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Are IT Stocks Driving the Indian Equity Market? A Dynamic Causality and Cointegration Study

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Abstract

This study examines the dynamic linkage between the Nifty IT index and the NSE Nifty 50 index using weekly data from April 2020 to March 2025. The Augmented Dickey-Fuller (ADF) unit root test reveals that both indices are non-stationary at level, with test statistics of −1.37 (Nifty 50) and −1.12 (Nifty IT), but become stationary at first difference, with significantly negative values of −9.82 and −15.63 respectively ($p = 0.0000$), confirming integration of order one, I(1). Johansen's cointegration test indicates the existence of one long-run equilibrium relationship, as the Trace statistic (21.84216) exceeds the 5% critical value (15.49471) with a probability of 0.0031, supported by the Maximum Eigenvalue statistic (17.91432; $p = 0.0127$). Furthermore, Granger causality results demonstrate bidirectional causality between the indices, with Nifty IT Granger-causing Nifty 50 ($F = 14.7826$, $p = 0.0002$) and Nifty 50 Granger-causing Nifty IT ($F = 6.9541$, $p = 0.0091$). These findings confirm strong long-run integration and short-run interdependence, highlighting the systemic significance of the IT sector in influencing overall market dynamics in India.

Keywords: Nifty IT Index, NSE Nifty 50, Cointegration Analysis, Granger Causality

Introduction:

The Information Technology (IT) sector has become a central driver of India's economic transformation, contributing substantially to GDP, exports, and skilled employment generation. Since the post-liberalization period, India's IT industry has expanded rapidly due to globalization, digital outsourcing, and technological innovation (Arora & Athreye, 2013). The sector's global integration makes it highly responsive to international demand, exchange rate volatility, and technological disruption (Kumar & Joseph, 2016). The Nifty IT index reflects the market valuation of leading technology firms, many of which hold significant weight in the NSE Nifty 50. Consequently, fluctuations in IT stocks can influence broader market sentiment and index performance. Studies have shown that sectoral leaders often drive aggregate market movements in emerging economies like India (Bekaert & Harvey, 2014). More recently, digital transformation and artificial intelligence adoption have further strengthened the sector's systemic relevance (Brynjolfsson & McAfee, 2017; RBI, 2022). Therefore, examining the dynamic interaction between the IT sector and the Nifty 50 provides valuable insights into market integration, systemic risk, and long-term investment patterns.The NSE Nifty 50 index serves as a benchmark indicator of India's equity market performance, incorporating major companies across diversified sectors. Among these, IT firms occupy a dominant position due to their market capitalization and export-driven revenues. Empirical research suggests that sectoral indices with high capitalization tend to exhibit strong co-movement with broader market indices (Mukherjee &

Mishra, 2010). As financial markets deepen and trading mechanisms become technologically advanced, sectoral integration within the stock market increases (Nymoen, 2019). The Indian equity market has experienced rising cross-sectoral linkages due to institutional investments, algorithmic trading, and global capital flows (SEBI, 2021). Given that IT companies are heavily influenced by global macroeconomic indicators, shocks in international markets can transmit to the Nifty 50 through the IT segment (Ghosh, 2017). Cointegration between the IT index and Nifty 50 would imply the existence of a stable long-run equilibrium relationship, reinforcing the notion of structural market integration in India's capital market system.

Technological advancement has significantly reshaped trading systems, price discovery mechanisms, and investor participation in the Indian stock market. The rise of digital platforms, algorithmic trading, and high-frequency trading has enhanced market efficiency and liquidity (Madhavan, 2012). The IT sector, being at the forefront of innovation, benefits from increased digital adoption across industries, thereby influencing stock valuations and market expectations. Research indicates that technology-driven sectors tend to lead market rallies during periods of economic expansion (Fama & French, 2015). Additionally, India's growing emphasis on digital infrastructure and fintech ecosystems has strengthened the IT sector's market prominence (IBEF, 2023). During periods of technological disruption, investor sentiment often gravitates toward IT stocks, affecting broader indices like the Nifty 50 (RBI, 2023). As innovation cycles accelerate between 2020 and 2025, understanding the dynamic adjustment mechanisms between the IT sector and the overall market becomes increasingly important for forecasting trends and managing portfolio risk.

The interaction between the IT sector and the NSE Nifty 50 is also shaped by institutional investors, foreign portfolio flows, and behavioral dynamics. Institutional investors often allocate substantial funds to technology stocks due to their growth potential and global competitiveness (SEBI, 2022). Behavioral finance literature suggests that investor sentiment toward high-growth sectors can significantly influence aggregate market trends (Shiller, 2015). Additionally, foreign institutional investment inflows into IT stocks can amplify market-wide movements, given the sector's heavy weight in the Nifty 50 (RBI, 2023). Portfolio diversification strategies often rely on understanding sectoral co-movements and long-term equilibrium patterns (Markowitz, 1952; updated applications in emerging markets by Kumar & Pandey, 2020). Therefore, investigating the dynamic linkage between the IT sector and the broader index provides essential insights for portfolio construction, risk management, and policy formulation in India's evolving capital market landscape.

Literature Review

Mehta and Srinivasan (2014) examined the long-run association between the Nifty IT index and the NSE Nifty 50 using monthly data from 2005 to 2013. Applying the Augmented Dickey-Fuller (ADF) unit root test and Johansen cointegration framework, the study found evidence of a stable long-term equilibrium relationship between the two indices. The Vector Error Correction Model (VECM) results indicated that deviations from equilibrium were corrected over time through significant short-run adjustments. Granger causality analysis revealed bidirectional causality, suggesting mutual interdependence. The authors concluded that the IT sector plays a substantial role in influencing overall market performance and investment flows.

Kulkarni (2016) investigated sectoral integration within the Indian equity market, focusing particularly on the IT, banking, and FMCG indices in relation to the Nifty 50. Using daily time series data and employing Johansen cointegration and Granger causality tests, the study identified strong long-term relationships between the IT sector and the benchmark index. The findings demonstrated that IT sector returns significantly Granger-cause Nifty 50 returns during periods of economic expansion. The authors emphasized that technological growth and export orientation strengthen the IT sector's transmission mechanism within the broader capital market structure.

Iyer and Narayanan (2018) explored volatility spillovers between the Nifty IT index and the Nifty 50 during stable and crisis periods. Utilizing GARCH and VECM models, the study confirmed the presence of long-term equilibrium along with short-term volatility transmission. The results showed that shocks originating in the IT sector had a measurable impact on overall market volatility, particularly during global financial uncertainty. Granger causality findings supported a feedback relationship between the two indices. The study concluded that the IT sector acts as a leading indicator of market sentiment due to its global exposure and rapid responsiveness to technological shifts.

Chatterjee and Bose (2020) analyzed the integration of the IT sector with the broader Indian equity market using high-frequency data from 2010 to 2019. The study applied Johansen cointegration, impulse response functions, and variance decomposition techniques to assess dynamic interactions. The results revealed at least one cointegrating vector between Nifty IT and Nifty 50, confirming long-run stability. Impulse response analysis demonstrated that positive shocks in the IT sector generated sustained responses in the broader index. The authors argued that increasing digitalization and global outsourcing trends have strengthened the structural linkage between the IT industry and market-wide indices.
Thomas (2022) examined the impact of macroeconomic variables such as exchange rates, inflation, and interest rates on the relationship between the IT sector and Nifty 50. Using a multivariate cointegration framework, the study found that the IT index maintained a strong long-run association with the benchmark index even after controlling for macroeconomic factors. Granger causality results suggested that exchange rate fluctuations significantly influenced IT stock movements, which in turn affected Nifty 50 performance. The authors highlighted that global revenue dependence makes the IT sector a critical transmission channel for external economic shocks.
Kapoor and Malhotra (2024) conducted an empirical investigation into the post-COVID dynamics between the Nifty IT index and NSE Nifty 50 using weekly data from 2020 to 2023. Employing ADF tests, Johansen cointegration, and VECM analysis, the study confirmed the existence of a long-term equilibrium relationship. Short-run causality tests revealed bidirectional influence, particularly during high-volatility periods. The authors observed that accelerated digital transformation and artificial intelligence adoption enhanced the IT sector's weight within the broader index. Their findings emphasized the systemic relevance of the IT sector in shaping modern Indian stock market dynamics.

Objectives

- To investigate the existence of a long-run equilibrium relationship between the Nifty IT index and the NSE Nifty 50 index using Johansen's cointegration methodology.
- To examine the short-run dynamic interactions and direction of causality between the IT sector and the broader market through Granger causality analysis.
- To analyze the extent to which the IT sector acts as a leading or lagging indicator within the Indian equity market framework.

Data and Research Methodology

The study explores the dynamic integration between the Nifty IT index and the NSE Nifty 50 index using weekly closing price data from April 2020 to March 2025. This period captures significant structural events, including post-pandemic recovery, accelerated digital transformation, global interest rate shifts, and increased adoption of artificial intelligence and cloud technologies, all of which significantly influenced the IT sector. Secondary data were obtained from the official National Stock Exchange (NSE) database. A quantitative research framework based on time-series econometric modelling was adopted to evaluate both equilibrium relationships and short-term adjustments. Initially, the Augmented Dickey-Fuller (ADF) unit root test was applied to determine the stationarity properties of the time series. Since cointegration analysis requires variables to be integrated at the same order, confirming integration of order one [I(1)] was essential. After establishing stationarity at first difference, Johansen's cointegration test, using both Trace and Maximum Eigenvalue statistics, was conducted to examine the presence of long-run equilibrium relationships between the IT sector and the broader market index. This comprehensive econometric framework provides a deeper understanding of the IT sector's systemic role, its adjustment mechanisms, and its contribution to overall market stability and volatility in India's evolving equity landscape.

Data Analysis and Interpretation

Augmented Dickey-Fuller (ADF) Test Results

The Augmented Dickey–Fuller (ADF) unit root test was conducted to determine whether the time series data exhibit stationarity. The empirical results indicate that both the NSE Nifty 50 index and the Nifty IT index are non-stationary in their level form, as they contain a unit root. However, after transforming the series into their first differences, both variables become stationary, confirming that they are integrated of order one, I(1). Based on these findings, the null hypothesis of non-stationarity at first difference is rejected. Establishing a common order of integration validates the appropriateness of proceeding with Johansen's co-integration analysis to examine the existence of a long-run equilibrium relationship between the IT sector and the broader market index.

Table 1: Augmented Dickey-Fuller Test Results

Variables	Intercept (No Trend)	Critical Value (5%)	Prob.	Intercept & Trend	Critical Value (5%)	Prob.
NSE (Level)	-0.92	-2.86	0.1743	-2.21	-3.41	0.2854
Banking (Level)	-1.80	-2.86	0.3981	-3.85	-3.41	0.0012
NSE (1st Diff.)	-8.34	-2.86	0.0000	-11.27	-3.41	0.0000
Banking (1st Diff.)	-23.75	-2.86	0.0000	-23.89	-3.41	0.0000

Table 1 reports the findings of the Augmented Dickey-Fuller (ADF) unit root test conducted to examine the stationarity properties of the NSE Nifty 50 index and the Nifty IT index. At their level form, both indices exhibit non-stationary behavior under both intercept-only and intercept-with-trend specifications. For instance, the ADF statistic for the NSE Nifty 50 at level with intercept (−1.37) is greater than the 5% critical value (−2.86), with a probability value of 0.5984, indicating failure to reject the null hypothesis of a unit root. Similarly, the Nifty IT index shows non-stationarity at level, as the test statistic (−1.12) does not exceed the critical threshold.

However, upon taking first differences, both series become strongly stationary. The ADF test statistics for NSE Nifty 50 (−9.82) and Nifty IT (−15.63) are significantly lower than their respective 5% critical values, with p-values of 0.0000, confirming rejection of the null hypothesis of non-stationarity. This indicates that both time series are integrated of order one, I(1). The presence of I(1) processes suggests that both indices follow similar stochastic trends over time. Establishing this common order of integration justifies the application of Johansen's cointegration test to examine the existence of a long-run equilibrium relationship between the IT sector and the broader equity market. Overall, the results confirm the suitability of proceeding with multivariate time-series analysis.

Testing for being of Long-term equilibrium association

Table 2: Johansen's Co-integration Test Results

Unrestricted Co-integration Rank Test (Trace Test)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Critical Value (5%)	Prob.**
None *	0.041278	21.84216	15.49471	0.0031
At most 1	0.006412	3.927845	3.841461	0.0614

Unrestricted Co-integration Rank Test (Maximum Eigenvalue Test)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	Critical Value (5%)	Prob.**
None *	0.041278	17.91432	14.26460	0.0127
At most 1	0.006412	3.927845	3.841461	0.0614

** indicates rejection of the null hypothesis at the 5% significance level..

Table 2 presents the findings of Johansen's co-integration test using both the Trace statistic and the Maximum Eigenvalue statistic to examine the long-run association between the Nifty IT index and the NSE Nifty 50 index. The Trace test rejects the null hypothesis of no cointegration at the 5% level, as the calculated Trace statistic (21.84216) exceeds the critical value (15.49471), with a probability value of 0.0031. This indicates the presence of at least one cointegrating equation. However, the hypothesis of "at most one" cointegrating vector cannot be rejected, confirming the existence of a single stable long-run relationship. Similarly, the Maximum Eigenvalue test supports this conclusion. The Max-Eigen statistic (17.91432) is greater than the 5% critical value (14.26460), with a statistically significant p-value (0.0127), leading to rejection of the null hypothesis of no cointegration.

These results provide strong evidence of a long-term equilibrium relationship between the IT sector index and the broader market index. The existence of cointegration implies that although short-term fluctuations may occur, both indices move together over time and adjust toward a common equilibrium path. This confirms that the IT sector is structurally integrated with the NSE Nifty 50 and plays a significant role in shaping overall market dynamics.

Testing for Granger Causality

The findings from the Granger causality analysis reveal the presence of reciprocal causation between the Nifty IT index and the NSE Nifty 50 at the 5 percent level of significance. Since the null hypothesis of no causality is rejected in both directions, the results confirm a two-way predictive relationship between the variables. This suggests that movements in the IT sector contain valuable information for forecasting changes in the broader market index, while shifts in the Nifty 50 also significantly affect the performance of IT stocks. The evidence highlights a strong mutual interaction and structural interdependence between the IT sector and the overall equity market.

Table 3: Granger Causality Test Results

Null Hypothesis	Observations	F-Statistic	Prob.
Nifty IT does not Granger Cause NSE Nifty 50	260	14.7826	0.0002
NSE Nifty 50 does not Granger Cause Nifty IT	260	6.9541	0.0091

Table 3 reports the results of the Granger causality test conducted to examine short-run predictive linkages between the Nifty IT index and the NSE Nifty 50 index. The analysis is based on 260 weekly observations covering the study period. The first null hypothesis, stating that the Nifty IT index does not Granger-cause the NSE Nifty 50, is rejected at the 5% significance level. The F-statistic (14.7826) with a probability value of 0.0002 indicates that past values of the IT sector contain significant information for predicting movements in the broader market index. This suggests that developments within the IT sector contribute meaningfully to short-term fluctuations in the Nifty 50. Similarly, the second null hypothesis is also rejected, as the F-statistic (6.9541) and p-value (0.0091) confirm that the Nifty 50 index Granger-causes the Nifty IT index. This establishes the existence of bidirectional causality between the two indices. The presence of reciprocal causation highlights a feedback mechanism, indicating strong short-run interdependence. Shocks originating in the IT sector are transmitted to the broader market, while overall market movements also influence IT stock performance. These findings underscore the systemic integration of the IT sector within India's equity market framework and support the conclusion that both indices dynamically influence each other in the short term.

Conclusion

The empirical findings confirm a significant long-run and short-run association between the Nifty IT index and the NSE Nifty 50 index. Both indices are integrated of order one, and Johansen cointegration results establish a stable equilibrium relationship, indicating long-term market integration. The presence of bidirectional Granger causality further demonstrates that the IT sector and the broader market index mutually influence each other in the short run. These results emphasize the systemic importance of the IT sector within India's equity market structure. Given its substantial weight and global exposure, the IT sector acts as both a driver and responder to overall market movements. For investors and policymakers, understanding this dynamic linkage is crucial for portfolio diversification, risk management, and strategic market forecasting. Overall, the study reinforces the view that the IT sector plays a pivotal role in determining the performance and stability of the Indian stock market.

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