such as the Realty sector. This suggests that prices tend to adjust rapidly to new information, yet do not do so in a perfectly random manner.

Most importantly, the Variance Ratio test provides strong and consistent evidence against the random walk hypothesis for all sectoral indices and across multiple holding periods. Variance ratios are significantly less than unity and decline with longer horizons, indicating mean-reverting behaviour and short-term predictability in sectoral returns. This finding implies that Indian sectoral indices are not weak-form efficient, even though traditional autocorrelation tests may fail to detect inefficiencies.

From an implications perspective, the results suggest that investors and portfolio managers may be able to exploit short-term predictability and mean-reversion patterns through active trading and sector rotation strategies. The presence of inefficiencies also indicates that passive investment strategies may not always be optimal at the sectoral level in India. For policymakers and regulators, the findings highlight the need to strengthen market microstructure, information dissemination, and transparency to enhance market efficiency. Overall, the study underscores that while Indian sectoral markets exhibit rapid information adjustment, they remain characterised by structural inefficiencies that allow deviations from random walk behaviour.

8. Conclusion

This study empirically examines the weak-form efficiency of Indian sectoral indices using multiple econometric techniques. The findings reveal non-normal return distributions, stationarity at level, weak linear dependence, and strong mean reversion across sectors. Most importantly, the Variance Ratio test robustly rejects the random walk hypothesis for all indices. Overall, the results indicate that the Indian stock market, at the sectoral level, is not weak-form efficient. These findings have important implications for investors, portfolio managers, and policymakers concerned with market development and efficiency.

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