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Indirect Tax Reform and Market Efficiency : An empirical Study on Indian Stock Market

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Abstract. *The biggest indirect tax reform by the Indian Government is the implementation of the Goods and Services Tax (GST), which has replaced eleven types of indirect taxes. Ten years of data from the Bombay Stock Exchange Sensex and the National Stock Exchange Nifty50 index is studied. The data is divided into two sub-periods before GST was passed from Parliament Period - I and after GST was passed from the Parliament of India Period - II. The study intends to test the market efficiency in its semi-strong form. To establish the objective with the help of the time series data for normality, stationarity, random walk, and autocorrelation function, Kolmogorov-Smirnov (KS) test, Augmented Dickey-Fuller (ADF) test, Phillips Perron (PP) test is used for the analysis of the time-series data. The study found that returns are not normally distributed and the market is inefficient in a weak form for both the periods under study.*

Keywords: GST, Market Efficiency, Reform, Stock Exchange, Weak Form.

JEL Codes: C1, E0, H2

1. Introduction

Studies of developing economies have revealed that the proper functioning of the stock market has a considerable effect on the growth of an economy. Many studies have been conducted across the globe regarding the efficiency of financial market by various researchers. The results of those studies are conflicting, as from those studies we cannot conclude that the particular market is efficient or inefficient as market efficiency keeps on changing over time. The developing nations' share market needs frequent studies to determine if the event in the economy changes the efficiency of the market. By stock market efficiency study, we try to explain the association between the share price and market information. It was first defined by Eugene Fama in 1970. Where he describes market efficiency when the market automatically incorporates new information. Thus for an efficient market, we can say the current price reflects all the information related to the market. Fama (1970) the Efficient Market Hypothesis can be divided into weak form, semi-strong form, and strong form. In the weak form efficiency hypothesis, the market reflects the information contained in the historical price. In the semi-strong form, the current price of the share price not only reflects the historical price but also all the publicly available information. In strong form, the share price reflects both public and private information.

On 8th September 2016, the one hundredth and first constitutional amendment bill was approved by the former president Late. Mr. Pranab Mukherjee. India was Lagging behind many countries in ease of doing business and one of the core reasons is the complex tax structure. With the aim of One Nation One Tax, GST Goods and Services Tax was introduced. It is an indirect tax that has replaced many indirect taxes in India such as the VAT, excise duty, services tax, etc. The Goods and Services Tax Act was passed in the

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Parliament of India on 29th March 2017 and came into effect on 1st July 2017. In other words, Goods and Services Tax (GST) is levied on the supply of goods and services. Goods and Services Tax Law in India is a comprehensive, multi-stage, destination-based tax that is levied on every value addition. GST is a single domestic indirect tax law for the entire country. In this study, an attempt is being made to check if the implementation of GST has any impact on the Indian market efficiency. (Kushalappa. S., 2018) studied the impact of GST on the Indian stock market. The researcher studied the IT Industry, Automobile Industry, Cement Industry, FMCG Industry, and NBFC Industry sector and selected the companies on a random basis. The researcher has concluded that there is no statistically significance difference in the return in pre and post-GST implementation during the event window of 30 pre and post-event days. (Mani et al., 2017) in their study on the impact of GST on sectors, indices studied seven sectors. Automobile, Banking, FMCG, Health Care, IT, Manufacturing, and real estate. They used least square and DLOG as tools for the study of pre-15 days and post-15 days of the event. The researchers concluded that the automobile and banking sector have shown a significant impact whereas other studied sectors have some impact but not significant. Only the real estate sector has a positive return throughout the study whereas all other sector has an opposite return in the post and pre-studied period. Except for the real estate sectoral index all other indices.

1.1. Objective of the Study

This study aims to recognise the nature of the Indian stock market by testing the randomness in the returns of the daily market and to study the impact of GST implementation. Randomness in returns of the stock is possible only if the market is not efficient in weak form. Hence, the objective of this study is to check whether the Indian stock market follows a random walk which can be established by testing the weak form of market efficiency.

1.2. Rationale and Scope of Study

As there are three forms of market efficiency, all three forms are not studied in this paper. As for the strong form of market efficiency, there is the unavailability of data as it considers private or insider information which is not available in public platforms. While the semi-strong form does not measure the randomness of the market returns. As per the objectives which are studying the randomness in market return only a weak form of market efficiency is studied. Our objective is to test the effect of recent tax reforms on the randomness in market returns which is possible only in weak form. However, the valuation of shares is an essential function of the financial market which makes a path to form trading strategies. To understand the behavior of the market, the valuation of securities is required which is only possible by studying the market efficiency. Arbitrage is possible if the market is inefficient. If the market is efficient in the weak form, purchasing the undervalued share and selling into other markets where securities are overvalued or fairly valued is not possible. So for investors, it becomes difficult to earn abnormal profits from trading in such markets.

2. Research Elaboration

In the study, both the Bombay Stock Exchange BSE and the National Stock Exchange NSE market index is studied. The periodicity of the study is from 07-09-2012 to 28-08-2022 which consists of almost ten years of data. The data is divided into two periods; Period I consists of market data from 07-09-2012 to 06-09-2016 while period II consists of data from 08-09-2016 to 28-08-2022. The data is divided based on GST approved by the president and the gazette was published. The pre-data is given the name of period I while post-data is to be called period II. SPSS, e-views, and MS Excel are used to analyze the data of the market. The methods that are used to test the time series data for a random walk are normality, stationarity, and autocorrelation function.

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Jarque-Bera (JB) Test is used to measure the normality of the distribution. The results of skewness and kurtosis, which are also used to test the normality, are verified by the JB test. So, the JB test is the test of the joint hypothesis that skewness and kurtosis are zero and three respectively. The value of the JB statistic is calculated using the following equation:

JB = n [S2/6 + (K-3)2/24]

The conclusion can also be drawn based on the probability value. If the value of probability is more than 0.05 at a 5% level of significance, we accept the null hypothesis for normality and can conclude that the observed series follows a normal distribution.

Kolmogorov-Smirnov (KS) Test is a well-accepted goodness of fit test. It compares the observed cumulative distribution function for a variable with a specified theoretical distribution which may be normal, uniform, Poisson, or exponential. It determines how well a random sample of data fits a particular distribution. It checks whether the observations have come from the specified distribution.

Run Test is used to test the randomness of the time series. The null hypothesis of the test is that the observed series is a random variable. When the Z value is more than + 1.96 at a 5 percent level of significance, the test rejects the null hypothesis. The test is non-parametric and is independent of the normality and constant variance of data.

Unit Root Test is used to test the stationarity of time series data and to find out whether a time series variable is non-stationary. The most popular unit root tests used to test the stationarity are the Augmented Dickey-Fuller (ADF) test and Phillips Perron (PP) test. Both tests use the existence of a unit root as the null hypothesis. If the series is nonstationary and the first difference of the series is stationary, the series contains a unit root.

The Autocorrelation Function (ACF) is used to determine the correlation of the series with itself. It measures the amount of linear dependence between observations in a time series that are separated by lag.

3. Results and Discussions

3.1 Descriptive Statistics

The descriptive statistics describe the characteristics of the data as the summary of descriptive statistics, which is provided in exhibit - 1 for both Period-I and Period II. The sample means median, maximum, minimum, Standard deviation, skewness, kurtosis, Jarque-Bera statistics, probability, and observation value are given hereunder.

Exhibit - 1: Descriptive Statistics

	Period-I		**Period-II**	
	BSE	**NSE**	**BSE**	**NSE**
Mean	23846.89	7198.411	34446.81	10409.32
Median	25033.69	7565.800	34920.34	10583.65
Maximum	29681.77	8996.250	41952.63	12362.30
Minimum	17683.73	5285.000	25765.14	7610.250
Std. Deviation	3580.804	1107.187	4085.216	1107.581
Skewness	-0.188235	-0.164325	-0.246242	-0.406428
Kurtosis	1.473364	1.450104	2.176056	2.327365
Jarque-Bera	101.3663	102.9178	37.54798	45.36181
Probability	0.000000	0.000000	0.000000	0.000000
Observation	984	984	978	978

Source: Authors Calculation

From the exhibit of the period - I, it can be seen that the mean value, median value, minimum price maximum price and standard deviation of BSE are higher than the NSE. The high standard deviation in BSE for period I as compared to NSE signifies that BSE is more volatile. The skewness and kurtosis reveal that

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the market doesn't follow a normal distribution as is also reflected in the value of Jarque-Bera and the probability value.
For period – II, it gives the same result the Std Deviation is higher in BSE Sensex. The volatility in BSE has increased in period – II as compared to period – I. The volatility doesn't change much in NSE in both periods, it remains almost the same at Std. Deviation of 1107.187 and 1107.581 in two periods. Both the market doesn't follow a normal distribution as it is reflected in the value of skewness, kurtosis, Jarque-Bera and probability value.

3.2 One-Sample Kolmogorov-Smirnov Test

The Kolmogorov-Smirnov one-sample test compares the cumulative distribution function for variables with a uniform or normal distribution and tests whether the observation has come from the specified distribution. Exhibit 2 shows the results of the KS test for Period-I and period-II respectively.

Exhibit -2: One-Sample Kolmogorov-Smirnov Test

Parameters		**Period - I**		**Period - II**	
		BSE	**NSE**	**BSE**	**NSE**
N		984	978	984	978
Most Extreme Differences	Absolute	.139	.053	.156	.069
	Positive	.136	.043	.156	.050
	Negative	-.139	-.053	-.137	-.069
Test Statistic		.139	.053	.156	.069
Asymp. Sig. (2-tailed)		.000[c]	.000[c]	.000[c]	.000[c]

Source: Authors Calculation

Ho : Test distribution is Normal
Exhibit 2, shows that returns in both periods I and II do not follow a normal distribution as the probability value is less than 0.05 at 5 percent level of significance in both the period for BSE and NSE thus the null hypothesis, Ho: Test distribution is Normal is rejected. It can be said that the returns are not normally distributed.

3.3 Run Test

The results of the run test are given in the following Exhibit. Exhibit 3 gives the values of the run test for period -I i.e. the period before GST was passed in parliament and the value for period II i.e. the period after GST was passed.

Exhibit -3: Runs Test

	Period -I		**Period - II**	
	BSE	**NSE**	**BSE**	**NSE**
Test Value	25033.69	34920.34	7565.80	10583.65
Cases < Test Value	492	489	492	489
Cases >= Test Value	492	489	492	489
Total Cases	984	978	984	978
Number of Runs	14	24	16	20
Z	-30.555	-29.817	-30.428	-30.073
Asymp. Sig. (2-tailed)	.000	.000	.000	.000

Source: Authors Calculation

Ho: The Variable is random

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From period – I, it is seen that the p-value for both BSE and NSE is less than 0.05, as well as Z values, are more than +1.96. So Ho: The Variable is random null hypothesis is rejected at a 5 percent level of significance. Both BSE and NSE do not follow random walk during this period, thus implying that BSE and NSE are weak form inefficient.
For the period – II, the p-value for both the index is less than 0.05 thus means that even after the passing of GST the market does not follow a random walk. It is concluded that the market is weak form inefficient.

3.4 Unit Root Test

The unit root test is used to test the existence of non-stationarity in the time series data. If the series is nonstationary in level form and stationary in first difference form, then it is expected that the series contains unit roots. The results of the level form and first difference are given in the following part.
Ho: The null hypothesis of unit root states that the series does not contain unit root.

3.4.1 Augmented Dickey-Fuller (ADF) Test

The results of the ADF Augmented Dickey-Fuller Test of the unit root are given in Table 4a for the period I, which is before the GST was passed in parliament and Table 4b for the period). after the GST was passed.

Table – 4.a: Unit Root Test (Period - I)
Augmented Dickey-Fuller (ADF) Test

	Level				**First Difference**		
Symbol	Lag length	ADF statistic	p-value		Lag length	ADF statistic	p-value
BSE	1	-1.306200	0.6286		0	-28.28554	0.0000
NSE	1	-1.165089	0.6913		0	-28.13814	0.0000

Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=21)
MacKinnon (1996) one-sided p-values.
Deterministic terms: Intercept

Values in exhibit 4.a, show the ADF test regarding the stationarity of data at level form and first difference form. From the p-value we can see at the level form for both BSE and NSE the series is non-stationary whereas in the first difference, it is stationary. Which means that the time series data contains a unit root. Therefore, from period – I data it can be concluded that both BSE and NSE do not follow random walk. The markets in this period are considered to be weak form inefficient.

Exhibit – 4.b: Unit Root Test (Period - II)
Augmented Dickey-Fuller (ADF) Test

	Level				**First Difference**		
Symbol	Lag length	ADF statistic	p-value		Lag length	ADF statistic	p-value
BSE	6	-1.694727	0.4337		5	-12.37102	0.0000
NSE	7	-2.040736	0.2694		5	-12.42774	0.0000

Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=21)
MacKinnon (1996) one-sided p-values.
Deterministic terms: Intercept

Values in Tablet 4.b, show the ADF test regarding the stationarity of data at level form and first difference form. From the p-value we can see at the level form for both BSE and NSE the series is non-stationary whereas in the first difference, it is stationary. This means that the time series data contains a unit root.

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Therefore, from period – II data it can be concluded that both BSE and NSE do not follow random walk. The markets in this period also are considered to be weak form inefficient.

3.4.2 Phillips-Perron (PP) Test

PP test is another method of testing the stationarity in time series data. The results of the PP test for the period before the passing of GST in parliament (Period-I) and the period after the GST was passed by parliament (period-II) are given in Table 5a and Table 5b respectively.

Table– 5.a: Unit Root Test (Period - I)

Phillips-Perron (PP) Test

	Level				First Difference		
Symbol	Bandwidth	P-P test statistic	p-value		Bandwidth	P-P test statistic	p-value
BSE	6	-1.250367	0.6542		9	-28.14498	0.0000
NSE	6	-1.099996	0.7177		9	-27.98825	0.0000

Exogenous: Constant
Bandwidth: Newey-West using Bartlett kernel
MacKinnon (1996) one-sided p-values
Deterministic terms: Intercept

Table 5.a, shows the PP test rejects the null hypothesis. Ho: The series does not contain a unit root. Both the market data of BSE and NSE are non-stationary in level form whereas at the first difference level, it is stationary. This implies that both BSE and NSE do not follow a random walk and can be said as weak form inefficient in period – I.

Table – 5.b: Unit Root Test (Period - II)

Phillips-Perron (PP) Test

	Level				First Difference		
Symbol	Bandwidth	P-P test statistic	p-value		Bandwidth	P-P test statistic	p-value
BSE	2	-1.550830	0.5074		5	-33.32141	0.0000
NSE	2	-1.718662	0.4215		4	-33.02507	0.0000

Exogenous: Constant
Bandwidth: Newey-West using Bartlett kernel
MacKinnon (1996) one-sided p-values
Deterministic terms: Intercept

Table 5.b, shows the PP test rejects the null hypothesis. Ho: The series does not contain a unit root. Both the market data of BSE and NSE are non-stationary in level form whereas at first difference level, it is stationary. This implies that both BSE and NSE do not follow random walk in the second period also and can be said as weak form inefficient in period – II.

3.5 Auto Correlation Function (ACF)

The ACF is used to determine the independence of stock index changes. It measures the amount of linear dependence between observations in time series that are separated by lags.

Table – 6: Autocorrelation Function

Lags	**Period I**			**Period II**	
	BSE	**NSE**		**BSE**	**NSE**

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1	.995	.995		.994	.993
2	.991	.990		.988	.987
3	.986	.986		.982	.979
4	.982	.981		.975	.972
5	.977	.977		.969	.964
6	.973	.973		.961	.955
7	.970	.969		.954	.948
8	.966	.965		.947	.939
9	.962	.961		.939	.930
10	.958	.957		.932	.922

Source: Authors Calculation

Table 6, shows the ACF which reflects a high degree of dependence on previous series data when the lag is low. However, as the lag is increased the dependence is decreased. For BSE the autocorrelation values range between .995 and .958 and for NSE it ranges between .995 and .957 for period I. For a market to be efficient in weak form the autocorrelation should be around Zero. For period I and for period II no correlation is found to be Zero thus implying that the market is inefficient in weak form.

4. Conclusion

The efficiency in stock markets explains the extent to which the stock prices reflect all available information in the market and therefore by relying upon this information, one can decide between buying or selling the stocks. Relevant investment strategies could be adopted after deciding whether the market is efficient or not. Based on the results of the data in section 5, we concluded that the Indian stock market does not show weak-form market efficiency and doesn't follow a random walk for both periods. The implementation of GST has no impact on the efficiency in both the period. There are possibilities of earning abnormal returns from BSE and NSE because the market is inefficient as a result future prices can be predicted using historical data. The Augmented Dickey-Fuller (ADF) Test Phillip Perron test results show that both BSE and NSE don't follow random walk. The study concludes that the market is inefficient in weak form. The condition of weak-form market inefficiency may be beneficial for investors as they can earn abnormal returns from the market. If the investors use historical market data, they can earn abnormal returns from the market

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