

Exploring the Causal Relationship Between Stock Returns, Volume, and Turnover across Sectoral Indices in Indian Stock Market

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Abstract

The traditional saying “Market Discounts Everything” is applicable to stock returns, trading volume, and turnover as well. The present study is an analytical attempt to examine the causal relationship between stock returns, trading volume, and turnover across 10 sectoral indices of National Stock Exchange (NSE) for the period 2006–2016. To critically examine this relation, the study uses various statistical techniques such as descriptive statistics, correlation analysis, regression analysis, and econometric tests such as Granger causality test and augmented Dickey–Fuller test. The required analyses have been performed using statistical software E-views, SPSS, and Microsoft Excel. The study noticed a weak positive relationship between stock returns and turnover for Nifty Auto Index, Nifty Bank Index, Nifty Financial Services Index, Nifty Media Index, Nifty Metal Index, and Nifty Private Bank Index. The study also found a significant impact of turnover on stock returns in the case of Nifty Auto Index, Nifty Bank Index, Nifty FMCG Index, Nifty Metal Index, and Nifty Pharma Index and a significant impact of volume on stock returns in the case of Nifty Bank Index, Nifty FMCG Index, and Nifty Pharma Index. Augmented Dickey–Fuller test suggests that there exists no unit root in the data ($p < 1$) and the data are stationary. It is evident from the study that the causal relationship between stock returns, turnover, and volume varies across the sectoral indices.

Keywords

Stock returns, trading volume, share turnover, sectoral indices

Executive Summary

The present study aims to explore the association between stock returns, volume, and turnover; examines the impact of volume and turnover on stock returns; and analyses the causal relationship between stock returns, volume, and turnover across sectoral indices. The analyses have been performed across 10 sectoral indices of National Stock Exchange (NSE), that is, Nifty Auto, Nifty Bank, Nifty Financial Services, Nifty FMCG, Nifty IT, Nifty Media, Nifty Metal, Nifty Pharma, Nifty Private Bank, and Nifty Energy. The required data have been extracted from the official website of NSE and the period of study is confined to 10 years, that is, from 1 November 2006 to 31 October 2016. Various statistical techniques such as descriptive statistics, correlation analysis, regression analysis, and

econometric tests such as Granger causality test and augmented Dickey–Fuller test have been used to achieve the objectives. All necessary analyses have been carried out using statistical software E-views, SPSS, and Microsoft Excel. The study analysed the association between stock returns, volume, and turnover using Karl Pearson’s correlation analysis; examined the impact of volume and turnover on stock returns with the help of regression analysis; investigated the causal relationship between the variables using Granger causality test; and tested for stationarity of the data using augmented Dickey–Fuller test. The study noticed a negative daily average growth in respect of turnover across all the sectoral indices. The augmented Dickey–Fuller test suggested that the data are stationary. The study witnessed a weak positive relationship between stock

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return and turnover for Nifty Auto Index, Nifty Bank Index, Nifty Financial Services Index, Nifty Media Index, Nifty Metal Index, and Nifty Private Bank Index and a weak negative return–volume relationship across Nifty FMCG Index, Nifty IT Index, Nifty Pharma Index, and Nifty Energy. The present study also noticed a significant impact of turnover on stock returns in the case of Nifty Auto Index, Nifty Bank Index, Nifty FMCG Index, Nifty Metal Index, and Nifty Pharma Index. Also, there exists an impact of turnover on stock returns in the case of Nifty Financial Service Index and Nifty Media Index. The results indicated a significant impact of volume on stock returns in the case of Nifty Bank Index, Nifty FMCG Index, Nifty Pharma Index, Nifty Auto Index, Nifty Financial Services Index, and Nifty Energy Index. The study also showed causal evidence of volume Granger causing the returns and turnover Granger causing volume in the case of Nifty Auto Index. Also, for Nifty Financial Services Index, Nifty FMCG Index, and Nifty Energy Index, the study found the evidence of turnover Granger causing the volume. The study reflected a significant evidence of turnover and volume Granger causing the returns in the case of Nifty FMCG Index and Nifty IT Index. It was evident from the study that the causal relationship between stock returns, turnover, and volume varies across the sectoral indices.

Introduction

With the growth of well-regulated stock market in India, companies are now able to raise funds from a large pool of investors. Also, the investors expect better returns and hence consider equity investment or trading better than other investment alternatives like fixed income securities. Equity investment or trading involves high risk. But a wise strategy can accumulate huge wealth over the years. What is essential is knowledge of market, experience, and use of fundamental and technical analysis in picking right stocks. Fundamental analysis is normally used by long-term investors who study in depth about the economy, industry, and company before investing, whereas technical analysis helps day traders, scalpers, or other short-term investors who aim to make quick profits within a short time span. Technical analysis serves this need by identifying trend and thereby helping the traders in identifying the timing of buying and selling the stocks. In taking such a decision, various indicators help investors which include new high/new low price, volume, opening and closing price, turnover, and so on. Therefore, in a country like India where investors are rapidly rising, it becomes vital to know if these indicators play any significant role. The present study will evaluate the relationship of stock returns with volume and turnover and analyse the impact, if any.

In stock market, volume refers to the quantity of securities which are traded for a particular period of time. For a given stock, volume is the number of shares purchased and sold during a particular day. The trading volume can get

affected by numerous factors such as any positive or negative news about company, its financial status, changes in ownership, and so on. In technical analysis, therefore, volume is regarded as one of the important indicators. Another crucial element along with volume is that the liquidity of stocks is measured by share turnover. The number of shares traded is divided by the average number of shares to obtain the share turnover. It is an accepted phenomenon that when the share turnover is high, the stocks of the company are assumed to be more liquid. Trading volume and turnover are closely related and used while analysing the liquidity. The present study will examine this association between trading volume and turnover and also examine its relationship with stock returns. As we know, the stock returns also tend to get affected by various factors related to economy and company as well, it becomes evident to know how the returns move as regards to volume and turnover. The association of stock returns and volume has been investigated by various researchers from various countries over past several years. Ning and Wirjanto¹ examined the volume and return association in six East-Asian emerging markets. The study witnessed a significant and asymmetric association between the said variables. In a similar study evidenced from emerging Asian markets, Lin² analysed the dynamic relationship between stock returns and volume. The study concluded that volume Granger cause the stock returns. A thorough literature review will provide more insights about the significant contribution of numerous researchers and help us to identify the research gaps.

Review of Literature

Darrat, Rahman, and Zhong³ examined the relationship between stock return volatility and trading volume of stocks forming the part of Dow Jones Industrial Average Index. The researchers measured volatility using E-GARCH model and five-minute intraday data. The study evidenced no contemporaneous relation between stock return volatility and trading volume; however, lead–lag relations were noticed. Caselani and Eid Jr⁴ studied the impact of historical volatility, interest rates, financial gearing, and turnover on the present stock volatility. The researchers also examined the relationship between changes in prices and volume. The results revealed that decrease in stock prices is related with increase in volatility. Also, increase in trading volume tends to have a rise in volatility. De Medeiros and Van Doornik⁵ conducted an empirical study to investigate the relationship between stock returns volatility, stock returns, and volume. The researchers utilized the data from Brazilian stock market for the period 2000–2005. Various econometric models and tests such as unit root test, cross-correlation analysis, GARCH, VAR, simultaneous equations regression analysis, and Granger causality test were implemented to prove the results. The study evidenced a dynamic association between trading volume and stock returns. Eastman and Lucey⁶ investigated the distribution of trading volumes

and futures markets returns. The researchers used non-parametric tests to conclude that trading volume and daily returns were asymmetric.

The trading volume and price relationship was investigated by Kumar, Singh, and Pandey⁷ using vector autoregression, variance decomposition, Granger causality test, and impulse response function. The results revealed a significant positive and asymmetric association between changes in prices and volume. The study also indicated a bi-directional relationship between stock returns and volume. The variance decomposition results implied a weak dynamic association between volume and returns. Mubarik and Javid⁸ explained the relationship between returns, volatility, and trading volume, considering the Pakistani stock market for the period 1998–2008. To test for stationarity, the researchers used Dickey–Fuller test. The association between volume, return, and volatility was analysed using ARCH and GARCH-M models. The study found a feedback relationship between volume and stock returns. But the results indicated a more causal relation from return to volume and not reverse. The findings of the study also suggested the effect of trading volume on stock return. Chiang, Qiao, and Wong⁹ evaluated the relationship between trading volume and stock returns volatility using Granger causality test. The study showed that there exists no causal relation from trading volume to stock return volatility, but in reverse direction, such a causation effect exists.

Senger¹⁰ examined the relationship between stock returns and trading volume taking a sample of companies from Nile Stock Exchange. The study indicated that for most of the companies selected, the volume influences the stock returns, and the same is also evidenced vice versa. Pathak¹¹ analysed the dynamic relationship between stock returns and futures volume using Granger causality test. The researcher conducted study with reference to National Stock Exchange (NSE) for the period July 2009–September 2009. Dickey–Fuller test was implemented to test for stationarity of data. The results revealed a weak causal association between stock returns and futures volume. Yamani, Hindy, and Hanafy¹² investigated the association between trading volume and stock return in Egyptian Securities Exchange (ESE). The study examined the power of volume in forecasting the future stock returns. The researchers made use of Granger causality test and GARCH model to prove the results. No significant evidence of the role played by volume in forecasting stock returns was noticed.

Lakshmi and Alagappan¹³ evaluated the association of stock returns volatility and trading volume of foreign institutional investment (FII) flows. Using ordinary least square (OLS), the researchers examined the asymmetry and correlation between returns of Nifty and trading volume of FII. The study evidenced the positive association between volume and returns. The researchers also studied the relationship between volume and conditional volatility using GARCH model. But the study did not notice any strong influence of FII values on stock volatility. Sheikh and

Riaz¹⁴, using multivariate time series analysis, investigated the relationship between stock returns volatility, trading volume, and overconfidence bias. The researchers performed the analysis taking data from Karachi Stock Exchange. The study noticed a positive relationship between stock returns and volume but did not find any significant positive relationship between overconfidence and returns volatility.

Chen, So, and Chiang¹⁵ examined the association between stock returns and trading volume by presenting a quantile regression model which included the specification of GARCH. The study revealed that under low quantile levels, there exists negative effect of abnormal volume on stock returns. And under high quantile levels, the study evidenced a positive effect. The researchers also indicated in the study that with various quantile levels, the market beta also varied. This reflects that it captures various states of conditions of market. Takeda and Wakao¹⁶ examined the relationship of trading volume and stock returns of Japanese stocks with the Google search intensity. The period of study was from 2008 to 2011, and sample consisted of 189 stocks. The study revealed that the correlations of volume and search intensity were strongly positive and the correlations of returns and search intensity were weakly positive.

Singh¹⁷, using the data from NSE, conducted a study to examine the association between volume, return, and volatilities in stock market. The researcher showed that ARCH models prove to be superior to traditional OLS models. Also, among the volatility models, that is, TARCH, EGARCH, and GARCH, using SIC and AIC criteria, the TARCH model was found to be better fitted. The study witnessed the causality from volatility to trading volume and stock returns to trading volume. Considering the behaviour of DJIA stock portfolio, Gold¹⁸ evaluated some of the opposing viewpoints in finance literature related to trading volume and stock returns, that is, first, association of trading volume with information asymmetry which revealed higher uncertainty in returns; second, viewpoint being trading volume associated with informed trading; and third, viewpoint which supported the efficient market hypotheses (EMH). The analysis of the study clearly supported the asymmetry information that had significant importance with relation to investment strategies.

Lee, Kim, and Kim¹⁹ showed in their study that the trading volume predictability is more related with trading activity that is not represented by past volume. The study found the forecasting power to be negative of trading activity, and it remains for a longer period of time. The study also concluded that the investors' attention and biases in behaviour also help in explaining the trading volume. In a similar study, Liu, Mao, and Seasholes²⁰ investigated the dynamics of return–volume using CRSP (Center for Research in Security Prices) data on monthly basis. The study documented that the returns forecasting is stronger for companies that show inferior performance before the volume shocks, for the companies which receive news that is mostly positive and the companies which have information asymmetry.

Research Gap

The review of literature indicates that considerable amount of research has been done analysing the relationship between stock returns and volume, but less contribution is noticed evaluating the association of stock returns with volume and turnover together. The present study breaches this gap and critically examines the relationship of stock returns with volume as well as turnover and analyses the impact and causal relationship between the said variables. The association is analysed across 10 sectoral indices of NSE to investigate the significance of such relation across various sectors which is one of a kind. Every sectoral index represents the major companies of that particular sector. Any news pertaining to the sector will have impact on companies forming part of the sector and will be reflected through sectoral index. Thus, the present study considers 10 sectoral indices of NSE which will represent 10 sectors in India.

Objectives of the Study

The following are the objectives of the present study:

1. To investigate the association of stock returns with volume and turnover across sectoral indices.
2. To examine the impact of volume and turnover on stock returns across sectoral indices.
3. To analyse the causal relationship between stock returns, volume, and turnover across sectoral indices.

Research Methodology

The motive behind conducting the present study is to analyse the association of stock returns with volume and turnover across sectoral indices. The present study makes use of one of the most widely used statistical techniques, Karl Pearson's correlation analysis, to analyse such a relation. The technique of Karl Pearson's correlation analysis not only explains the relationship between variables but also helps us to understand whether the relation is significant or not. These analyses have been performed using SPSS software. The required data pertaining to stock returns, volume, and turnover have been extracted from the official website of NSE, India. The period of the study is 10 years, that is, from 1 November 2006 to 31 October 2016. The stock returns of 10 sectoral indices of NSE are computed with the help of daily closing prices using the formula $\ln(P_0/P_1)$, where P_0 reflects the current price of the stock and P_1 indicates the previous-day price of the stock. Thus, it is evident from the formula that the returns are converted into log form for normality purpose. The data relating to volume and turnover are taken in the form of growth, that is, they are converted into percentage for the purpose of analysis. The required data are sorted and tabulated using Microsoft Office Excel. The impact of volume and

turnover on stock returns is examined using OLS model where volume and turnover are assumed to be regressors and stock returns to be dependent variable. It is important to note that the present study did not use multiple regression analysis as the variables volume and turnover are highly correlated with each other which account for multicollinearity. Dropping of the variables is not done considering the significant importance of both the variables, that is, volume and turnover in present study. The study made use of regression analysis using OLS as it provides us with the output of coefficients and p -values which are crucial in examining the impact and accounted for structural breaks using Bai–Perron test. The presence of structural breaks can distort the results and hence structural breaks were identified using Bai–Perron test, and the impact thereby examined for various sub-periods. Bai–Perron test was selected considering its efficiency in identifying multiple breaks in the data. The suitability of the model was evaluated using CUSUM test which is based on the cumulative sum of the recursive residuals. Also, the present study attempts to analyse the causal relationship between stock returns, volume, and turnover for which Granger causality test have been implemented. The correlation analysis merely explains the relationship between regressors and dependent variables. Regression analysis examines only the impact of regressors on dependent variables. But both these techniques fail to evaluate which variable causes the other variable. Hence, Granger causality test has been used in the present study. The study also provides summary statistics across the selected variables. The variables analysed under summary statistics include mean, standard deviation, skewness, and kurtosis. Mean is used to measure the performance, that is, to identify highest returns, volume, and turnover among sectoral indices, and standard deviation to signify the amount of variation. The symmetry of data and its flatness have been interpreted using skewness and kurtosis. To check the stationarity of the data relating to stock returns, volume, and turnover across the selected sectoral indices, augmented Dickey–Fuller test has been used. As the data involve daily returns, considering the high frequency of data, the present study preferred to use augmented Dickey–Fuller test over Dickey–Fuller test or traditional unit root test. The required analysis relating to summary statistics, correlation, examination of impact, causal relationship, and stationarity have been done using statistical software E-views.

The core part of the study involves performing all these mentioned analyses sector-wise. Thus, the relationship of stock returns with volume and turnover, impact of volume and turnover on stock returns, and the causal relationship between stock returns, volume, and turnover are investigated across 10 sectoral indices of NSE. Table 1 enumerates the list of selected sectoral indices for the present study:

Table 1. Details of Sectoral Indices and Market Representation

Sr. No.	Name of the Sectoral Index	Number of Companies Consisting the Index	Market Representation, i.e., Percentage of Free Float Market Capitalization of the Stocks Forming Part of Respective Sector
1	Nifty Auto	15	91.1
2	Nifty Bank	12	93.3
3	Nifty Financial Services	15	75.8
4	Nifty FMCG	15	80.4
5	Nifty IT	10	91.9
6	Nifty Media	15	72.8
7	Nifty Metal	15	87.9
8	Nifty Pharma	10	79.9
9	Nifty Private Bank	10	97.7
10	Nifty Energy	10	83.8

Source: Compiled using data from official website of NSE.

Hypotheses Development

The following hypotheses were developed for the purpose of analysis:

- Hypothesis I: H₀: There exists no significant impact of volume on stock returns across sectoral indices.
- Hypothesis II: H₀: There exists no significant impact of turnover on stock returns across sectoral indices.
- Hypothesis II: H₀: Turnover does not Granger cause stock return.
- Hypothesis III: H₀: Stock return does not Granger cause turnover.
- Hypothesis IV: H₀: Volume does not Granger cause stock return.
- Hypothesis V: H₀: Stock return does not Granger cause volume.
- Hypothesis VI: H₀: Volume does not Granger cause turnover.
- Hypothesis VII: H₀: Turnover does not Granger cause volume.

Results and Discussion

Descriptive Statistics

Table 2 portrays the results of summary statistics for the stock returns, turnover, and volume. For the purpose of analysis, the turnover and volume variables are converted into percentages and are expressed as growth. The key constituents of summary statistics examined during the study include mean, standard deviation, skewness, and kurtosis. In statistics, mean is regarded as a performance measure and higher mean value is considered as favourable. For the selected period of study, the mean return of Nifty Private Bank Index has been highest, that is, 0.07 per cent, followed by Nifty Auto Index, Nifty FMCG Index, and Nifty Pharma Index being 0.06 per cent, 0.06 per cent, and 0.06 per cent respectively. This signifies the growing bullish behaviour of investors towards private bank stock for the selected period. It is evident that the private banks have been able to attract large pool of customers, thereby generating investors' faith in the stocks. The performance in terms of returns has been least for Nifty Energy Index (0.02%) and Nifty Metal Index (0.02%). The daily average

Table 2. Summary Statistic Results of Stock Returns, Volume and Turnover

Indices	Returns (%)				Turnover (%)				Volume (%)			
	Mean	Std Dev.	Skewness	Kurtosis	Mean	Std Dev.	Skewness	Kurtosis	Mean	Std Dev.	Skewness	Kurtosis
Nifty Auto	0.06	1.47	-0.10	9.09	-0.04	43.98	-0.40	17.82	-0.01	43.19	-0.12	14.86
Nifty Bank	0.05	2.01	0.11	7.94	-0.01	43.22	0.10	29.23	-0.01	43.53	0.02	29.64
Nifty Financial Services	0.05	1.96	0.11	8.80	-0.16	45.36	-0.51	18.66	-0.13	44.06	-0.45	18.34
Nifty FMCG	0.06	1.28	-0.21	6.74	-0.09	46.71	0.36	20.36	-0.09	48.84	0.39	19.18
Nifty IT	0.03	1.70	-0.14	8.41	-0.06	47.12	0.23	22.18	-0.07	45.55	0.11	24.06
Nifty Media	0.03	1.75	-0.21	7.88	-0.08	50.49	-0.03	8.89	-0.07	46.19	0.13	6.26
Nifty Metal	0.02	2.26	0.58	15.15	-0.14	41.71	-0.08	16.23	-0.10	41.56	-0.06	15.17
Nifty Pharma	0.06	1.23	-0.43	10.22	-0.003	47.43	0.32	23.35	-0.04	49.05	0.36	23.63
Nifty Private Bank	0.07	2.07	0	8.74	-0.71	44.71	-0.52	8.16	-0.53	42.55	-0.22	5.98
Nifty Energy	0.02	1.65	-0.25	11.97	-0.09	43.76	0.12	22.51	-0.06	44.36	0.04	22.17

Source: Compiled using E-views and MS Excel.

returns for Nifty Bank Index, Nifty Financial Services Index, Nifty IT Index, and Nifty Media Index were noticed to be 0.05 per cent, 0.05 per cent, 0.03 per cent, and 0.03 per cent respectively. The study noticed a negative daily average growth in respect of turnover across all the sectoral indices. The negative daily growth was found to be lowest for Nifty Pharma Index, that is, -0.003 per cent, and highest for Nifty Private Bank Index, that is, -0.71 per cent. A similar negative trend has been noticed in the case of volume where negative daily growth was lowest for Nifty Auto Index and Nifty Bank Index, that is, -0.01 per cent and -0.01 per cent respectively, and highest for Nifty Private Bank Index, that is, -0.53 per cent. The present study witnessed an interesting aspect, that is, the daily average returns are higher for Nifty Private Bank Index as compared to the other sectoral indices, but its turnover and volume are also showing higher negative growth as compared to other sectoral indices. The standard deviation is used to reflect the variation in data. Statistically accepted theory is that the lower the variations are the better it is. In respect of returns, the variations have been low for Nifty Pharma Index, that is, 1.23, and highest for Nifty Metal Index. In the case of turnover and volume, the variation was found to be least in the case of Nifty Metal Index, that is, 41.71 and 41.56, as compared to the other sectoral indices. A near-to-perfect symmetry is noticed for Nifty Private Bank Index; positive skewness in the case of Nifty Bank Index, Nifty Financial Services Index, and Nifty Metal Index; and negative skewness in the case of Nifty Auto Index, Nifty Energy Index, Nifty FMCG Index, Nifty IT Index, Nifty Media Index, and Nifty Pharma Index. The trend in skewness relating to turnover and volume has been almost similar. The data across all the sectoral indices have been leptokurtic as the kurtosis are found to be more than 3. More clear evidence about the relationship between stock returns, volume, and turnover will be indicated using correlation analysis, regression analysis, and Granger causality test.

Augmented Dickey–Fuller Test

The present study also tests for stationarity of data for the variables, that is, stock returns, turnover, and volume, across sectoral indices. For true results from the analysis, the data selected for the period of study need to be stationary, that is, their mean, variance and co-variance should be stable over a period of time. If the data are non-stationary, it reflects the presence of unit root ($p = 1$) in the data. The present study uses augmented Dickey–Fuller test to examine if there is presence of unit root in the data. For this purpose, the following hypothesis was developed.

H0: There exists unit root in the data.

The output in Table 3 is obtained using statistical software E-views and sorted using MS Excel. The results across sectoral indices for the selected variables, that is, stock returns, turnover, and volume, show the p -value close to 0. This suggests that across all the indices, the null hypothesis is rejected at 1 per cent level of significance. Thus, there exists no unit root in the data ($p < 1$), and the data is stationary.

Correlation Result

The correlation result between stock returns, volume, and turnover across sectoral indices is reflected in Table 4. The study noticed a weak positive relationship between stock return and turnover for Nifty Auto Index, Nifty Bank Index, Nifty Financial Services Index, Nifty Media Index, Nifty Metal Index, and Nifty Private Bank Index, that is, 0.03, 0.01, 0.03, 0.10, 0.08, and 0.02 respectively, and a weak negative return–volume relationship across Nifty FMCG Index, Nifty IT Index, Nifty Pharma Index, and Nifty Energy Index, that is, -0.01 , -0.03 , -0.7 , and -0.04 respectively. A similar trend has been noticed while analysing the relationship between stock return and volume, where weak positive relationship was found for Nifty Financial Services Index, Nifty Media Index, Nifty Metal

Table 3. Stationarity Results of Stock Returns, Volume and Turnover

	Indices	Return (%)		Turnover (%)		Volume (%)	
		t-statistic	p-value	t-statistic	p-value	t-statistic	p-value
Augmented Dickey–Fuller test statistic	Nifty Auto	−43.0896	0	−16.6718	0	−19.911	0
	Nifty Bank	−44.0698	0.0001	−22.274	0	−22.6926	0
	Nifty Financial Services	−44.1522	0.0001	−16.2132	0	−15.9242	0
	Nifty FMCG	−48.7336	0.0001	−24.6473	0	−24.622	0
	Nifty IT	−36.8355	0	−27.8547	0	−26.7226	0
	Nifty Media	−45.4319	0.0001	−19.2104	0	−19.1425	0
	Nifty Metal	−45.1052	0.0001	−22.5094	0	−22.9076	0
	Nifty Pharma	−47.7871	0.0001	−25.6334	0	−25.6738	0
	Nifty Private Bank	−44.2151	0.0001	−12.9064	0	−13.0965	0
	Nifty Energy	−47.1101	0.0001	−25.0333	0	−25.1407	0

Source: Compiled using E-views and MS Excel.

Notes: Test critical values are -3.43 , -2.86 , and -2.56 at 1%, 5%, and 10% levels of significance.

Table 4. Results Showing Relationship of Stock Returns with Volume and Turnover

Indices			Return (%)	Volume (%)		Return (%)	Turnover (%)
Nifty Auto	Return (%)	Pearson correlation Sig. (2-tailed)	1	-0.003	Return (%)	Pearson correlation Sig. (2-tailed)	1
	Volume (%)	Pearson correlation Sig. (2-tailed)	-0.003	1	Turnover (%)	Pearson correlation Sig. (2-tailed)	0.033
			0.923				0.227
			0.923				0.227
			Return (%)	Volume (%)		Return (%)	Turnover (%)
Nifty Bank	Return (%)	Pearson correlation Sig. (2-tailed)	1	-0.006	Return (%)	Pearson correlation Sig. (2-tailed)	1
	Volume (%)	Pearson correlation Sig. (2-tailed)	-0.006	1	Turnover (%)	Pearson correlation Sig. (2-tailed)	0.016
			0.770				0.423
			0.770				0.423
			Return (%)	Volume (%)		Return (%)	Turnover (%)
Nifty Financial Services	Return (%)	Pearson correlation Sig. (2-tailed)	1	0.017	Return (%)	Pearson correlation Sig. (2-tailed)	1
	Volume (%)	Pearson correlation Sig. (2-tailed)	0.017	1	Turnover (%)	Pearson correlation Sig. (2-tailed)	0.033
			0.536				0.242
			0.536				0.242
			Return (%)	Volume (%)		Return (%)	Turnover (%)
Nifty FMCG	Return (%)	Pearson correlation Sig. (2-tailed)	1	-0.034	Return (%)	Pearson correlation Sig. (2-tailed)	1
	Volume (%)	Pearson correlation Sig. (2-tailed)	-0.034	1	Turnover (%)	Pearson correlation Sig. (2-tailed)	-0.012
			0.094				0.559
			0.094				0.559
			2,474	2,474		2,474	2,474
			Return (%)	Volume (%)		Return (%)	Turnover (%)
Nifty IT	Return (%)	Pearson correlation Sig. (2-tailed)	1	-0.039	Return (%)	Pearson correlation Sig. (2-tailed)	1
	Volume (%)	Pearson correlation Sig. (2-tailed)	-0.039	1	Turnover (%)	Pearson correlation Sig. (2-tailed)	-0.037
			0.050				0.063
			0.050				0.063
			Return (%)	Volume (%)		Return (%)	Turnover (%)
Nifty Media	Return (%)	Pearson correlation Sig. (2-tailed)	1	0.084	Return (%)	Pearson correlation Sig. (2-tailed)	1
	Volume (%)	Pearson correlation Sig. (2-tailed)	0.084	1	Turnover (%)	Pearson correlation Sig. (2-tailed)	0.102
			0.002				0
			0.002				0
			Return (%)	Volume (%)		Return (%)	Turnover (%)
Nifty Metal	Return (%)	Pearson correlation Sig. (2-tailed)	1	0.069	Return (%)	Pearson correlation Sig. (2-tailed)	1
	Volume (%)	Pearson correlation Sig. (2-tailed)	0.069	1	Turnover (%)	Pearson correlation Sig. (2-tailed)	0.086
			0.012				0.002
			0.012				0.002
			Return (%)	Volume (%)		Return (%)	Turnover (%)
Nifty Pharma	Return (%)	Pearson correlation Sig. (2-tailed)	1	-0.102	Return (%)	Pearson correlation Sig. (2-tailed)	1
	Volume (%)	Pearson correlation Sig. (2-tailed)	-0.102	1	Turnover (%)	Pearson correlation Sig. (2-tailed)	-0.077
			0				0
			0				0

Indices			Return (%)	Volume (%)		Return (%)	Turnover (%)	
Nifty Private Bank	Return (%)	Pearson correlation	1	0.004	Return (%)	Pearson correlation	1	
		Sig. (2-tailed)		0.957		Sig. (2-tailed)	0.718	
	Volume (%)	Pearson correlation	0.004	1	Turnover (%)	Pearson correlation	0.026	1
		Sig. (2-tailed)	0.957			Sig. (2-tailed)	0.718	
Nifty Energy	Return (%)	Pearson correlation	1	-0.058	Return (%)	Pearson correlation	1	-0.046
		Sig. (2-tailed)		0.004		Sig. (2-tailed)	0.022	
	Volume (%)	Pearson correlation	-0.058	1	Turnover (%)	Pearson correlation	-0.046	1
		Sig. (2-tailed)	0.004			Sig. (2-tailed)	0.022	

Source: Compiled using SPSS.

Index, and Nifty Private Bank Index and a weak negative association for Nifty Auto Index, Nifty Bank Index, Nifty FMCG Index, Nifty IT Index, Nifty Pharma Index, and Nifty Energy Index. The study evidenced low and insignificant relationship across all the sectoral indices which suggest that although volume and turnover are very useful indicators in technical analysis, but its association with daily stock returns is limited.

Regression Result

The regression analyses have been performed using OLS model to examine the impact of turnover and volume on stock returns across sectoral indices. Residual diagnostic tests were performed before obtaining the regression output. As the period of the study involves 2008 financial crises, for the specified period study noticed heteroscedasticity and autocorrelation. Also, the data were found to be not normally distributed. Omitting the impact of financial crises, the study fulfils the assumptions of classical linear regression model. The study accounted for the presence of structural breaks in the data and hence analysed the impact for various sub-periods. The structural breaks were identified using Bai–Perron test. The structural breaks varied across sectoral indices. As the purpose of the present study is to analyse the impact across 10 sectoral indices, accordingly, volume is regressed over returns, and turnover is regressed over returns separately. The study did not use multiple regression analysis as the variables volume and turnover are highly correlated with each other which account for multicollinearity. Dropping of the variables is not done considering the significant importance of both the variables, that is, volume and turnover in the present study. The output as reflected in Tables 5 and 6 is obtained using statistical software E-views and sorted using MS Excel for simplification.

The sampling errors in the data are reflected by the standard error. As can be noticed from the output, the standard errors for the selected variables across all the sectoral indices have been close to 0, and hence it is favourable for the study. The present study while analysing the impact of turnover on stock returns and volume on stock returns, the

appropriate level of significance (1%, 5%, 10%), is considered based on the p -value.

The present study noticed a significant impact of turnover on stock returns in the case of Nifty Bank Index, Nifty Media Index, and Nifty Metal Index. The study also noticed an impact before structural break in the case of Nifty FMCG Index, Nifty IT Index, Nifty Pharma Index, and Nifty Energy Index. Low impact was evidenced from the period 2009–2010 as most of these sectors were gradually recovering from the financial crises. However, impact of turnover on stock returns was not found in the case of Nifty Auto Index, Nifty Financial Services Index, and Nifty Private Bank Index. Also, the impact of volume on stock returns was not evidenced. This is due to the fact that the companies forming part of these sectoral indices have been able to generate large volumes consistently, and the investment decision of investors have been motivated more by other factors such as future growth prospects of these companies, change in management, government policies towards the sector, and other company-related factors, rather than only volumes or turnover. The study witnessed a significant impact of volume on stock returns in the case of all other sectoral indices, but the impact seemed to be reduced from the period 2009–2010 as reflected in Tables 5 and 6.

The present study used the CUSUM test which is based on the cumulative sum of the recursive residuals to evaluate the stability of the linear regression models. The CUSUM test plots the cumulative sum together with 5 per cent critical lines. The model is said to be unstable if the cumulative sum goes outside the area between two critical lines. The present study noticed all the cumulative sums within the 5 per cent critical lines for regression models of volume and stock returns as well as for regression models of turnover and stock returns across sectoral indices. The CUSUM test results are exhibited in the Annexure.

Granger Causality Test

The present study aims to analyse the causal relationship between stock returns, turnover, and volume. To achieve this objective, the necessary analyses have been performed using Granger causality test which is depicted in Table 7.

Table 5. Bai-Perron Test Results Indicating Structural Breaks

	Variable	Coefficient	Std Error	t-statistic	p-value
Nifty Auto	Volume (1 November 2006–15 September 2014)	0.001672	0.000919	1.820012	0.069*
	Volume (16 September 2014–30 October 2016)	-0.004716	0.001497	-3.151004	0.001***
Nifty Bank	Volume (1 November 2006–18 May 2009)	-0.007284	0.002011	-3.620558	0.000***
	Volume (19 May 2009–30 October 2016)	0.001620	0.001045	1.549976	0.121
Nifty Financial Services	Volume (1 November 2006–30 October 2016)	0.000558	0.000907	0.614965	0.538
Nifty FMCG	Volume (1 November 2006–20 May 2009)	-0.003671	0.001024	-3.585654	0.000***
	Volume (21 May 2009–30 October 2016)	0.00012	0.000615	0.194929	0.845
Nifty IT	Volume (1 November 2006–28 May 2009)	-0.005201	0.001283	-4.053985	0.000***
	Volume (29 May 2009–30 October 2016)	0.000444	0.000918	0.483468	0.628
Nifty Media	Volume (1 November 2006–30 October 2016)	0.00253	0.000834	3.032915	0.002***
Nifty Metal	Volume (1 November 2006–30 October 2016)	0.002842	0.001132	2.510523	0.012**
Nifty Pharma	Volume (1 November 2006–22 May 2009)	-0.006985	0.000885	-7.888734	0***
	Volume (25 May 2009–9 April 2015)	0.000633	0.000675	0.937682	0.348
	Volume (10 April 2015–30 October 2016)	-0.004821	0.001293	-3.728171	0.000***
Nifty Private Bank	Volume (1 November 2006–1 March 2016)	-0.014337	0.00522	-2.746636	0.006***
	Volume (2 March 2016–30 October 2016)	0.002589	0.002175	1.190397	0.235
Nifty Energy	Volume (1/ November 2006–18 May 2009)	-0.010696	0.001718	-6.225219	0***
	Volume (19 May 2009–30 October 2016)	-0.000199	0.00082	-0.242186	0.808

Source: Compiled using E-views and MS Excel.

- Notes:** 1. *10% level of significance, **5% level of significance, ***1% level of significance.
 2. Least Squares with Breaks (Y = Returns, X = Volume).
 3. Break type: Bai-Perron tests of L + 1 vs L sequentially determined breaks.
 4. Break selection: Trimming 0.15, Max. breaks 5, Sig. level 0.05.

Table 6. Least Squares with Breaks (Y = Returns, X = Turnover)

	Variable	Coefficient	Std Error	t-statistic	p-value
Nifty Auto	Turnover (1 November 2006–30 October 2016)	0.000929	0.000772	1.203936	0.228
Nifty Bank	Turnover (1 November 2006–18 May 2009)	-0.004862	0.002098	-2.318014	0.020**
	Turnover (19 May 2009–30 October 2016)	0.002143	0.001045	2.050159	0.040**
Nifty Financial Services	Turnover (1 November 2006–30 October 2016)	0.001027	0.00088	1.166632	0.243
Nifty FMCG	Turnover (1 November 2006–9 September 2008)	0.005117	0.001492	3.429243	0.000***
	Turnover (10 October 2008–22 March 2010)	-0.004786	0.001083	-4.421172	0***
	Turnover (23 March 2010–30 October 2016)	0.000353	0.000705	0.500351	0.616

	Variable	Coefficient	Std Error	t-statistic	p-value
Nifty IT	Turnover (1 November 2006–29 May 2009)	-0.005263	0.001399	-3.76265	0.000***
	Turnover (1 June 2009–30 October 2016)	7.58E-05	0.000843	0.089927	0.928
Nifty Media	Turnover (1 November 2006–30 October 2016)	0.002816	0.000762	3.696947	0.000***
Nifty Metal	Turnover (1 November 2006–30 October 2016)	0.003507	0.001127	3.113238	0.001***
Nifty Pharma	Turnover (1 November 2006–22 May 2009)	-0.006577	0.000948	-6.940201	0***
	Turnover (25 May 2009–9 April 2015)	0.000938	0.000687	1.365043	0.172
	Turnover (10 April 2015–30 October 2016)	-0.004107	0.001358	-3.02447	0.002***
Nifty Private Bank	Turnover (1 November 2006–30 October 2016)	0.000674	0.001947	0.346107	0.729
Nifty Energy	Turnover (1 November 2006–18 May 2009)	-0.012202	0.001874	-6.511995	0***
	Turnover (19 May 2009–30 October 2016)	0.000261	0.000818	0.318922	0.749

Source: Compiled using E-views and MS Excel.

- Notes:** 1. *10% level of significance, **5% level of significance, ***1% level of significance.
2. Break type: Bai–Perron tests of L + 1 vs L sequentially determined breaks.
3. Break selection: Trimming 0.15, Max. breaks 5, Sig. level 0.05.

Table 7. Results Showing Causation Effect between Stock Returns, Volume and Turnover

		Null Hypothesis					
		Turnover (%) does not Granger cause return (%)	Return (%) does not Granger cause turnover (%)	Volume (%) does not Granger cause return (%)	Return (%) does not Granger cause volume (%)	Volume (%) does not Granger cause turnover (%)	Turnover (%) does not Granger cause volume (%)
Nifty Auto	F-statistic	2.268	1.673	2.852	0.986	0.588	3.056
	P-value	0.104	0.188	0.0581*	0.374	0.556	0.0474**
Nifty Bank	F-statistic	0.217	1.148	0.177	0.231	0.098	1.606
	P-value	0.805	0.317	0.838	0.794	0.907	0.201
Nifty Finance Services	F-statistic	0.579	0.840	0.436	0.512	1.235	3.152
	P-value	0.561	0.432	0.647	0.600	0.291	0.0431**
Nifty FMCG	F-statistic	3.301	0.766	2.372	0.393	0.283	2.447
	P-value	0.037**	0.465	0.0935*	0.675	0.753	0.0868*
Nifty IT	F-statistic	6.616	1.295	6.667	1.101	3.369	1.521
	P-value	0.0014***	0.274	0.0013***	0.333	0.0346**	0.219
Nifty Media	F-statistic	0.760	0.689	0.092	1.044	0.396	1.446
	P-value	0.468	0.502	0.912	0.352	0.673	0.236
Nifty Metal	F-statistic	1.212	0.484	0.627	1.620	0.863	2.093
	P-value	0.298	0.616	0.535	0.198	0.422	0.124
Nifty Pharma	F-statistic	2.275	3.173	2.727	0.910	0.305	0.538
	P-value	0.103	0.0421**	0.0656*	0.403	0.737	0.584
Nifty Private Bank	F-statistic	0.093	1.767	0.150	2.286	0.482	0.352
	P-value	0.911	0.174	0.861	0.104	0.618	0.704
Nifty Energy	F-statistic	1.087	7.654	1.146	4.058	0.076	4.488
	P-value	0.337	0.0005***	0.318	0.0174**	0.927	0.0113**

Source: Compiled using E-views and MS Excel.

- Notes:** *10% level of significance, **5% level of significance, ***1% level of significance.

The study noticed the causal evidence of volume granger causing the returns at 10 per cent level of significance and turnover Granger causing volume at 5 per cent level of significance for Nifty Auto Index. Also, for Nifty Financial Services Index, Nifty FMCG Index, and Nifty Energy Index, the study found the evidence of turnover Granger causing the volume. The study found a significant evidence of turnover and volume Granger causing the returns in the case of Nifty FMCG Index and Nifty IT Index. Nifty IT Index also indicates the causation from volume to turnover. However, in the case of Nifty Pharma Index and Nifty Energy Index, the causation from return to turnover is witnessed. Thus, it is evident from the study that the causal relationship between stock returns, turnover, and volume varies across the sectoral indices.

Conclusion

The stock returns tend to get affected by various factors related to economy and company as well. Also, trading volume can get influenced by numerous factors such as any positive/negative news about company, its financial status, changes in ownership, and so on. Thus, it becomes evident to know how the returns move as regards to volume and turnover. The motive behind conducting the present study was to analyse the association between stock returns, volume, and turnover across sectoral indices. The impact of volume and turnover on stock returns was examined using OLS model where volume and turnover were assumed to be regressors and stock returns to be dependent variable. The present study attempted to analyse the causal relationship between stock returns, volume, and turnover for which Granger causality test had been implemented. To check the stationarity of the data relating to stock returns, volume, and turnover across the selected sectoral indices, augmented Dickey–Fuller test had been used. The mean of Nifty Private Bank Index was highest, that is, 0.07 per cent, followed by Nifty Auto Index, Nifty FMCG Index, and Nifty Pharma Index being 0.06 per cent, 0.06 per cent, and 0.06 per cent respectively. The performance in terms of returns had been least for Nifty Energy Index (0.02%) and Nifty Metal Index (0.02%). The study noticed a negative daily average growth in respect of turnover across all the sectoral indices. The augmented Dickey–Fuller test suggested that across all the indices, the null hypothesis was rejected at 1 per cent level of significance, and thus there exists no unit root in the data ($p < 1$) and the data is found to be stationary. The study witnessed a weak positive

relationship between stock return and turnover for Nifty Auto Index, Nifty Bank Index, Nifty Financial Services Index, Nifty Media Index, Nifty Metal Index, and Nifty Private Bank Index, that is, 0.03, 0.01, 0.03, 0.10, 0.08, and 0.02 respectively, and a weak negative return–volume relationship across Nifty FMCG Index, Nifty IT Index, Nifty Pharma Index, and Nifty Energy Index, that is, -0.01 , -0.03 , -0.7 , and -0.04 respectively. The present study noticed a significant impact of turnover on stock returns in the case of Nifty Bank Index, Nifty Media Index, and Nifty Metal Index. The study also witnessed a significant impact of volume on stock returns in the case of all other sectoral indices, but the impact seemed to be reduced from the period 2009–2010. Low impact was evidenced from the period 2009–2010 as most of these sectors were gradually recovering from the financial crises. The study used the CUSUM test and found the regression models stable.

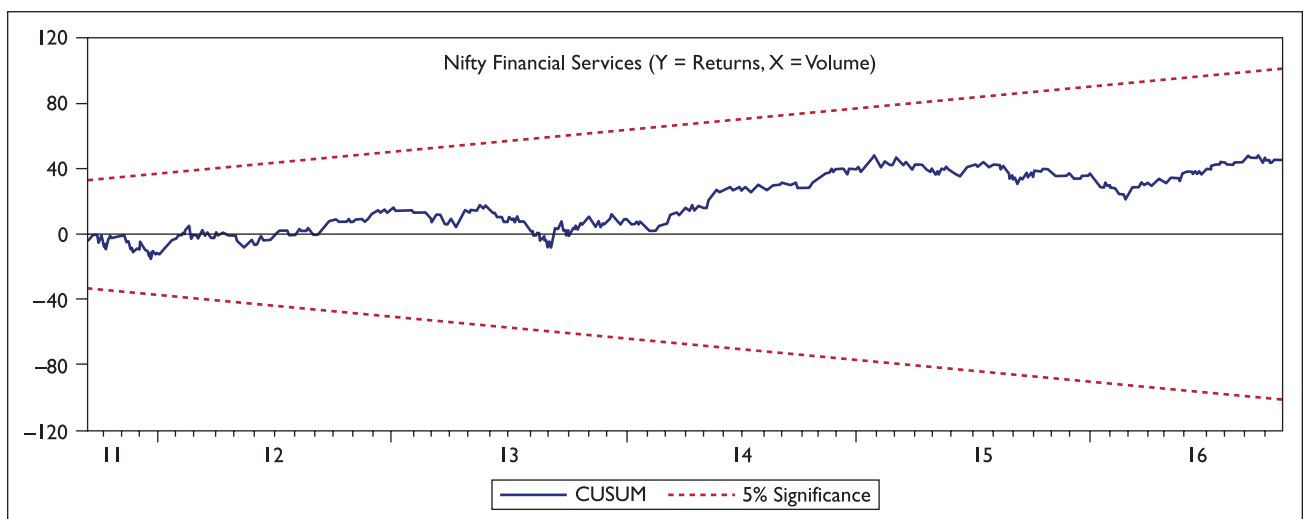
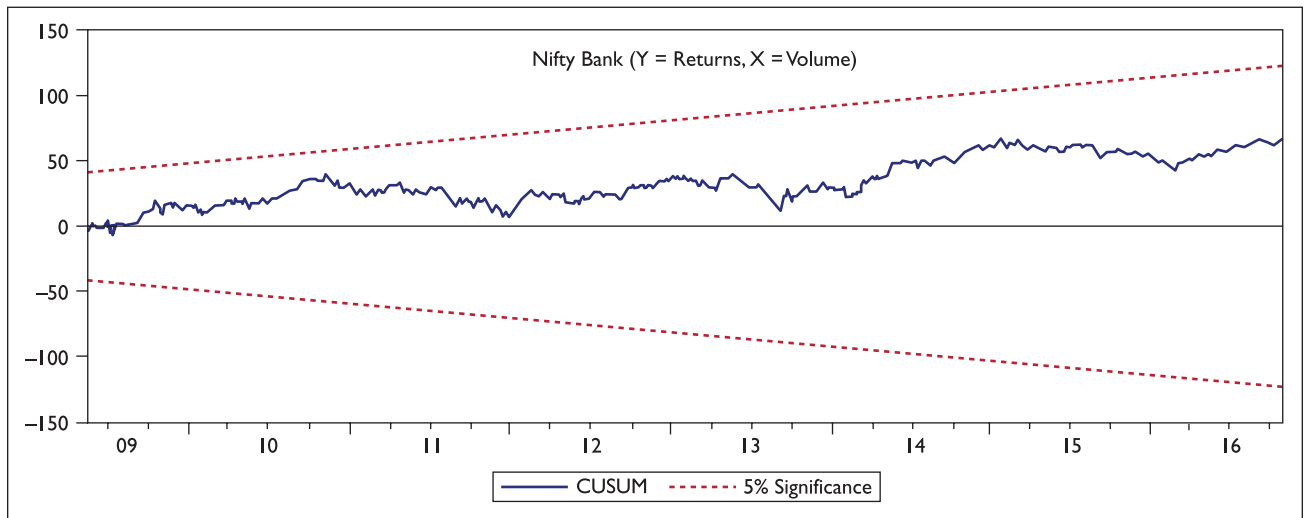
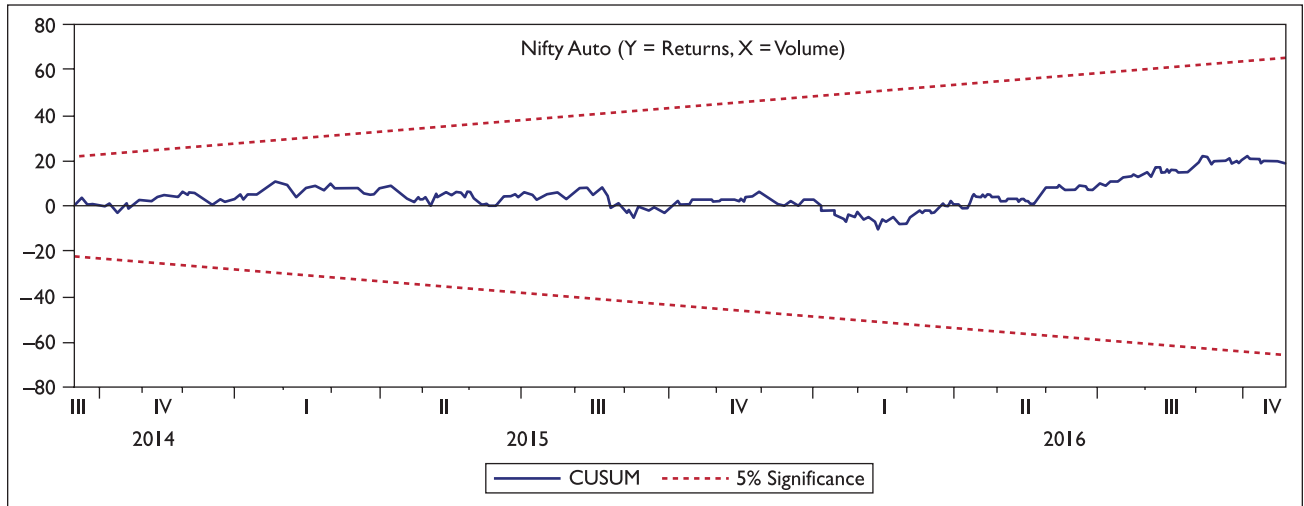
The results also showed causal evidence of volume Granger causing the returns at 10 per cent level of significance and turnover Granger causing volume at 5 per cent level of significance for Nifty Auto Index. Also, for Nifty Financial Services Index, Nifty FMCG Index, and Nifty Energy Index, the study found the evidence of turnover Granger causing the volume. The study reflected a significant evidence of turnover and volume Granger causing the returns in the case of Nifty FMCG Index and Nifty IT Index. It was evident from the study that the causal relationship between stock returns, turnover, and volume varies across the sectoral indices.

The present study faced the limitation as regards to the period of study which is only 10 years. Also, all the analyses are performed across only 10 sectoral indices. Hence, the study cannot be generalized to all the sectors in India. Also, the period of the study involves 2008 financial crises, as a result of which the data was heteroscedastic during the crisis period. There exists a scope for further research, that is, the period of study can be extended to accumulate more number of years with increased number of sectors. Also, more econometric models relating to time series can be implemented.

The present study will help retail investors, institutional investors, traders, stock market brokers, regulatory authorities, technical and fundamental analysts, and other market participants in evaluating the dynamics of stock returns, volume, and turnover in the Indian stock market perspective.

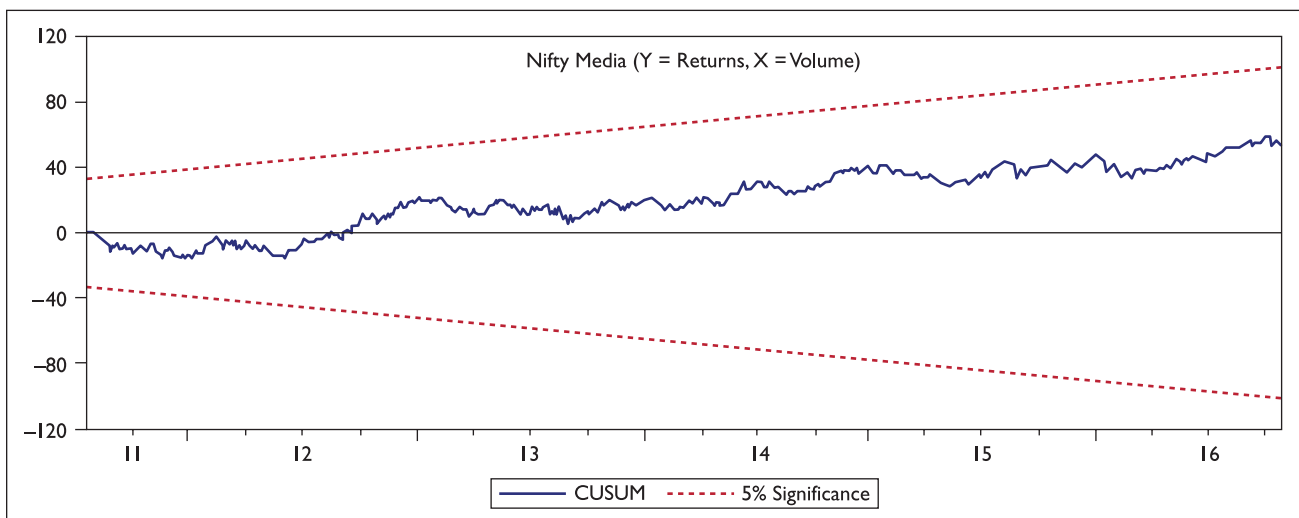
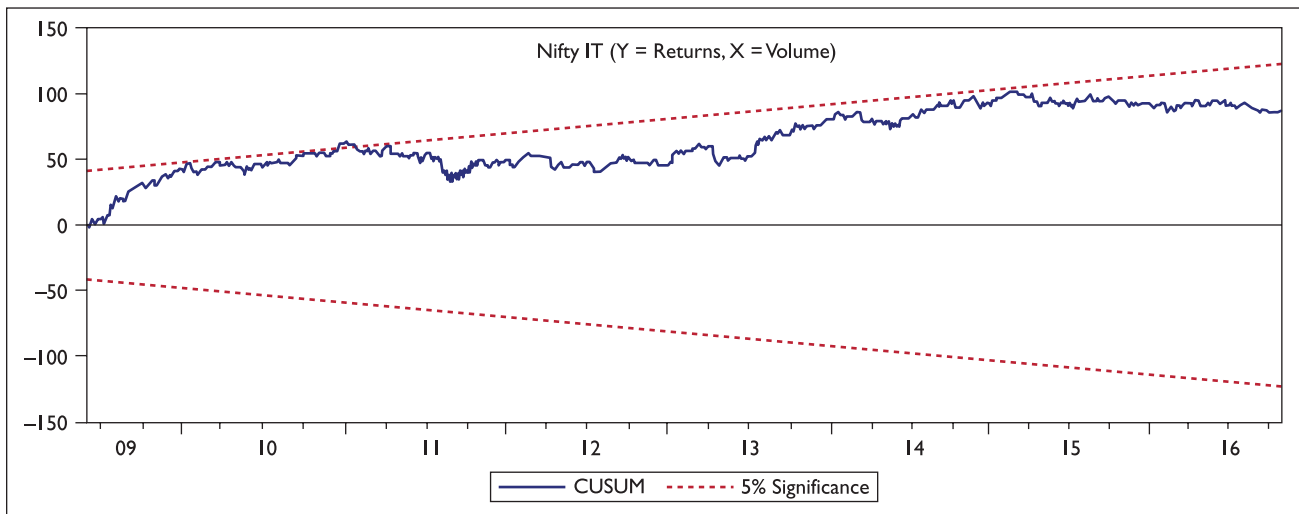
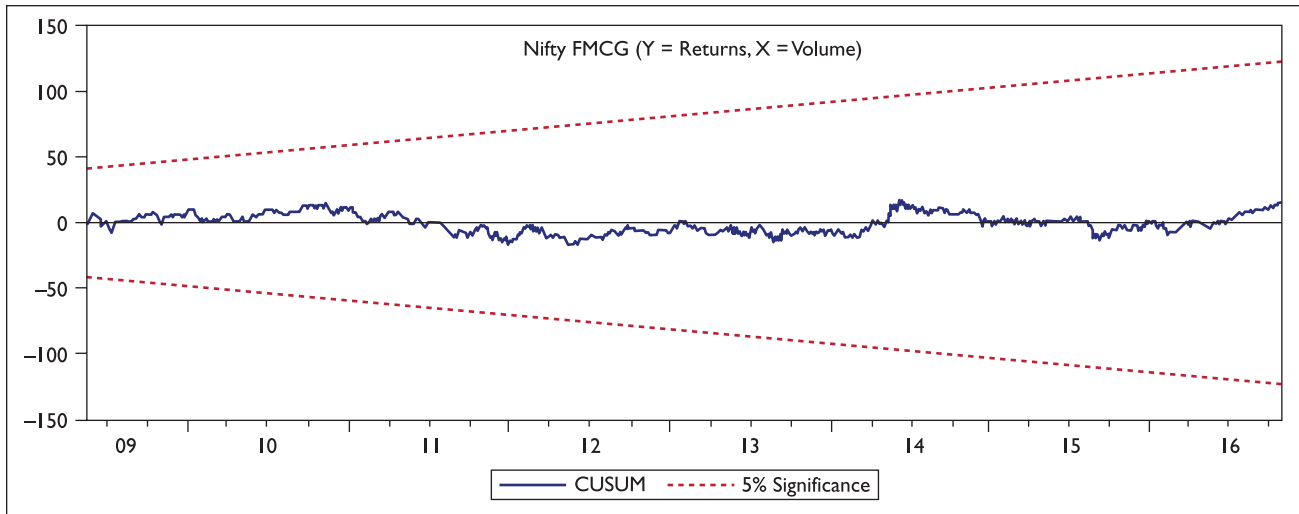
Annexure

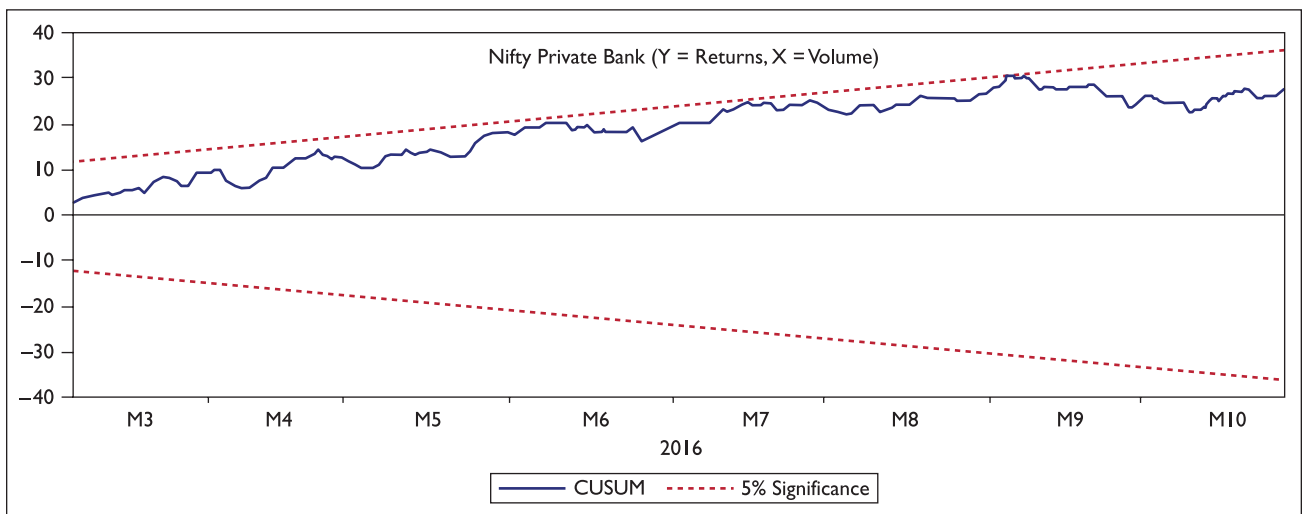
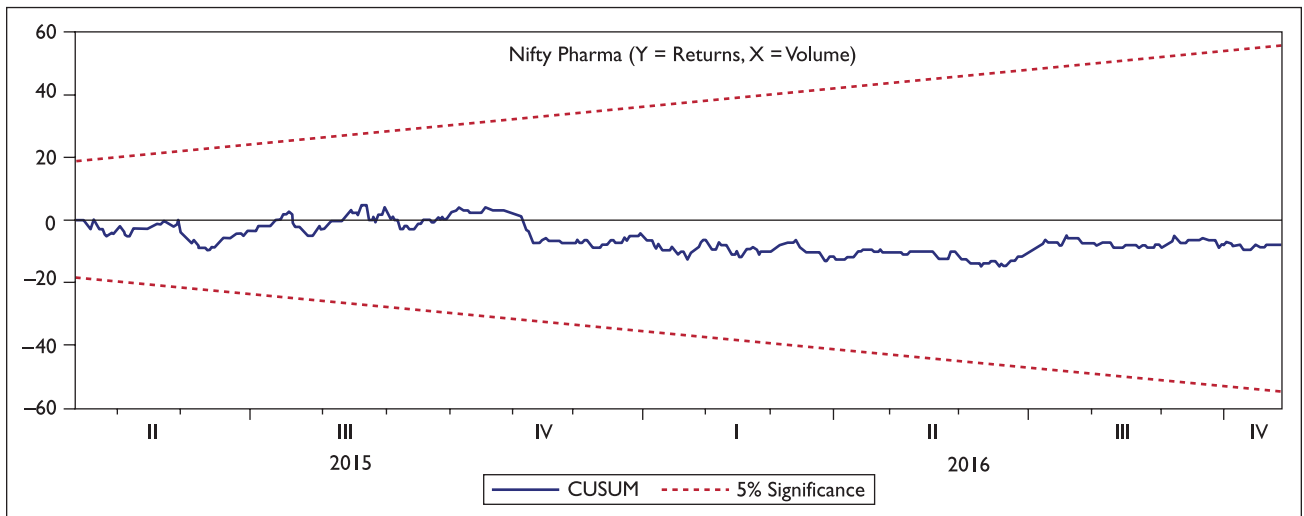
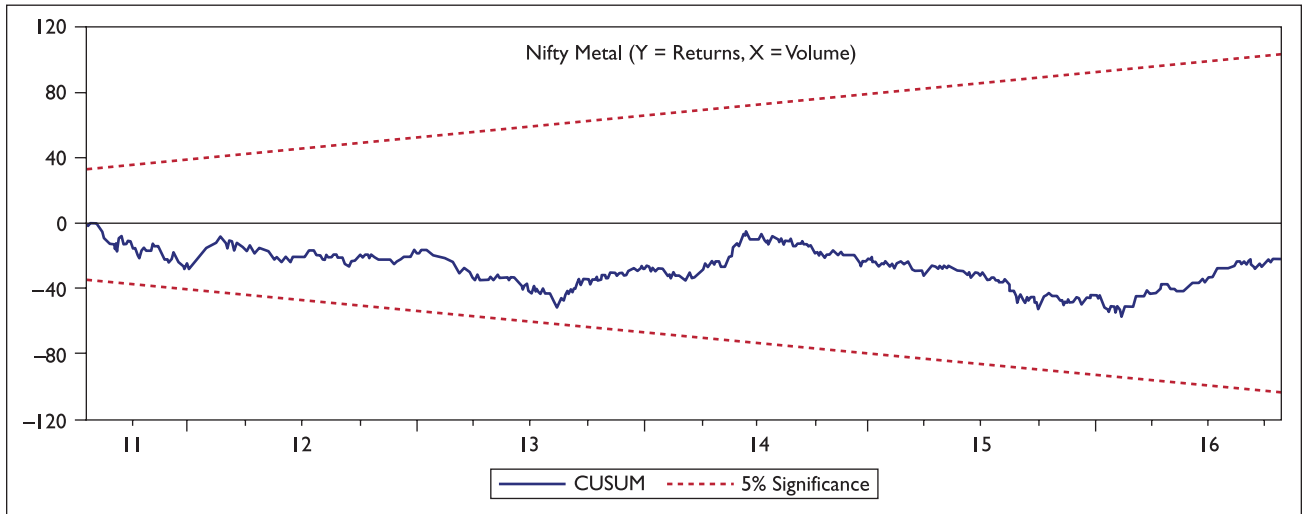
Figure AI. Results of CUSUM Test (Y = Returns, X = Volume)

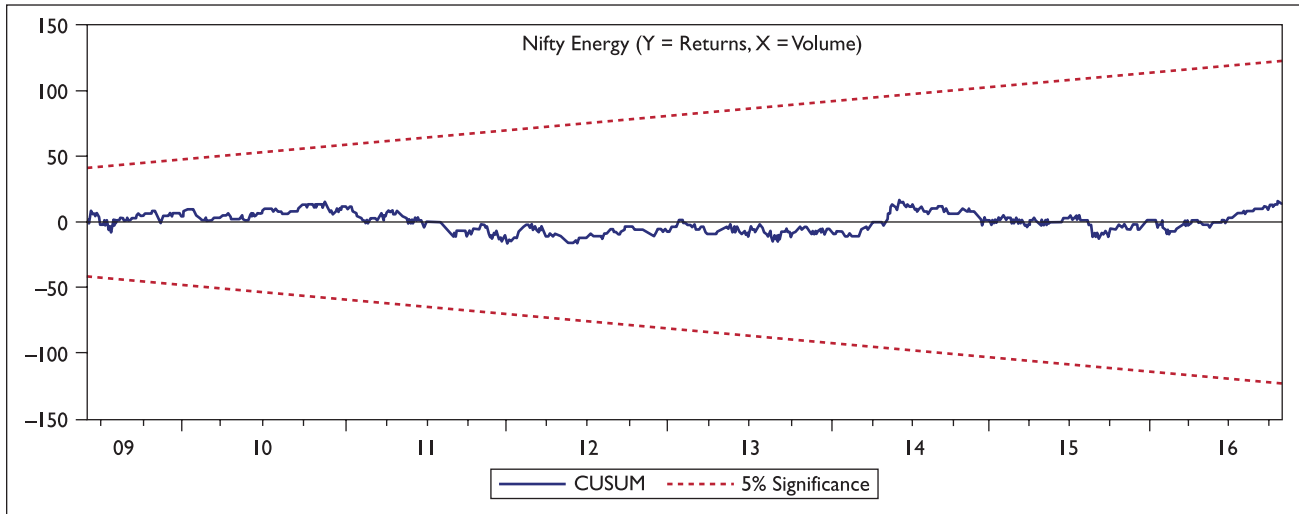


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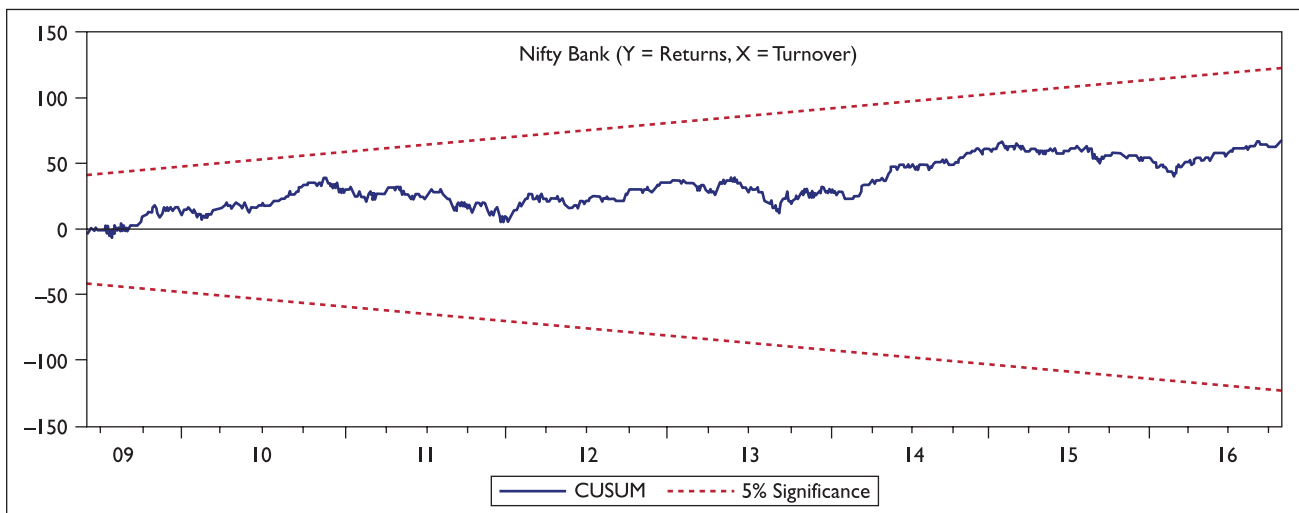
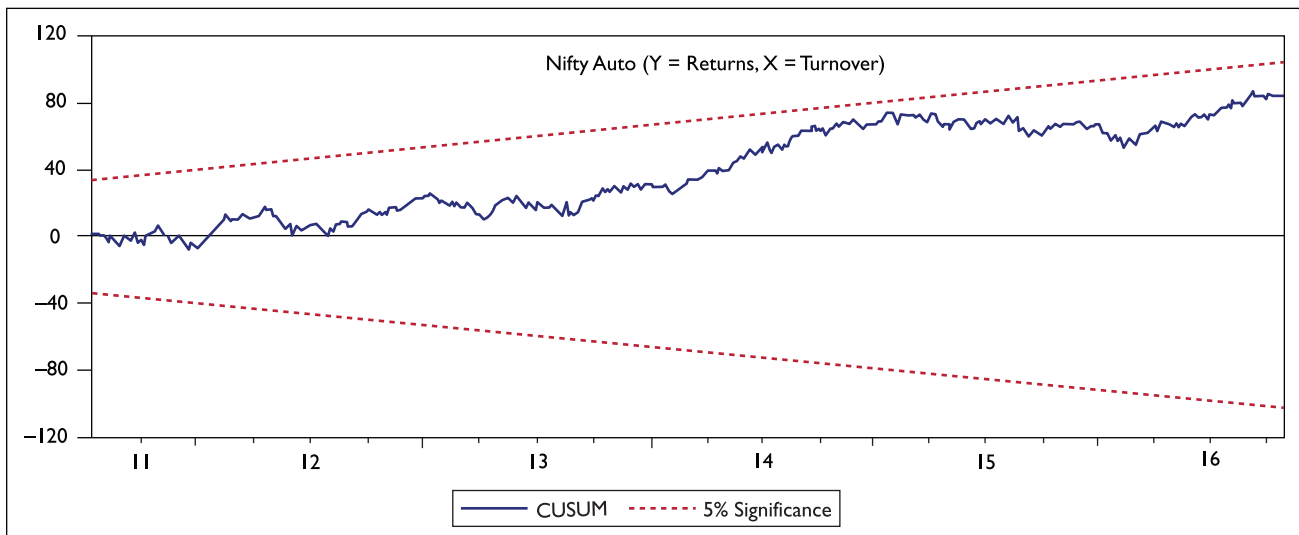


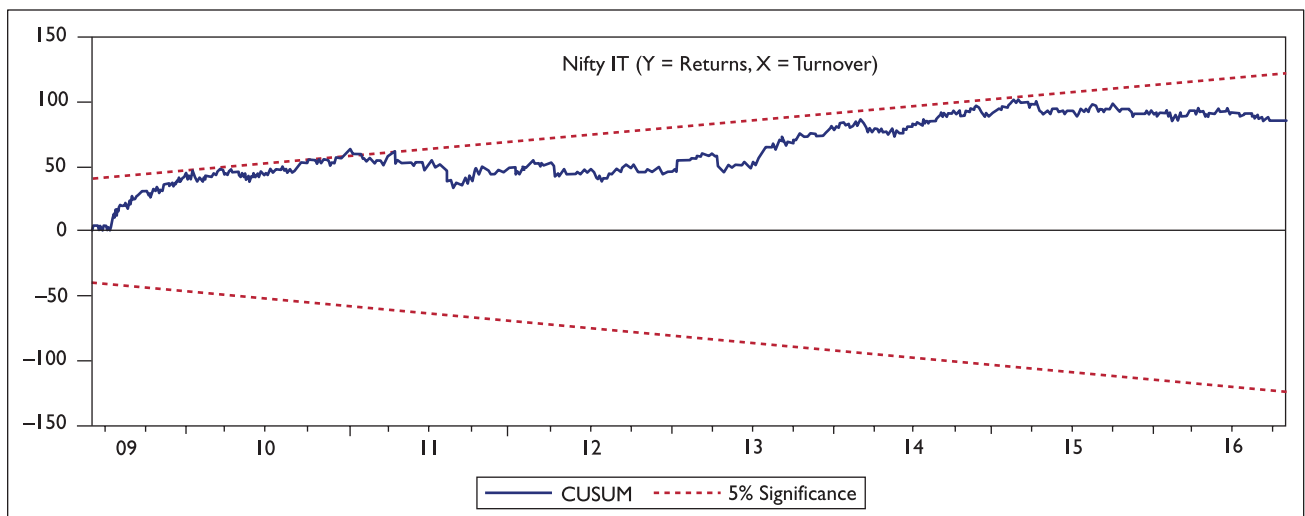
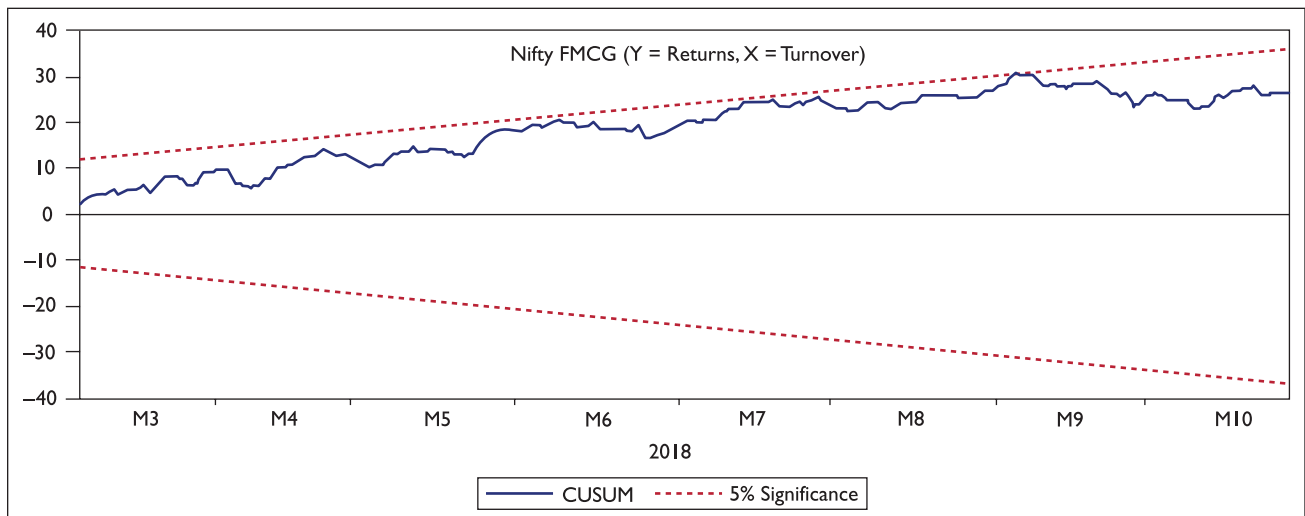
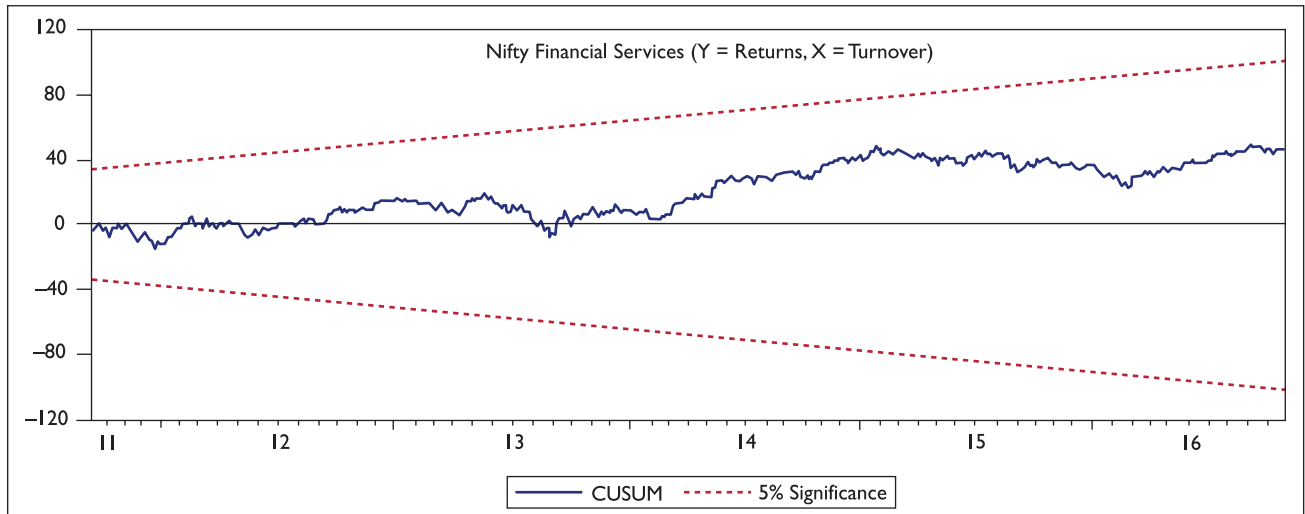




Source: Compiled using E-views.

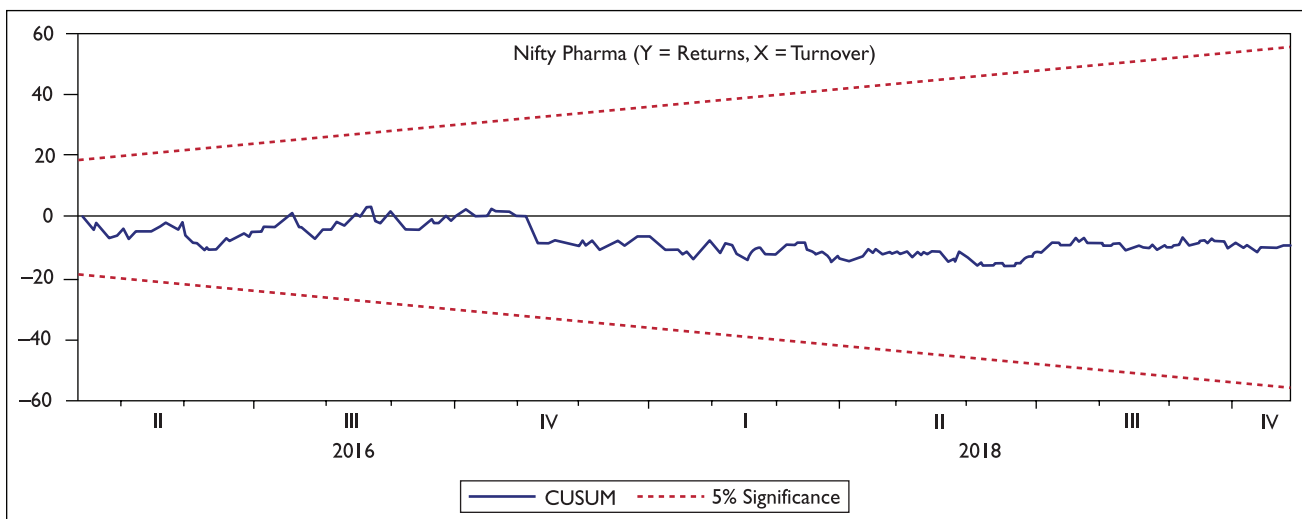
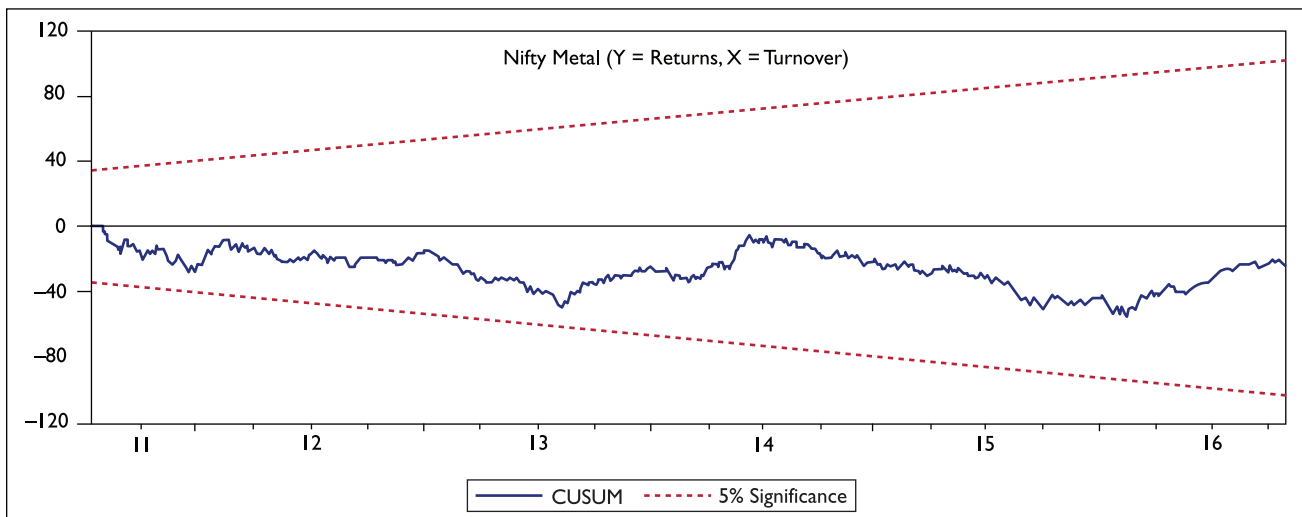
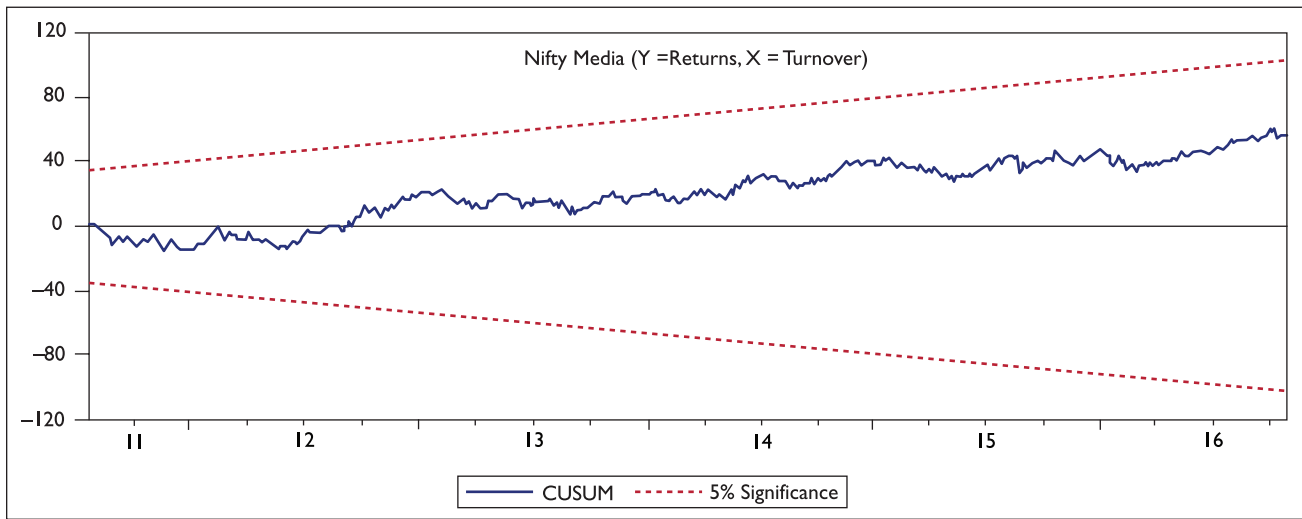
Figure A2. Results of CUSUM Test (Y = Returns, X = Turnover)

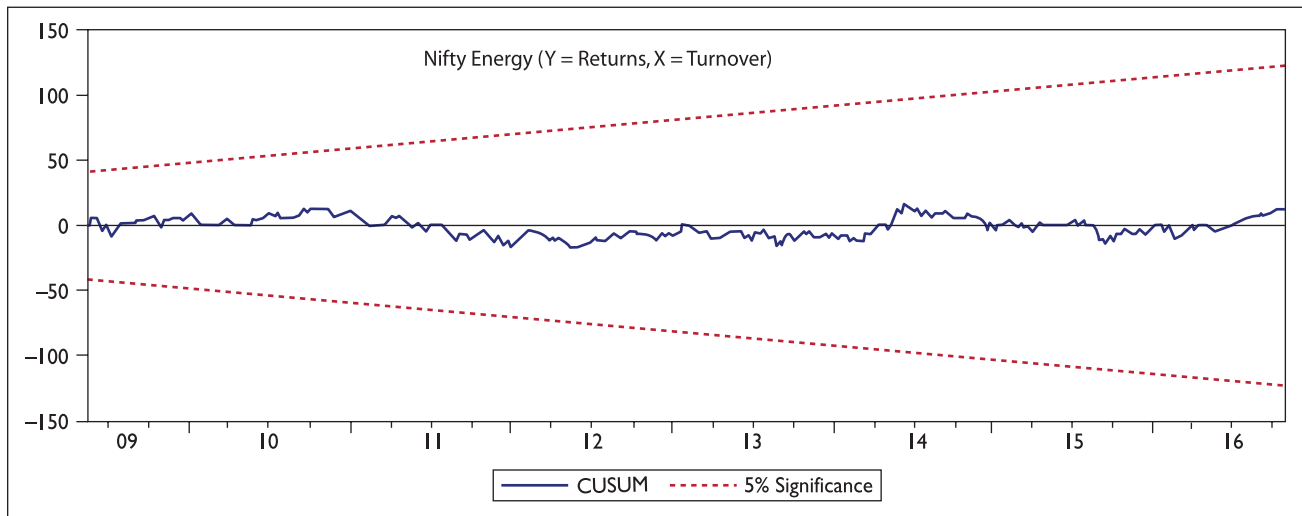
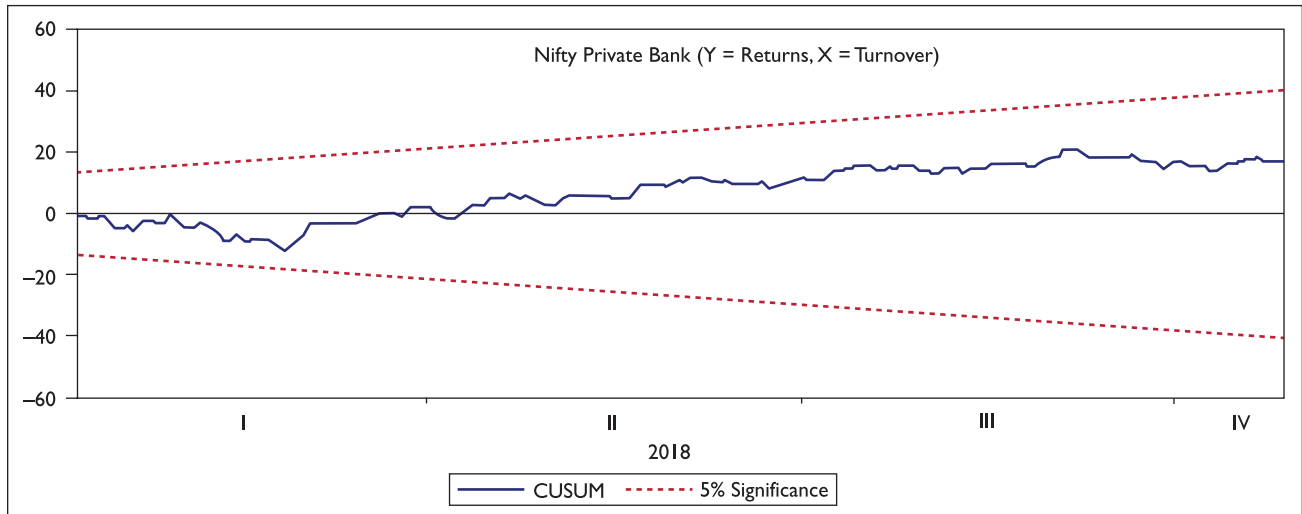




(Figure A2 continued)

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Source: Compiled using E-views.

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