Effect of Declaration of GST Rates and Changes in the GST Rates on the Sectorial Indices of National Stock Market

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ABSTRACT

As per the Hypothesis of efficient market, the market is sectioned in three sections in view of how efficiently the market reacts to the private and public information. The main objective of this paper is to check whether there is a presence of volatility in the market due to declaration of GST rates and the declaration of changes in the GST rates and test semi-strong efficiency of Indian stock market. It was discovered that the declaration of GST rates and declaration of changes in GST rates did create an effect on the volatility of stock market. Goods and Service Tax has replaced the existing cascading taxes levied by the governments. It is going to change the way taxes are levied which effects the sentiments of the investors which can been analysed on the reaction of the investors towards stock market. The closing prices of NSE 10 sectorial indices and Nifty index has been used for conducting the study. The study is conducted using OLS, GARCH, and TGARCH. Thus, the study is useful to the regulatory bodies, investors and portfolio managers.

Keywords: OLS, GST, GARCH, TGARCH, Efficient Market.

Introduction:

Researchers have led various studies on Efficient Market Hypothesis for finding out the efficiency of stock market (Gupta, Gedam, 2014). GST is one of the largest tax assessment changes in India it boosts overall growth of the economy .All the segments of economy large, medium, small scale units, will be effected by GST. Numerous indirect taxes of state and central will be included in GST, as only paying single GST rather than all can be done (Garg, ,2014). GST aims to create single market that benefits economy as a whole.

Many countries follow this tax system the first country to implement GST was France .GST helps in improvement of Indian economy and it is especially useful in enhancing the GDP of the nation in excess of two percent (Chaurasia, Shweta, Kumar Sen,2016). GST brings a simpler and transparent tax system which is user friendly and it is also effective for fiscal management because of same tax rate whole nationwide (Sehrawat, Dhanda, 2015). All segments of economy whether the business, business including Govt. divisions and administration area might need to manage effect of GST.

GST makes Indian market economically stronger and many economists say that GST will is probably going to enhance tax collections and Boost India's financial advancement by removing tax barriers amongst states and coordinating India by a uniform tax rate. The main contribution to economy because of GST would be to end the cascading effect of taxes (Garg, 2014). GST divides tax burden equally between services and manufacturing by increasing the tax base and limiting exemptions. Different studies have been attempted on stock market responses to news impact, for example, political news, central elections, monetary policies, mergers and acquisitions and have tried to test the short term efficiency of the Indian stock exchange

A semi strong market is a market in which all the public information is calculated into the stock prices without giving any chance to investors for making abnormal returns (Fama, 1991).The present paper tests the semi-strong efficiency of the Indian securities exchange and financial investors reactions to the declaration of the rates of GST on 19th May 2017 and to the declaration of changes in the GST rates which were announced on November 10th 2017 by looking

at the volatility and movements of Nifty 50 and 10 sectorial indices of National stock market.

Review of Literature:

The implementation of GST helps in getting rid of current framework of indirect taxes which have many exemptions and are levied multiple times (Chaurasia, Shweta, Kumar Sen,2016).GST removes the effects of cascading taxes and establishes a common national market and it subsumes all the indirect taxes in India (Sehrawat, Dhanda,2015). GST lowers the cost of doing business which makes the domestic produces more attractive in international and local markets. Most likely GST will make INDIA a world class framework by distinctive treatment to service and manufacturing sector. (Sehrawat, Dhanda, 2015). Various studies were led in the past to consider the impact of public information on stock market (Gupta, Gedam, 2014).

After the implementation of GST the prices of goods and services are going to reduce in long run as it will reduce the tax burden which will be passes on to costumer (Garg, 2014).Studies were done to check if the capital market efficient semi strongly with regard to political announcements (Sathyanarayana, Gargesha, 2017).Studies were done to check weak form efficiency of the stock market (Anjala, Kaur Kalra, 2015; Deep Sharma, Mahendru, 2009).

The Indian Stock market is thought to be delicate to news and events. Different papers that were directed previously have checked the semi strong form of efficiency of the stock market by breaking down the effect of a specific event or news on the index of the stock market. Studies were done regard to the Union Budget(Thomas, Susan, Shah,2002).Many studied the effect of half-yearly declarations to the stock market(Obidullah,1990) and to check the effect of bonus issue(Mishra,2005).

Certain researchers additionally utilized regression models to figure out the reaction of stock market .A portion of the studies additionally uses GARCH and TGARCH models to check the volatility of stock market as these models are effective in evaluating financial series data that are inclined to heteroscedasticity and to give more strong outcomes (Asteriou, Samitas, and Kenourgios, 2013)

Not many papers could be found on sectorial indices of stock market and the effect of GST rates declaration and effect of changes in GST rates on sectorial indices. Thus, this paper considered the reaction of investors on the returns of the sectorial index and Nifty 50 with regard to the declaration of GST rates which was announced on May 19th and the changes in the GST rates which was announced on November 10th 2017.

Data:

The information gathered involves day to day closing share prices of Nifty 50 and 10 Sectorial Indices of National Stock Exchange (NSE). The information is collected from the site of NSE. The information is gathered for a period ranging from 1th January 2011 to 30th December 2017. The paper considers information from January 2011 as the most recent sectorial record; Pharma was included on Oct 2010.

Methodology:

In this paper, a single regression model is used which calculates the log-returns for all the 10 NSE sectorial indices. The model which is used here is given below:

$$R_i = \alpha_i + \beta_i R_m + \Upsilon_t + \mu_t$$

where, R_i remains for the returns made in a specific sector, R_m remains for the market return made and Υ stands for dummy variable which is in relation to the declaration of GST rate and α, β and Υ stands for coefficients of estimates and the error term is μ_t which has the assumption of regular normality. The Dummy Variable which is included takes 0 as the value for the before the declaration of GST rate, and it takes 1 as the value for the date of declaration and the dates after for the analysis of declaration of GST rates effect on market. The dummy variable which is included takes 0 as the value for before the declaration of changes in GST rates, and it takes the value of unity for the date of declaration of changes in GST rates and the dates after for the analysis of declaration in changes of GST rates effect on market. The consideration of dummy variable permits all wide range of changes that happened after the date of declaration to be considered in the model (Asteriou, Samitas, and Kenourgios, 2013).

The above model has been estimated using OLS. We additionally evaluate the above model utilizing a Generalized Autoregressive Conditional Heteroscedasticity (GARCH)model because volatility clustering happens in a financial time series and OLS model may not give suitable outcomes for this.

The model is also assessed utilizing TGARCH model, for an enhanced estimation and to give more robustness to the outcomes that are obtained. The TGARCH model also considers the effect of the negative and the positive information on the variance series. The methodology is same for the analysis of effect on market because of announcement of GST rates and for the analysis effect on market because of announcement of changes in the GST rates.

Empirical Results for GST rates announcement:

OLS Market Model:

An OLS Market Model has been utilized to assess the equation model. The results of the model are presented in Table 1. Out of the 10 sectors and the NIFTY 50 Index, considered all sectors demonstrate a positive effect because of the announcement of GST apart from the Pharma sector which shows a negative

effect. Nifty 50 shows statistically insignificant for the dummy variable even at 10 percent significance level .Out of the 10 sectors included in the study, all the sectors are statistically insignificant for the dummy variable even at 10 percent significance level. This demonstrates that the OLS model, expected in reflecting the effect of the event, is not optimum enough to determine the effect during the period.

GARCH Market Model:

The returns made by the stock exchange are very volatile due to which the equation is estimated using GARCH(1,1) model as the OLS model is not sufficient enough. The dummy variable is incorporated in both variance equation and mean equation to estimate the equation. Analysis is done and results are shown in TABLE 2.We can notice in the results that effect shown by dummy variable is significant. In variance equation it had affected all the sectors. Out of the Nifty index and 10 sectors considered, only PHARMACEUTICAL and PSU BANK sectors are affected positively apart from these all the other sectors are affected negatively. NIFTY 50 and FMCG demonstrate a significant result by the dummy variable at the 5 percent level. All the other sectors apart from these demonstrate a significant result for the dummy variable at the 1 percent level. The results indicate that most of these sectors are negatively affected by the declaration of GST rates showing a reduced volatility in these sectors.

The coefficients of ARCH($\alpha 1$) and GARCH ($\beta 1$) gives valuations of the persistence of volatility and the mean reversion. The ARCH ($\alpha 1$) term shows the volatility reaction for short term. The GARCH ($\beta 1$) term shows the persistence of the volatility. If the ARCH ($\alpha 1$) value is higher shows the jumpy attitude of return while the higher GARCH ($\beta 1$) demonstrates that the innovations to the conditional variance will take long time for reverting to mean.

It is observed from the Table 2 that moderate or low reaction, represented by $\alpha 1$, to market movement is occurring in almost all the sectors except in IT (Information Technology) and Pharma .IT (Information Technology demonstrates a highly unsteady reaction to the announcement of in the GST rates whereas Pharma shows a negative impact. Then again, high GARCH coefficients which are represented by $\beta 1$ demonstrate the persistence of volatility, from the results it shows that it takes longer time for reverting back to the mean; in all the sectors expect in IT, MEDIA, PSU BANK, AUTO, PHARMA and REALTY sectors. AUTO, MEDIA, PSU BANK and REALTY sectors which have relatively low GARCH coefficients shows a quick reversion towards the mean. IT sector with very low coefficient of GARCH shows a very quick reversion towards the mean while pharma had a negative impact.

Persistence demonstrates at what speed variance decays or reverts to its long-run average. Persistence is estimated by adding up $\alpha 1$ and $\beta 1$. The value of Persistence is close to 1 in all sectorial indices except in IT, MEDIA, REALTY and PSU BANK and indicates the slow decay and the slow reversion towards the mean. Lower persistence level in the IT, MEDIA, REALTY and PSU BANK indicates fast decay and very quick reversion towards the mean.

TGARCH Market Model:

The equation is estimated using TGARCH(1,1,1) model and the dummy variable is incorporated in both variance equation and mean equation. Analysis is done and results are shown in Table 3.In the variance equation, It can been noticed that, of the 10 sectors and Nifty 50 index considered only Pharmaceutical doesn't show any significant effect for the dummy variable at any significant level. FMCG shows a significant result for the dummy variable at 5 percent level. PSU BANK shows a significant result for the dummy variable at 10 percent level. Out of the 10 sectors and Nifty 50 index considered, 8 sectors AUTO, BANK , FINSERV , IT , MEDIA , PVTBANK , REALTY and NIFTY 50 shows a significant result for the dummy variable at 1 percent significant level. But all these sectors are affected negatively which indicates that declaration of GST rates reduced volatility in these sectors.

It is noticed from the Table 3 that either moderate or low reaction, to market movement is occurring in all sectors by looking at Alpha1 ($\alpha 1$) except in IT(Information Technology),PSU Bank(Public sector undertaking),NIFTY and AUTO sectors. IT and PSU Bank demonstrates a highly unsteady reaction to the announcement of the GST rates. NIFTY and AUTO had a negative impact. Then again, high GARCH coefficients which is represented by (Beta1)$\beta 1$ demonstrate the persistence of volatility , from the results it shows that it takes very long time for reverting back to the mean, in all the sectors expect in IT, AUTO, MEDIA, PSU BANK and REALTY sectors. AUTO, MEDIA and REALTY sectors with a relatively low GARCH coefficient shows a quick reversion to the mean. IT and PSU Bank sectors with very low GARCH coefficient shows a very quick reversion to the mean.

The coefficients of T-GARCH are significant at 1 percent level in all the sectors excluding IT, Pharma, Realty, FMCG. The coefficient of FMCG sector is significant at 10 percent level.

The value of Persistence is near to 1 for all sectorial indices except IT, AUTO, MEDIA, REALTY and PSU BANK and it indicates very slow decay and the slow reversion towards the mean. The Low persistence level in IT, AUTO, MEDIA, REALTY and PSU BANK indicates a fast decay and quick reversion towards the mean.

Empirical Results for changes in GST rates:

OLS Market Model:
The equation has been assessed using OLS Market Model. The results are presented in Table 4.Out of the 10 sectors and Nifty 50 index, considered all sectors demonstrate a positive effect because of the announcement of changes in GST rates apart from Bank, Finserv, PSU Bank and Private Bank sectors which shows a negative effect. Out of the 10 sectors included in the study, all the sectors are statistically insignificant for the dummy variable even at 10 percent significance level. This demonstrates that the OLS model is not optimum enough to determine the effect of the event.

GARCH Market Model:
Results are shown in TABLE 5. we can notice that in the results effect of the dummy variable is significant. In the variance equation, Out of the 10 sectors considered BANK, FINSERV, IT, MEDIA, PSU BANK demonstrate a significant result for the dummy variable at the 1 percent level. PHARMA sector demonstrate a significant result for the dummy variable at the 5 percent level. But all these sectors are affected negatively which indicates that declaration of changes in GST rates reduced the volatility in these sectors.

It is seen from the Table 5 that Alpha1($\alpha1$) represents moderate or low reaction to the market movement in all sectors except in IT(Information Technology) and PSU Bank(Public Sector Undertaking) . IT and PSU Bank demonstrates the highly unsteady reaction to the announcement of changes in the GST rates. The high coefficients of GARCH which are represented by $\beta1$ demonstrate the persistence of volatility, from the results it shows that it takes longer time for reverting back to the mean, in all the sectors expect in IT, PSU BANK and REALTY sectors .PSU BANK and REALTY sectors with a relatively low GARCH coefficient shows a quick reversion to the mean. IT sector with very low GARCH coefficient shows a very quick reversion to the mean.

The value of Persistence is near to 1 for all sectorial indices except IT, REALTY and PSU BANK and it means a slow decay and the slow reversion towards the mean. Low persistence level in IT, REALTY and PSU BANK indicates a fast decay and quick reversion towards the mean.

TGARCH Market Model:
Analysis is done and results are shown in Table 6. In the variance equation, It can been noticed that, of the 10 sectors and Nifty considered AUTO, BANK, IT, MEDIA, PSU BANK and REALTY shows a significant result for the dummy variable at 1 percent level. NIFTY, FINSERV sector shows a significant result for the dummy variable at 5 percent level. But all these sectors are affected negatively which

indicates that declaration of GST rates reduced volatility in these sectors.

It can been seen from the Table 6 that very moderate or low reaction which is shown by $\alpha1$ is occurring in all sectors excluding IT(Information Technology) and PSU Bank(Public sector undertaking). IT and PSU Bank demonstrates the highly unsteady reaction to the announcement of changes in the GST rates. Then again, high GARCH coefficients which is shown by $\beta1$ demonstrates volatility persistence, from the results it shows that it takes longer time for reverting back to the mean, in almost all the sectors expect in IT, AUTO, MEDIA, PSU BANK REALTY and NIFTY 50 sectors. AUTO, MEDIA and REALTY sectors with a relatively low GARCH coefficient shows a quick reversion to the mean. IT and PSU Bank sectors with very low coefficients of GARCH shows very quick reversion to the mean. Nifty shows a negative impact.

The coefficients of T-Garch are significant at 1 percent level in almost all the sectors except in, Realty, FMCG, IT, Pharma sectors.

The Persistence value is almost near to 1 for all sectorial indices and Nifty except in IT, AUTO, MEDIA, REALTY and PSU BANK and it represents the slow decay and the slow reversion towards the mean. Low persistence level in IT, AUTO, MEDIA, REALTY and PSU BANK indicates a fast decay and quick reversion towards the mean.

Conclusion:

The response of stock exchange is thought to be a representative of the variations in a country's economy and it in this way helps in studying the progress of a country. The present article intends to consider reaction of the Indian capital market as for the declaration of GST rates and the changes in the GST thereafter it also furthermore tries to check the semi-strong form of efficiency of the market. GARCH, TGARCH and OLS market model were utilized to assess the equation model in which dummy variable is included.

OLS market model was not optimum enough the in knowing the effect of the event as it does not include heteroscedasticity as it is not appropriate for the financial series that are volatile (Asteriou, Samitas, and Kenourgios, 2013). In the OLS mode, all the sectors are statistically insignificant for the dummy variable even at 10 percent significance level. This demonstrates that the OLS model, expected in reflecting the effect of the event, is not optimum enough to determine the effect during the period. Thus a much efficient models of GARCH and TGARCH were utilized to analyze the impact of declaration of the GST rates on the different sectors. Under Garch, the mean equation did not show any significant effect on any sector. But more significant results of the effect were seen in coefficients of the variance

equation, which shows that there was an enormous impact on this sectorial indices volatility. In variance equation it had affected all the sectors, only Pharma and PSU Bank sectors were affected positively apart from these all the other sectors were affected negatively. The results indicate that most of these sectors are negatively affected by the declaration of GST rates showing a reduced volatility in these sectors. Then again, IT sector with very low coefficient of GARCH shows a very quick reversion towards the mean while pharma had a negative impact. Lower persistence level in the IT, MEDIA, REALTY and PSU BANK indicates fast decay and very quick reversion towards the mean. In the TGARCH(1,1,1)model only Pharmaceutical doesn't show any significant effect for the dummy variable at any significant level. But all these sectors were affected negatively which indicates that declaration of GST rates reduced volatility in these sectors. So by analyzing the results, declaration of GST rates had a significant impact on the volatility of the market. Whereas the announcement of changes in GST rates also had a significant impact on the volatility of the market. In the results of the Garch (1,1) model effect of the dummy variable is significant in many sectors. But all these sectors are affected negatively which indicates that declaration of changes in GST rates reduced the volatility in these sectors. Low persistence level in IT, REALTY and PSU BANK indicates a fast decay and quick reversion towards the mean. Financial investors and the portfolio managers remain to profit by the finding of the paper as they are in steady research to see how markets respond to the news . This analysis would enable them to reduce their risk to certain degree and limit potential losses. The administrative bodies can utilize the finding to regulate the market more effectively.

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Table 1: Results of OLS estimation of dummy variable for analysis of effect of announcement of GST rates on Nifty and sectorial indices

Indices	Regressors Coefficient	ADJ R^2
NIFTY	0.045051 (0.495905)	0.005939
Auto	0035462 (0.309665)	0.010740
Bank	0.034445 (0.255651)	0.009624
FINSERV	0.037011 (0.294858)	0.008054
FMCG	0.057818 (2.030463)	0.000771

Indices	Regressors Coefficient	ADJ R^2
IT	0.045988 (0.706689)	0.001517
Media	0.017378 (0.144624)	0.002202
Pharma	-0.077302 (-0.775188)	0.006881
Private Bank	0.019704 (0.146796)	0.010298
PSU Bank	0.005702 (0.030375)	0.005844
Realty	0.199380 (0.992774)	0.008251

*** means significance at 1% ** means significance at 5% * means significance at 10%

Table 2: Results of the GARCH (1,1) estimation of dummy variable for analysis of effect of announcement of GST rates on Nifty and sectorial indices

Indices	Mean Equation	Variance Equation					
	ϒ (M)	C (V)	α 1(ALPHA1)	β1 (Beta1)	Dummy	ADJ R^2	Persistence
NIFTY	0.019649 (0.331527)	0.013507 (2.717377)***	0.044192 (5.198013)***	0.941866 (80.93731)***	-0.007905 (-2.042708)**	0.005428	0.986058
AUTO	0.001751 (0.021636)	0.086944 (3.512534)***	0.067048 (5.458168)***	0.876321 (37.02301)***	-0.046708 (-2.803130)***	0.010085	0.943369
BANK	0.006479 (0.086411)	0.028369 (3.090020)***	0.046422 (6.583222)***	0.939666 (95.86948)***	-0.018866 (-2.595361)***	0.009031	0.986088
FINSERV	0.005712 (0.078053)	0.027274 (2.893197)***	0.044246 (6.031790)***	0.940362 (88.31608)***	-0.018519 (-2.590945)***	0.007481	0.984608
FMCG	0.003063 (0.035392)	0.043846 (2.789063)***	0.032211 (4.449347)***	0.930434 (49.97880)***	-0.010289 (-1.990837)**	0.000682	0.962645
IT	0.045988 (0.706689)	0.964302 (11.16937)***	0.249229 (11.46117)***	0.223337 (3.834039)***	-0.605918 (-8.504382)***	0.001517	0.472566
MEDIA	0.052195 (0.545968)	0.399394 (3.119774)***	0.083004 (4.255970)***	0.704861 (8.595163)***	-0.189254 (-2.799917)***	0.001911	0.787865
PHARMA	-0.079121 (-0.705042)	2.217359 (40.76033)***	-0.002459 (-2.003928)**	-0.990414(-167.2778)***	1.256400 (3.296546)***	0.006757	-0.992873
PRIVATE BANK	-0.024252 (-0.317638)	0.028590 (3.056939)***	0.046794 (6.782565)***	0.938444 (95.28212)***	-0.020614 (-2.733464)***	0.010028	0.985238
PSU BANK	-0.314965 (-1.101500)	0.540287 (5.345301)***	0.138841 (6.049976)***	0.735766 (20.34792)***	0.346501 (4.488934)***	0.004080	0.874607
REALTY	0.214619 (1.439418)	1.046346 (4.390815)***	0.109321 (4.956608)***	0.678947 (10.73906)***	-0.554263 (-3.724427)***	0.008171	0.788268

*** means significance at 1% ** means significance at 5% * means significance at 10%

Table 3: Results of the TGARCH(1,1,1) the estimation of dummy variable for analysis on

effect of announcement of GST rates on Nifty 50 and sectorial indices.

Indices	Mean Equation	Variance equation						
	Υ(M)	C (V)	α1 (ALPHA1)	T-Garch	β1 (BETA1)	Dummy	ADJ R^2	Persistence
NIFTY	0.014739 (0.252183)	0.023571 (4.619091)***	-0.007717 (-0.945075)	0.105196 (7.185929)***	0.930773 (78.79249)***	-0.014679 (-3.489613)***	0.005872	0.923056
Auto	0.018634 (0.232910)	0.141523 (5.096193)***	-0.006812 (-0.487251)	0.163122 (7.025259)***	0.832955 (32.28862)***	-0.075265 (-3.805064)***	0.010722	0.826143
Bank	0.005440 (0.075534)	0.021976 (3.304386)***	0.005797 (1.125829)	0.059203 (6.747294)***	0.954179 (117.9394)***	-0.014770 (-2.656513)***	0.009338	0.959976
FIN SERV	0.004651 (0.064711)	0.029041 (3.474786)***	0.005143 (0.865328)	0.066003 (5.886325)***	0.945743 (95.62093)***	-0.019065 (-2.936144)***	0.007874	0.950886
FMCG	-0.000324 (-0.003932)	0.034600 (2.833906)***	0.037578 (4.092483)***	-0.015038 (-1.500354)*	0.941105 (63.23494)***	-0.011744 (-2.254896)**	0.000605	0.978683
IT	0.046009 (0.702297)	0.964503 (11.08139)***	0.249608 (10.80883)***	-0.000812 (-0.21641)	0.223245 (3.831117)***	-0.606074 (-8.451322)***	0.001515	0.472853
Media	0.047771 (0.515555)	0.332177 (3.996184)***	0.000523 (0.029953)	0.121950 (4.655251)***	0.761044 (14.31891)***	-0.166225 (-3.464953)***	0.002127	0.761567
Pharma	-0.106182 (-0.941172)	0.009180 (3.330444)***	0.022511 (3.415167)***	0.009217 (1.115535)	0.964513 (204.3489)***	0.010848 (1.472140)	0.006787	0.987024
PVT BANK	-0.024614 (-0.324925)	0.027504 (3.666326)***	0.002848 (0.533500)	0.069262 (6.668751)***	0.948929 (109.0921)***	-0.020251(-3.357765)***	0.010001	0.951777
PSU BANK	-0.329635 (-1.902883)*	3.089970 (9.373094)***	0.364586 (10.76102)***	-0.270047 (-5.698964)***	0.071679 (0.953128)	-0.663549 (-1.809198)*	0.003917	0.436265
Realty	0.217993 (1.473607)	1.020952 (4.215146)***	0.070109 (3.429069)***	0.070393 (2.415895)	0.686861 (10.82154)***	-0.551806 (-3.666856)***	0.008232	0.75697

*** means significance at 1% ** means significance at 5% * means significance at 10%

**Table 4: Results of OLS estimation of the dummy variable for
analysis of effect of changes in the GST rates on sectorial indices**

Indices	Regression Coefficient	ADJ R^2
NIFTY	0.031588 (0.171725)	0.005815
AUTO	0.132028 (0.570075)	0.010871
BANK	-0.016289 (-0.059754)	0.009589
FINSERV	-0.013460 (-0.052985)	0.008006
FMCG	0.066095 (0.342650)	0.000814
IT	0.079923 (0.388168)	0.001843
MEDIA	0.217116 (0.892520)	0.002649
PHARMA	0.018513 (0.091656)	0.006541
PRIVATE BANK	-0.025290 (-0.093130)	0.010291
PSU BANK	-0.086031 (-0.226402)	0.005873
REALTY	0.367802 (0.904855)	0.008156

*** means significance at 1% ** means significance at 5% * means significance at 10%

**Table 5: Results of GARCH(1,1) estimation of the dummy variable for
analysis of effect of changes in the GST rates on sectorial indices**

Indices	Mean equation	Variance equation					
	Υ(M)	C (V)	α1 (Alpha 1)	β1 (Beta1)	Dummy	ADJ R^2	Persistence
NIFTY	0.009821 (0.088610)	0.007735 (2.361580)**	0.042344 (5.630337)***	0.949401 (102.0977)***	-0.007689 (-1.003843)	0.005214	0.991745
AUTO	0.083314 (0.368166)	0.039213 (3.163937)***	0.058759 (6.027313)***	0.914585 (60.69079)***	0.005371 (0.253968)	0.010289	0.973344
BANK	-0.072160 (-0.516744)	0.013708 (2.952566)***	0.042539 (7.119305)***	0.950588 (136.5192)***	-0.029631 (3.157661)***	0.008886	0.993127
FINSERV	-0.061519 (-0.427795)	0.010563 (2.356388)**	0.041293 (6.843986)***	0.952527 (133.6028)***	-0.016617 (1.629618)***	0.007310	0.99382
FMCG	0.085816 (0.564273)	0.051948 (2.673907)***	0.032685 (4.313994)***	0.922541 (41.42233)***	-0.034001 (-2.408336)**	0.000748	0.955226
IT	0.141144 (1.104043)	0.751088 (10.81898)***	0.258182 (12.38538)***	0.321490 (6.164119)***	-0.481585 (-4.079952)***	0.001278	0.579672
MEDIA	0.220106 (1.711210)*	0.083311 (2.793921)***	0.038921 (4.676927)***	0.915185 (40.94515)***	-0.092124 (-4.156073)***	0.002481	0.954106

Indices	Mean equation	Variance equation					
	Ɣ(M)	C (V)	α1 (Alpha 1)	β1 (Beta1)	Dummy	ADJ R²	Persistence
PHARMA	0.102226 (0.413513)	0.005647 (2.438971)**	0.025981 (6.017638)***	0.969741 (215.6298)***	-0.030056 (-2.068801)**	0.006305	0.995722
PRIVATE BANK	-0.076833 (-0.510708)	0.011925 (2.538771)**	0.045058 (7.550684)***	0.948597 (136.3553)***	-0.013883 (-1.395860)	0.009663	0.993655
PSU BANK	-0.140066 (-0.516505)	0.720695 (7.650828)***	0.173492 (14.47849)***	0.674574 (29.08221)***	-0.441141 (-2.696552)***	0.005694	0.847994
REALTY	0.345038 (1.268102)	0.770448 (4.237601)***	0.099588 (5.075859)***	0.738190 (14.08256)***	-0.435807 (-2.562080)**	0.008029	0.837778

*** means significance at 1% ** means significance at 5% * means significance at 10%

Table 6: Results of the TGARCH (1,1,1) and the estimation of dummy
Variable for analysis on the effect of changes in the GST rates on sectorial indices

Indices	Mean Equation	Variance Equaton						
	Ɣ (M)	C (V)	α 1(A1pha1)	(T-Garch)	β 1(Beta 1)	Dummy	ADJ R²	Persistence
NIFTY	0.006500 (0.058393)	0.013586 (3.937866)***	-0.001403 (-0.194353)	0.089273 (6.789706)***	0.941803 (98.73486)***	-0.015569 (-2.105130)**	0.005781	0.9404
Auto	0.122476 (0.566184)	0.093047 (4.896335)***	0.001821 (0.132008)	0.146854 (6.857692)***	0.861800 (41.29570)***	-0.014524 (-0.393657)***	0.010815	0.863621
Bank	-0.070310 (-0.514128)	0.010970 (3.147477)***	0.005857 (1.225931)	0.052698 (7.290634)***	0.962421 (161.1773)***	-0.024735 (-3.303349)***	0.009308	0.968278
Finserv	-0.068408 (-0.485943)	0.012108 (2.995663)***	0.007070 (1.353026)	0.055972 (6.371946)***	0.957892 (143.8160)***	-0.018519(-2.205025)**	0.007786	0.964962
Fmcg	0.087012 (0.570372)	0.046709 (2.655183)***	0.035305 (3.945512)***	-0.006850 (-0.700439)	0.928010 (45.52350)***	-0.031466 (-2.408848)**	0.000724	0.963315
IT	0.140697 (1.096508)	0.735106 (10.71687)***	0.242450 (11.43437)***	0.030469 (0.860998)	0.331694 (6.415680)***	-0.472177 (-4.045619)***	0.001356	0.574144
Media	0.248657 (1.549622)	0.226605 (3.638995)***	0.014937 (0.908234)	0.092588 (3.847124)***	0.813263 (18.83980)***	-0.152291 (-3.314863)***	0.002602	0.8282
Pharma	0.101140 (0.405809)	0.007133 (2.856775)***	0.022687 (3.558043)***	0.008437 (1.054751)	0.967324 (214.7496)***	-0.030144 (-1.919849)*	0.006345	0.990011
PVT BANK	-0.077355 (-0.533019)	0.012467 (3.126417)***	0.006499 (1.275446)	0.061334 (7.070806)***	0.956664 (146.9022)***	-0.019779(-2.442244)**	0.009991	0.963163
PSU BANK	-0.012433 (-0.042416)	3.128826 (8.879437)***	0.323225 (18.30521)***	-0.237438 (-6.172096)***	0.070274 (0.860821)	-1.464337 (-2.602327)***	0.005649	0.393499
Realty	0.349992 (1.307018)	0.747998 (4.190146)***	0.068128 (3.612994)***	0.059688 (2.332878)**	0.743438 (14.58238)***	-0.429272 (-2.593202)***	0.008115	0.811566

*** means significance at 1% ** means significance at 5% * means significance at 10%

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