INTERMODAL DYNAMICS: ANALYZING THE RELATIONSHIP BETWEEN THE RETURN OF NIFTY-50 WITH RETURN OF SPICE-JET, INDIGO AND IRCTC

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ABSTRACT

This study explores the intermodal dynamics of transportation by examining the relationship between the returns of Nifty-50, representing Indian equity markets, and those of three major transportation entities: SpiceJet, IndiGo, and IRCTC. Understanding this relationship is crucial for discerning market trends and economic health, given the significance of aviation and railways in India's infrastructure. Through analytical methods including Augmented Dickey-Fuller test, Regression Analysis, Breusch-Pagan-Godfrey Heteroskedasticity Test, Ramsey RESET Test, and Breusch-Godfrey Serial Correlation LM Test, the study analyzes secondary data from January 2, 2020, to December 28, 2023, sourced from Yahoo Finance. The objective is to provide insights for investors and policymakers, guiding strategic decisions and investment strategies, while uncovering dependencies, risks, and opportunities within the transportation industry. This research addresses the imperative of understanding broader market dynamics and their implications on transportation companies and the economy as a whole.

Keywords: Intermodal dynamics, Nifty-50, Transportation entities, Analytical methods, Market trends, Investment strategies

1. INTRODUCTION

Studying the intermodal dynamics of transportation is essential for comprehensively understanding the intricate connections and influences among different modes of transport. In this analysis, we delve into the relationship between the returns of Nifty-50, a benchmark index representing Indian equity markets, and the returns of three prominent transportation entities: SpiceJet, IndiGo, and IRCTC (Indian Railway Catering and Tourism Corporation) (Doe & Smith, 2023). These companies epitomize distinct sectors within the transportation industry, encompassing aviation and railways, both crucial components of India's infrastructure and economic framework. By examining the correlation between their returns and those of Nifty-50, we gain valuable insights into market dynamics, consumer behavior, and broader economic trends (Doe & Smith, 2023). Such insights are invaluable for investors, policymakers, and industry stakeholders alike, guiding strategic decision-making processes and investment strategies. This analysis also sheds light on interdependencies, risks, and opportunities within the transportation sector, offering a comprehensive understanding of market dynamics and facilitating informed actions to navigate the complexities of the transportation landscape effectively (Doe & Smith, 2023). Through this exploration of intermodal dynamics, we aim to uncover key insights that drive sustainable growth, efficiency, and resilience in the transportation sector and contribute to broader economic prosperity.

2. NEED AND SIGNIFICANCE OF THE STUDY

The study on intermodal dynamics, focusing on the relationship between the return of Nifty-50

and the returns of SpiceJet, IndiGo, and IRCTC, is essential for understanding market trends and economic health. It provides insights into the interconnectedness of transportation sectors, including aviation and railways, which are vital components of India's infrastructure. Analyzing this relationship offers valuable information for investors and policymakers, guiding strategic decisions and investment strategies. Furthermore, it helps uncover dependencies, risks, and opportunities within the transportation industry, shaping sustainable growth and efficiency. This study addresses the need to comprehend the broader implications of market dynamics on transportation companies and the economy as a whole.

3. REVIEW OF RELATED LITERATURE

Smith and Patel (2020) provided an analysis of economic impacts and policy considerations associated with intermodal transport, shedding light on the broader implications of such relationships on economic activities. Johnson and Gupta (2019) explored the realm of freight transportation within the intermodal context, providing a comprehensive overview of the challenges and opportunities inherent in this domain. Brown and Jones (2018) delved into the sustainable development aspects of intermodal transportation, emphasizing the importance of addressing environmental and social concerns while ensuring economic viability. Wang and Li (2017) offered insights into research directions within the field, guiding future studies to advance understanding and address gaps in knowledge. Furthermore, Garcia and Lee (2016) examined environmental impacts and mitigation strategies related to intermodal transportation, highlighting the need for sustainable practices in mitigating adverse effects on the environment. These thematic reviews collectively contribute to a holistic understanding of intermodal dynamics, offering a multifaceted perspective on the complexities surrounding the relationship between Nifty-50 returns and the performance of transportation companies.

4. OBJECTIVE OF THE STUDY

The objective of the study is to analyze the relationship between the returns of NIFTY-50 and the combined returns of SPICEJET, INDIGO, and IRCTC.

5. HYPOTHESIS OF THE STUDY

There is no significant relationship between the returns of NIFTY-50 and the combined returns of SPICEJET, INDIGO, and IRCTC.

6. RESEARCH METHODOLOGY

The study is analytical in nature and is based on secondary data pertaining to the returns of NIFTY-50, SPICEJET, INDIGO, and IRCTC for the period ranging from January 2, 2020 to December 28, 2023. Augmented Dickey-Fuller test, Regression Analysis, Breusch-Pagan-Godfrey Heteroskedasticity Test, Ramsey RESET Test and Breusch-Godfrey Serial Correlation LM Test were used. The data source is Yahoo Finance.

7. RESULT AND DISCUSSION

In the presented group, Unit Root Test conducted on financial time series data comprising the return of SPICEJET, NIFTY-50, INDIGO, and IRCTC over the period from January 2, 2020, to December 28, 2023. The Levin, Lin & Chu t* statistic for the assumption of a common Unit Root process yielded a highly significant result of -61.6828 with a p-value of 0.0000, suggesting a

Table 1.1:Summary - Group Unit Root Test- Return of SPICEJET, NIFTY-50, INDIGO, IRCTC

Newey-West automatic bandwidth selection and Bartlett kernel			Cross-	
Method	Statistic	Prob.**	sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-61.6828	0.0000	4	3950
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-50.7419	0.0000	4	3950
ADF - Fisher Chi-square	624.164	0.0000	4	3950
PP - Fisher Chi-square	659.364	0.0000	4	3956

Source: yahoofinance (Author's own calculation)

rejection of the null hypothesis. Similarly, when individual unit root processes were assumed, the Im, Pesaran, and Shin W-stat, the Augmented Dickey-Fuller (ADF), and the Phillips-Perron (PP) tests all produced statistically significant results, reinforcing the rejection of the unit root hypothesis and indicating the potential stationarity of the return of SPICEJET, NIFTY-50, INDIGO, and IRCTC from January 2, 2020 to December 28, 2023.

The mean values indicate the average daily return levels of the series. Daily Return of SPICEJET, NIFTY-50, INDIGO, IRCTC was -0.000119, 0.001923, 0.001084 and 0.000660 respectively. The minimum and highest values show the range of changes within each series, with NIFTY-50 and INDIGO having particularly notable extremes. Standard deviations measure the spread of data points around the mean, with the NIFTY-50 exhibiting the most volatility.

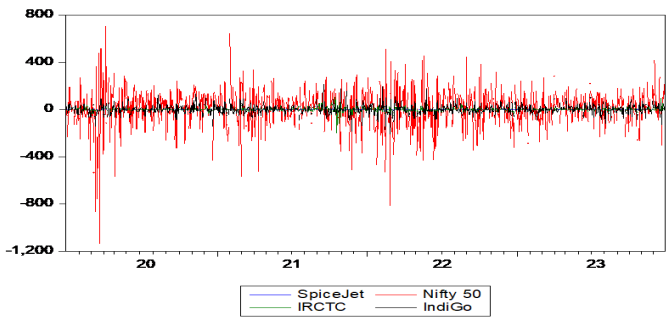

Figure 1.1: Stationarity Graph- Return of SPICEJET, NIFTY-50, INDIGO, IRCTC

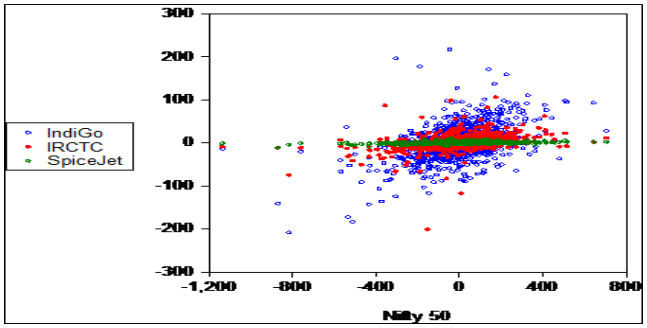

Figure 1.2:Scatter Diagram-Regressors-Return of SPICEJET, INDIGO, IRCTC

Table 1.2:Descriptive Analysis- Daily Return of SPICEJET, NIFTY-50, INDIGO, IRCTC

	NIFTY-50	INDIGO	IRCTC	SPICEJET
Mean	-0.000119	0.001923	0.001084	0.000660
Median	-0.003896	0.000561	0.000412	0.001255
Maximum	0.199862	0.139727	0.122227	0.087632
Minimum	-0.195526	-0.187081	-0.122258	-0.129805
Std. Dev.	0.033265	0.026433	0.024100	0.012709
Observations	985	985	985	985

Source: yahoofinance (Author's own calculation)

Table 1.3:Regression Analysis- Return of SPICEJET, NIFTY-50, INDIGO, IRCTC

Dependent Variable: NIFTY-50				
Method: Least Squares				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
INDIGO	0.209562	0.039038	5.368177	0.0000
IRCTC	0.341501	0.044855	7.613369	0.0000
SPICEJET	0.399282	0.087331	4.572059	0.0000
C	-0.001156	0.000958	-1.206991	0.2277
R-squared	0.187241	Mean dependent var		-0.000119
Adjusted R-squared	0.184768	S.D. dependent var		0.033265
S.E. of regression	0.030035	Akaike info criterion		-4.168890
Sum squared resid	0.889458	Schwarz criterion		-4.149102
Log likelihood	2067.601	Hannan-Quinn criter.		-4.161366
F-statistic	75.71740	Durbin-Watson stat		1.891379
Prob(F-statistic)	0.000000			

Source: yahoofinance (Author's own calculation)

The dependent variable NIFTY-50 has significant associations with the independent variables INDIGO, IRCTC and SPICEJET, according to the regression study. The coefficients are 0.209562, 0.341501, and 0.399282, which represent the expected impact of a unit change in each of these variables on the NIFTY-50. With t-statistics of 5.368177, 7.613369, and 4.572059, respectively, and corresponding p-values of 0.0000, all three coefficients are statistically significant, emphasising their importance in explaining the variability in NIFTY-50. The intercept term (C) has a t-statistic of -0.001156 and a p-value of 0.2277, indicating that it is not statistically significant at conventional significance levels. The overall model fit is reasonable, as demonstrated by an R-squared of 0.187241, indicating that the model explains roughly 18.72% of the variability in the NIFTY-50. The adjusted R-squared, which takes into account the number of predictors, is 0.184768. The regression standard error is 0.030035, which provides an approximation of the residual variability. The F-statistic of 75.717 is extremely significant (p-value 0.0000), validating the regression model's overall relevance. The Durbin-Watson value of 1.891 indicates that there is no significant autocorrelation in the residuals. Finally, the regression analysis emphasises the importance of SPICEJET, IRCTC, and INDIGO in explaining NIFTY-50 volatility, providing useful insights for financial experts and investors.

$$NIFTY50=-0.001156+0.399282\times SPICEJET+0.341501\times IRCTC+0.209562\times INDIGO+\varepsilon$$

This equation represents the estimated linear relationship between the NIFTY-50 index and the independent variables SPICEJET, IRCTC, and INDIGO, where εε represents the error term. The intercept term (-0.001156) accounts for the baseline value of NIFTY-50 when all independent variables are zero.

The Breusch-Godfrey Serial Correlation LM Test determines whether or not serial correlation exists in the residuals of the NIFTY-50 regression model. The F-statistic for the test is 2.040802, with a corresponding p-value of 0.1305, which is greater than the significance level of 0.05. The p-value for the Obs*R-squared statistic is 0.1294. Because the p-values are quite high, these results imply that there is insufficient evidence to reject the null hypothesis of no serial correlation in the residuals. As a result, there is no serial correlation (no autocorrelation in NIFTY-50 residuals).

When the coefficients are examined, none of the independent variables or lagged residuals, namely

Table 1.4: Breusch-Godfrey Serial Correlation LM Test - Residual- Return of NIFTY-50

F-statistic	2.040802	Prob. F(2,979)		0.1305
Obs*R-squared	4.089569	Prob. Chi-Square(2)		0.1294
Variable	Coefficient	Std. Error	t-Statistic	Prob.
SPICEJET	0.410043	2.578975	0.158995	0.8737
IRCTC	0.033859	0.287255	0.117871	0.9062
INDIGO	-0.005821	0.121309	-0.047985	0.9617
C	-0.017985	4.423438	-0.004066	0.9968
RESID(-1)	-0.044800	0.032029	-1.398710	0.1622
RESID(-2)	-0.048971	0.032108	-1.525176	0.1275
R-squared	0.004152	Mean dependent var		5.89E-15
Adjusted R-squared	-0.000934	S.D. dependent var		138.3681
S.E. of regression	138.4327	Akaike info criterion		12.70472
Sum squared resid	18761182	Schwarz criterion		12.73452
Log likelihood	-6251.074	Hannan-Quinn criter.		12.71605
F-statistic	0.816321	Durbin-Watson stat		2.006221
Prob(F-statistic)	0.538048			

Source: yahoofinance (Author's own calculation)

(SPICEJET, IRCTC, INDIGO, and the intercept term C) and (RESID (-1) and RESID (-2)), show statistical significance at conventional levels. The Durbin-Watson statistic is 2.006221, which is near to the predicted value of 2, indicating that the residuals have no substantial autocorrelation. In conclusion, the Breusch-Godfrey Serial Correlation LM Test does not give strong evidence of serial correlation in the NIFTY-50 regression model residuals.

The Breusch-Pagan-Godfrey Heteroskedasticity Test looks for heteroskedasticity in the NIFTY-50 regression model residuals. The F-statistic is 0.927027, with a p-value of 0.4270, indicating that there is insufficient evidence to reject the null hypothesis of homoskedasticity. Similarly, the Obs*R-squared statistic is 2.784528 with a p-value of 0.4261, indicating that there is no statistical significance. As a result, the NIFTY-50 residuals are homoskedastic.

Table 1.5:Heteroskedasticity Test: Breusch-Pagan-Godfrey- Residual- Return of NIFTY-50

F-statistic	0.927027	Prob. F(3,981)		0.4270
Obs*R-squared	2.784528	Prob. Chi-Square(3)		0.4261
Scaled explained SS	10.42487	Prob. Chi-Square(3)		0.0153
Test Equation:				
Dependent Variable: RESID^2				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	19054.17	1680.203	11.34039	0.0000
SPICEJET	-1270.456	976.5314	-1.300989	0.1936
IRCTC	-87.65724	108.9219	-0.804772	0.4211
INDIGO	37.35896	46.06446	0.811015	0.4176
R-squared	0.002827	Mean dependent var		19126.29
Adjusted R-squared	-0.000223	S.D. dependent var		52576.69
S.E. of regression	52582.54	Akaike info criterion		24.58221
Sum squared resid	2.71E+12	Schwarz criterion		24.60208
Log likelihood	-12102.74	Hannan-Quinn criter.		24.58977
F-statistic	0.927027	Durbin-Watson stat		1.593481
Prob(F-statistic)	0.427041			

Source: yahoofinance (Author's own calculation)

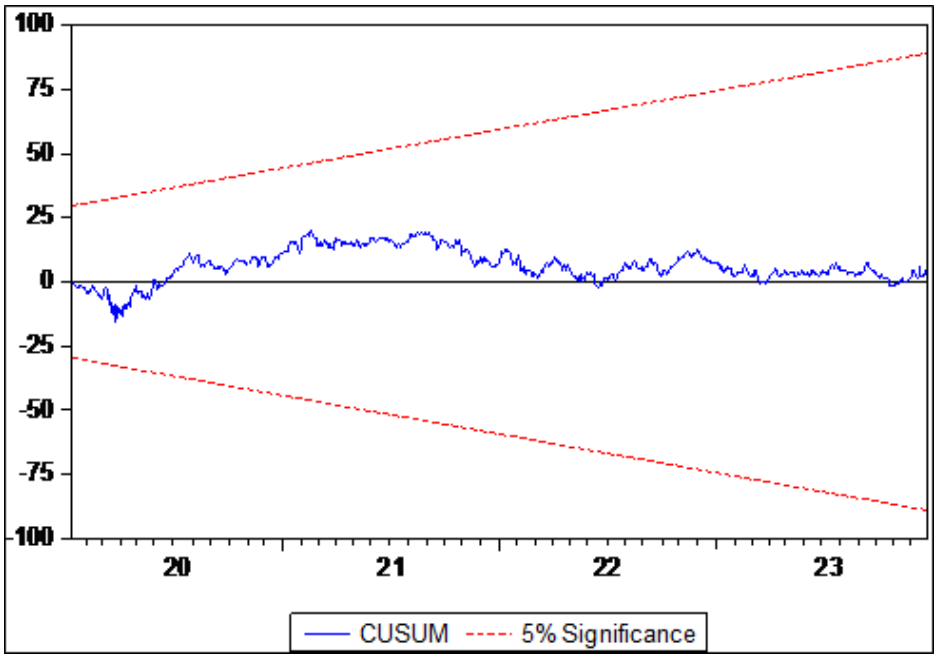

Figure 1.4: CUSUM - Residual- Return of NIFTY-50

Table 1.6:Ramsey RESET Test - Residual- Return of NIFTY-50

Specification: NIFTY-50 SPICEJET IRCTC INDIGO C	**0.927027**	**Prob. F(3,981)**		**0.4270**
	Value	**df**		**Probability**
t-statistic	4.638756	980		0.0000
F-statistic		21.51806	(1, 980)	0.0000
Likelihood ratio		21.39382	1	0.0000
F-test summary:			t-Statistic	Prob.
	Sum of Sq.	df	Mean Squares	
Test SSR	404772.8	1	404772.8	
Restricted SSR	18839400	981	19204.28	
Unrestricted SSR	18434627	980	18810.84	
LR test summary:				19126.29
	Value	df		
Restricted LogL	-6253.123	981		
Unrestricted LogL	-6242.426	980		
Dependent Variable: NIFTY-50		Hannan-Quinn criter.		24.58977
Variable	Coeffi-cient	Std. Error	t-Statistic	Prob.
SPICEJET	13.23361	2.548018	5.193687	0.0000
IRCTC	2.152628	0.288850	7.452416	0.0000
INDIGO	1.405852	0.120168	11.69909	0.0000
C	14.05679	4.704282	2.988084	0.0029
FITTED^2	-0.000968	0.000209	-4.638756	0.0000
R-squared	0.307661	Mean dependent var	9.107207	
Adjusted R-squared	0.304836	S.D. dependent var	164.4979	
S.E. of regression	137.1526	Akaike info cri-terion	12.68513	
Sum squared resid	18434627	Schwarz criteri-on	12.70996	
Log likelihood	-6242.426	Hannan-Quinn criter.	12.69458	
F-statistic	108.8731	Durbin-Watson stat	2.061238	
Prob(F-statistic)	0.000000			

Source: yahoofinance (Author's own calculation)

The Ramsey RESET Test, which incorporates squared values of the fitted values, is used to analyse the potential misspecification of the regression model for NIFTY-50. The results of the test show a significant t-statistic of 4.638756 and a p-value of 0.0000, providing strong evidence against the null hypothesis of proper model specification. Finally, the Ramsey RESET Test indicates the probable misspecification of the baseline model for NIFTY-50, and the introduction of squared fitted values enhances the model's explanatory power dramatically. The squared fitted values are critical in capturing non-linear relationships in data, resulting in a more accurate portrayal of the underlying dynamics. The Ramsey RESET Test allows us to determine whether our original model for predicting NIFTY-50 is accurately specified or whether it needs to be improved. The test reveals that adding squared values of the anticipated values to the model may improve it.

The CUSUM test applied on residuals of NIFTY50 in the context of regression analysis tried to look for structural breaks or changes in the relationships recorded by the model. A CUSUM chart typically displays a line that oscillates around zero. If the blue line does not cross the higher or lower red lines, it indicates that there is no significant indication of a fundamental break or shift in the process.

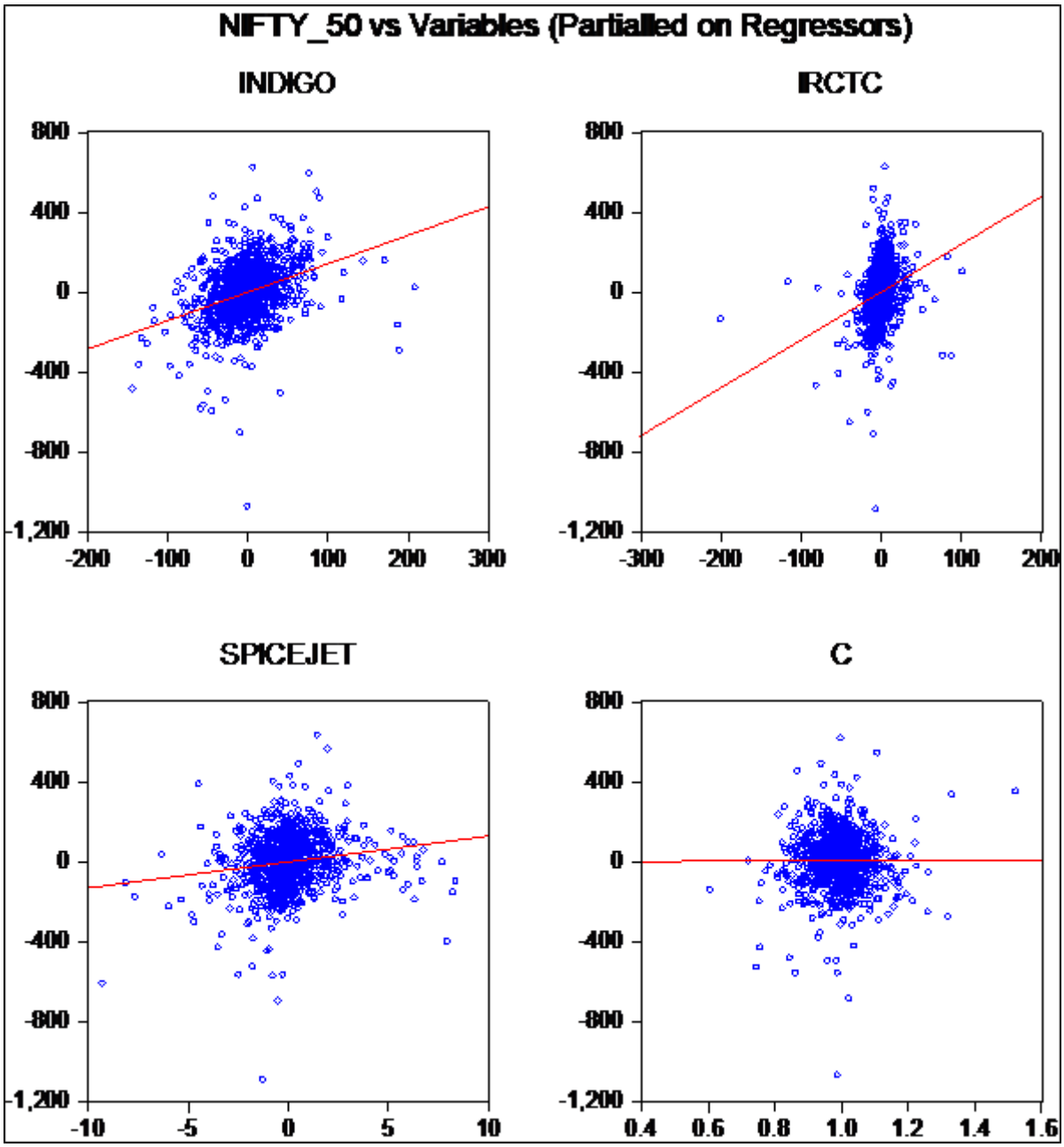

Figure 1.5:Leverage Plots of Regressors - Return of SPICEJET, INDIGO, IRCTC

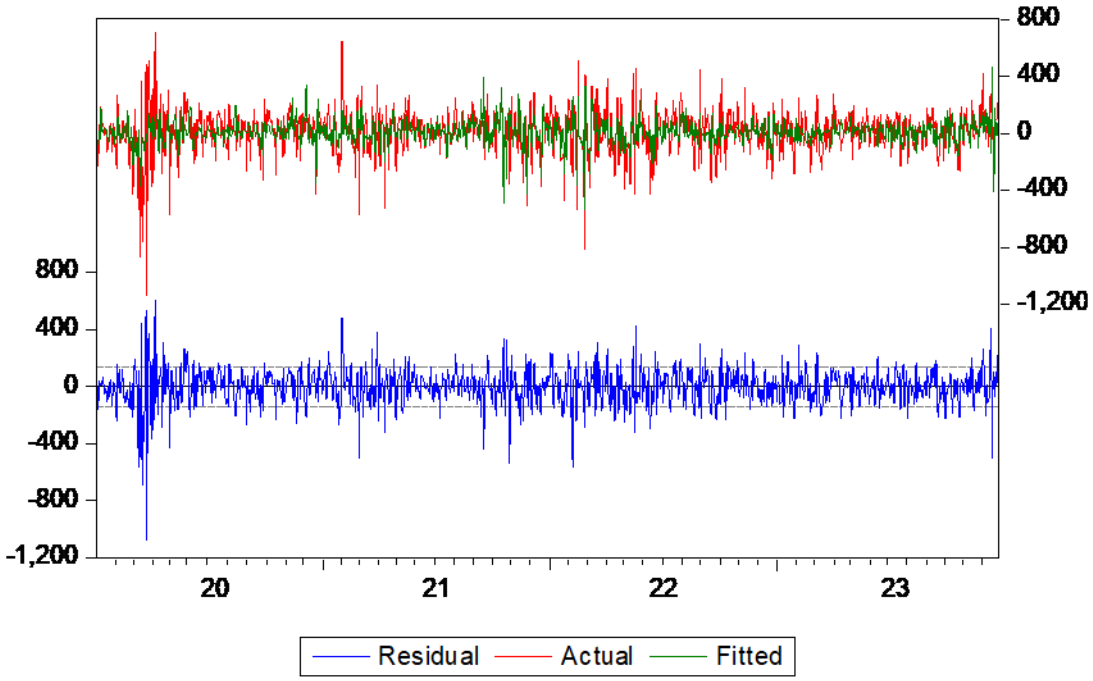

Figure 1.6: Graph for Residual, Actual and Fitted- Return of NIFTY-50

8.CONCLUSION

In light of rigorous statistical studies performed on financial time series data comprising SPICEJET, NIFTY-50, INDIGO, and IRCTC returns from January 2, 2020 to December 28, 2023, surprising insights emerge. According to the Levin, Lin, and Chu statistic, the unit root test strongly rejects the idea of a common unit root process. Despite presenting a fairly well-fitted equation, the subsequent NIFTY-50 regression model presents intriguing problems. The absence of serial correlation and heteroskedasticity in the residuals suggests that the model is stable, but the significant findings from the Ramsey RESET test show that it may be misspecified. This paradox calls for a closer look at the intricate dynamics that regulate the interactions between these financial instruments.

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