Evolution of Security Transaction Tax in India

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Abstract

Securities Transaction Taxes have received much attention over the last few years with countries and global organizations trying to control the level of speculations, especially since the Global Financial Crisis. This study examines the impact of an increase in the level of securities transaction tax on traded quantity of shares and time series behaviour of stock returns using data from two prominent national stock exchanges of India. We find that when the tax on equity transactions increases from 0.1% to 0.125%, the quantity of traded shares (volume) decreases by more than twenty five percent. Since the volatility of returns on stocks is not constant through time, conditional heteroscedasticity models are used to estimate the volatility of stock returns. The impact of tax on volatility of return on indices is insignificant.

Keywords: securities transaction taxes, stock market, returns

JEL Codes: G14, G18, H10

1. Introduction

The recent Global Financial Crisis has triggered policy makers to reform policies so as to avoid a replay of events and improve the financial sector. It has been felt that there is a need to make the financial sector contribute to the financing of the crisis. In the European Union, the European Commission has proposed a Financial Transaction Tax to generate revenues and help to ensure greater stability of financial markets. In contrast to this debate, however, there is little literature on the impact of Financial Transaction Taxation referred to as Securities Transaction Taxation in India.

Security Transaction Tax is a tax payable on the purchase and sale of securities, irrespective of the transaction resulting in a profit or loss. STTs have been a policy tool throughout the world. They have been operational in major financial markets including UK, USA, and Australia and many developing economies, such as, China, India and Malaysia. Table 1 shows STT in various economies of the world.

Table 1: Security Transaction Taxes in the world

Argentina	Federal stamp duty on share transfer abolished in 2001
Australia	State-level taxes may apply to shares
Brazil	1.5 per cent tax on equity issued abroad as DR (reduced from 3 per cent 2008)
China	0.1 per cent of principal
France	15-30 bps tax abolished in 2008
Hong Kong	10 bps
India	0.125 per cent on delivery and 0.025 per cent on intraday
Indonesia	0.1 per cent on value of shares, local stamp duty may also apply
Italy	0.01-0.14 per cent of shares traded off exchanges
Singapore	20 bps
South Africa	0.25 per cent of value, new share issues excluded
South Korea	0.5 per cent on value of shares in corporations or partnerships
Switzerland	15 bps on domestic and 30 bps on foreign shares
Taiwan	31 bps
Turkey	Initial margin 0.15 and annual maintenance charge 0.025 per cent
UK	Stamp duty 0.5 per cent on secondary sale of shares
USA	SEC fees 0.0013 per cent (volume), NY state tax $0.05 per share up to $350 per trade

Source: SEBI Bulletin, March 2012

Securities Transaction Tax in India

Security Transaction Tax (STT) was introduced in India in the Union Budget 2004-05. STT was proposed to abolish the tax on long-term capital gains and to reduce the short-term capital gains tax to 10 per cent from 33 per cent. The stock exchanges and mutual funds collect STT on all transactions and remit the same to the Government of India account. The rate of STT has varied over the years. Table 2 shows the structure of Security Transaction Taxation in India.

Currently STT is levied on the transaction value at the following applicable rates:

- In a sale of equity shares, which is settled by actual delivery, STT is levied at the rate of 0.125 percent on both the buyer and the seller
- For a sale of equity shares settled other than the way of actual deliveries or transfer, STT is levied at the rate of 0.025 per cent on the seller of equity shares
- A seller of derivatives on a recognized stock exchange is subject to STT of 0.017 per cent

In the latest Union Budget 2012-2013, it has been proposed to reduce STT on cash delivery transactions by 20 per cent from 0.125 per cent to 0.1 per cent to be effective from July 1, 2012.

Table 2: Structure of STT in India

	Purchase of Equity Shares, Units of Equity Oriented Mutual Fund delivery based)	Sales of Equity Shares, Units of Equity Oriented Mutual Fund delivery based)	Sales of Equity Shares, Units of Equity Oriented Mutual Fund (non-delivery based)	Sale of Derivatives	Sale of Unit of an Equity Oriented Fund to the Mutual Fund
October 1,2004 to May 31,2005	0.075%	0.075%	0.015%	0.01%	0.15%
June 1,2005 to May 31,2006	0.1%	0.1%	0.02%	0.0133%	0.2%
June 1,2006 to May 31,2008	0.125%	0.125%	0.025%	0.017%	0.25%
June 1,2008 onwards	0.125%	0.125%	0.025%	0.017% of option premium in the case of sale of option, 0.125% of settlement price in the case of sale of an option where option is exercised, 0.017% of the price in the case of sale of futures	0.25%
July 1,2012 onwards (proposed)	0.1%	0.1%	0.025%	Same as above	0.25%

Source: SEBI Bulletin, March 2012

As per the Union Budget 2012-13, revised estimates of the revenues from Securities Transaction Tax collected touched Rs.5,200 crore in the financial year 2011-12. The maximum collection of STT revenue was received from cash deliverable transactions. Till September 2011, total revenue collection at BSE and NSE was Rs.1,749 crores from imposition of STT on cash deliverable transactions. Table 3 represents the STT revenue collection at BSE and NSE.

Table 3: STT revenue collection at BSE and NSE (in Rupees crore)

Calendar Year	Cash Deliverable	Cash Non Deliverable	Equity Futures	Options Premium	Exercised Options	Total
2004-05	316	56	127	0	17	516
2005-06	1,738	249	573	0	69	2,628
2006-07	2,814	362	1,185	0	168	4,529
2007-08	5,178	626	1,974	0	293	8,071
2008-09	3,510	502	1,201	67	64	5,344
2009-10	4,871	758	1,552	24	97	7,301
2010-11	4,653	602	1,675	36	98	7,064
2011-12 (till September 2011)	1,749	193	656	22	32	2,652

Source: SEBI Bulletin, March 2012

Against this background, this paper attempts to provide an analysis of the impact of Security Transaction Tax on Indian stock market. The paper is organized as follows. Section 2 reviews the literature. Section 3 presents an introduction to the data and the methodology which are used to investigate the relationship. Section 4 reports the empirical findings and Section 5 concludes the paper.

2. Review of Literature

One of the earliest proponents of taxing financial sector transactions was Keynes (1936) who believes the introduction of a tax on transactions would mitigate the predominance of speculation over the enterprise in the United States. Keynes argues that STT will increase welfare and reduce wastage of resources, market volatility and asset pricing. In line with Keynes argument is Tobin (1978) who proposes a tax on all foreign exchange transactions to be levied multilaterally to decrease the speculative capital inflows. Summers and Summers (1989) examine the desirability

and feasibility of implementation of a Securities Transfer Excise Tax in US. They argue that imposition of such a tax would reduce speculation and raise revenues.

Stiglitz (1989) discusses that the imposition of a turnover tax can reduce price volatility. He argues that a tax on turnover is likely to lead to lower speculation in the stock market by discouraging noise traders and arbitrageurs. Habermier and Kirilenko (2003) assess the impact of securities transaction tax on financial markets and conclude that transaction taxes have a negative effect on price discovery, volatility, liquidity and lead to reduction in market efficiency.

Umlauf (1993) studies the effect of transaction taxes on the behavior of equity returns of Sweden for the period 1980-1987. He uses daily and weekly Swedish All-Share equity index returns and calculates variance ratios. He finds the presence of a rise in volatility in response to the imposition of a transaction tax with a movement of traded volume of Swedish stocks to London. Campbell and Froot (1993) study the international experience with securities transaction taxes using the Swedish and British systems as case studies. They report that due to imposition of transaction taxes, investors can change the location of trade, moving transactions off-exchange or abroad. They conclude that the impact of imposition of tax in Sweden is offshore trading and trading of untaxed local substitutes. In Britain, the authors observe that STT cannot be avoided, it can stimulate trading in untaxed securities and reduce total trading volume. Hayashida and Ono (2011) quantitatively examine the effect on the Tokyo stock market volume for the period from April 1995 to March 2003. The study concludes that the increased transaction cost due to imposition of tax significantly reduces the trading volume.

Baltagi et al (2006) examine the impact of an increase in stamp tax rate on stock market behavior in China. The authors use daily observations of Shanghai A Share Index and Shenzhen A Share Index over the period from November 11, 1996 to November 10, 1997. The study proves that trading volume significantly changes after the tax rate increases and also leads to lower market efficiency.

Phylaktis and Aristidou (2007) describe the effects of security transaction tax on volatility of stock market returns in the Athens Stock Exchange for All Share Index and large cap index FTSE/ASE 20 Index. The study uses different versions of GARCH-M/EGARCH-M models to

investigate the relationship between transaction tax and the conditional mean and variance during bull, normal and bear periods of daily stock returns for the period from September 24, 1997 to December 31, 2003. The study concludes that transaction tax increases volatility during the bull periods and decreases volatility during bear periods.

Kupiec (1995) reports that a transactions tax can impede the information efficiency of markets by discouraging the volume of information motivated trading. The author concludes that the tax is likely to cause risky assets to trade further from their underlying economic values. In another study, Kupiec (1996) analyses the effects of STT in the context of a general equilibrium model and argues that it can reduce the volatility of risky assets price and a decline in the risky assets price leading to rise in volatility of risky assets return.

Roll (1989) examines the stock market volatility for twenty three countries for the period from January 1987 to March 1989. He studies the impact of transaction taxes, price limits and margin requirements on stock market volatility around the 1987 Wall Street Crash. He compares the experience of countries which had a transaction tax with those which didn't impose a transaction tax (Canada, Mexico, New Zealand and United States). He reports transaction taxes are inversely but insignificantly correlated with volatility across countries.

Saporta and Kan (1997) discuss the effect of the UK stamp duty on the level and volatility of equity prices. The authors study the response of equity markets to changes in stamp duty rates and compare the prices of assets identical in all respects. This is done via comparing the prices of a sample of underlying shares of UK-listed companies (subjected to stamp duty) with the price of their US-listed ADRs. The authors perform the comparison empirically using univariate GARCH models and conclude that the stamp duty has no effect on volatility.

Chou and Wang (2006) study the impact of a reduction in transaction tax on the market quality of futures contracts of the Taiwan Stock Exchange in a structural equation framework. The authors measure market quality by trading volume, bid-ask spread and price volatility. The time period chosen for the study is from May 1999 to April 2001. They report that a decrease in transaction tax has a positive impact on trading volume in the index futures market and reduces the bid ask spread. The authors do not find a significant relationship between transaction taxes

and return volatility and argue that an increase or decrease in transaction tax does not result in the same percentage increase or decrease in the tax revenues.

Pomeranets and Weaver (2011) examine the changes in New York State Securities Transaction Tax for the time period between 1932 and 1981. The study uses three measures of market quality including volatility, spread width and volume. They conclude that an imposition of STT leads to wider bid ask spreads, lower volumes and find no consistent relationship between tax and volatility.

Liu (2007) investigates the effect of transaction taxes on the efficiency of Tokyo Stock Exchange price discovery process. The author uses daily data from April 1, 1987 to March 31, 1991 and empirically checks the effects through switching first order autocorrelation model. He suggests that tax event of 1989 results in lower STT related transaction costs and higher informational efficiency in the Tokyo Stock Exchange. The study also estimates the marginal impact on overall trading volume using a switching regression analysis and claims that the tax reform has a positive price impact on Japanese stocks without any effect on the prices for their respective ADRs. Thus the study demonstrates that a reduction in transaction costs improves the efficiency of the price discovery process.

Su (2010) discusses the impact of a change in securities transaction tax on the local A shares in the Shanghai and Shenzhen market over the period from April 1991 to August 2008. The author uses the Switching Generalized Autoregressive Conditional Heteroskedasticity methodology to test whether there are changes in market efficiency due to changes in STT. To examine the impact of STT changes on trading volume the author performs bootstrap testing and reports lower taxes can lead to increase in trading volume. The author concludes that a reduction in the level of STT rate increases return volatility and reduces market efficiency.

While some studies point to a reduction in volatility as a result of imposition of security transaction tax, others suggest the opposite. Our objective is to examine the effect of securities transaction tax on Indian stock market.

3. Data and Methodology

In India, there are two significant stock exchanges in for trading, namely Bombay Stock Exchange (BSE) and National Stock Exchange (NSE). The Bombay Stock Exchange was established in 1875 and has the largest number of listed companies in the world. As of March 2012, there were over 5,133 listed Indian companies and over 8,196 scrips being traded on the stock exchange. In 1986, BSE came out with the stock index– SENSEX, which has become one of the most significant indicators of the Indian stock market.The BSE SENSEX is calculated using data of thirty component stocks representing large, well-established and financially sound companies across key sectorsby the Market Capitalization-Weighted methodology. The base year of SENSEX is 1978-79. SENSEX is calculated on a free-float market capitalization methodology, since September 2003.

The National Stock Exchange was set up in 1991 on the recommendation of Pherwani Committee. NSE's key index is the S&P CNX Nifty, it is commonly known as NSE NIFTY (National Stock Exchange Fifty). NIFTY is an index of fifty major stocks weighted by market capitalisation. Our analysis is based on the change brought about on June 1, 2006, when the percentage of Security Transaction Tax on equity trading was increased from 0.1% to 0.125%.

Data

3.1.1 Effect on Traded Quantity

To examine the impact of change in security transaction taxes, we have used daily traded quantity in terms of number of shares at the Bombay Stock Exchange and National Stock Exchange. The data ranges for a period of one year before June 1, 2006 and one year after June 1, 2006, i.e. from June 1, 2005 to May 31, 2007. The data has been collected from the official websites of BSE and NSE. The traded quantity data is measured in crores. The summary statistics of the data for traded quantity are given in Table 4.

Table 4: Summary Statistics of Traded Quantity (crores)

Statistics	Pre Event (June 1, 2005 to May 31, 2006)	Post Event (June 2, 2006 to May 31, 2007)	Whole Sample (June 1, 2005 to May 31, 2007)
Panel A : BSE			
Number of observations	249	249	498
Maximum	67.15	47.1	67.15
Minimum	6.01	3.08	3.08
Mean	27.87	22.28	25.08
Standard Deviation	10.73	7.07	9.50
Panel B – NSE			
Number of observations	249	249	498
Maximum	71.24	59.79	71.24
Minimum	7.82	4.50	4.50
Mean	36.34	34.50	35.42
Standard Deviation	8.89	9.76	9.37

3.1.2 Effect on Return of Indices

To study the effect of change in security transaction taxes, the BSE SENSEX and NSE NIFTY indices are used. The data in this study cover the period from June 1, 2005 to May 31, 2007. There are 498 observations for closing price of BSE SENSEX and NSE NIFTY, respectively. The data of daily closing price for both the indices was retrieved from Reserve Bank of India website. The daily returns were calculated based on the closing prices by Return, $Rt = \ln(P_{t+1}/P_t)$, where P_t represents the value of index at time t and P_{t+1} represents the value of index at time t+1. There are 496 observations for daily returns of BSE SENSEX and NSE NIFTY, respectively Table 5 gives the summary statistics of the daily returns of the two indices SENSEX and NIFTY.

Table 5: Summary Statistics of daily returns of SENSEX and NIFTY

Statistics	Pre Event	Post Event	Whole Sample
Panel A: BSE SENSEX			
Number of observations	248	248	496
Maximum	0.0320	0.0667	0.0667
Minimum	-0.0700	-0.0484	-0.0700
Mean	0.0018	0.0013	0.0015
Standard Deviation	0.0130	0.0156	0.0144
Panel B: NSE NIFTY			
Number of observations	248	248	496
Maximum	0.0376	0.0611	0.0611
Minimum	-0.0701	-0.0504	-0.0701
Mean	0.0016	0.0013	0.0014
Standard Deviation	0.0135	0.0156	0.0146

Methodology

3.2.1 Effect on Traded Quantity

To study the impact of increase in taxation on purchase and sale of Equity Shares, units of Equity Oriented Mutual Fund (delivery based) from 0.1% to 0.125%, we look at the quantity of shares traded at the two exchanges before and after the event (June 1, 2006). This is done using the bootstrap method as discussed by Efron (1982). A similar method was used by Baltagi et al (2006) to study the impact of change in tax on two prominent Chinese Stock Exchanges (2006).

The quantity of shares traded are denoted by a = (a_1, a_2, a_3…a_k) for k trading days before the event (June 1, 2006) and b = (b_1, b_2, b_3…b_k) for k trading days after the event (June 1, 2006). To test the null hypothesis that there is no effect of change in tax rate on the quantity of traded shares we use the following test statistic G (c):

$$G(c) = \frac{(\bar{a}-\bar{b})}{\sqrt{\sigma a^2/k+\sigma b^2/k}} \qquad (1)$$

The test statistic is valid when we assume that there are equal variances between y and z. Test statistic G (c) was calculated for k =15, 20, 30, 50 and 75 to avoid arbitrariness.

Before choosing bootstrap samples, we performed transformations. $\hat{a_i} = a_i - \bar{a} - \bar{c}$ (where $\bar{a}$and $\bar{c}$ means of k samples pre the event and total samples of both pre and post the event respectively) and $\hat{b_i} = b_i - \bar{b} - \bar{c}$ (where $\overline{b}$ and $\bar{c}$ are means of k samples post the event and total samples of both pre and post the event respectively). Bootstrap samples were chosen from ($\hat{a_1}, \hat{a_2}, ..., \hat{a_k}$) and ($\hat{b_1}, \hat{b_2}, ..., \hat{b_k}$). We developed a program in MATLAB (see Appendix) to choose a random sample of k items with replacement from pre event group (containing k values) and a random sample of k items with replacement from post event group (containing k values). Samples were drawn 10,000 times and G*(c*) statistic was calculated on each time for k =15, 20, 30, 50 and 75.

$$G^*(c^*) = \frac{\bar{\hat{a}} - \bar{\hat{b}}}{\sqrt{\frac{\sigma^2_{\hat{a}}}{k} + \frac{\sigma^2_{\hat{b}}}{k}}} \qquad (2)$$

For each value of k, a bootstrap distribution of G*(c*) using the 10,000 values of G*(c*) statistic to find out the critical values of the test statistic. The critical values derived are given in Table A.1 of the Appendix.

3.2.2 Effect on Return of Indices

In this section, we test whether the return on indices (SENSEX and NIFTY) changes due to the increase in tax rate. Traditional homoskedastic models are not suitable when using the stock prices to calculate return due to the presence of conditional heteroskedasticity (Baillie & Bollerslev, 1990). The volatility of returns is not constant through time and exhibit clustering, which makes periods of relatively low volatility and periods of relatively high volatility grouped together. Thus, the returns can be characterised by Autoregressive Conditional Heteroskedasticity (ARCH), and its extensions, Generalised Autoregressive Conditional Heteroskedasticity (GARCH) Model. We use the ARCH and GARCH models to study the impact of increase in transaction tax on return.

The Standard GARCH model that was proposed by Bollerslev(1986) is

Mean Equation: $h_t = j_0 + \varepsilon_t$ …… (3)

Variance Equation: $var(\varepsilon_t | L_{t-1}) = \sigma_t^2 = s_0 + s_1 \varepsilon^2_{t-1} + s_2 \sigma^2_{t-1}$……..(4)

In the equation above L_{t-1} denotes the information set up to period t-1.

As suggested by Baltagi et al (2006), to understand whether the change in securities transaction tax in June 2006, we include a dummy variable in the Standard GARCH Model resulting in a Modified version of GARCH. The model with dummy variable used in the study is

$h_t = j_0 + j_1 D_t + \varepsilon_t$…….(5)

$var(\varepsilon_t | L_{t-1}) = \sigma_t^2 = s_0 + s_1 \varepsilon^2_{t-1} + s_2 \sigma^2_{t-1} + s_3 D_t$……(6)

where $D_t = 0$ before the event (before June 1, 2006) and $D_t = 1$ after the event(after June 1, 2006). The impact of the change in tax will be observed if the dummy coefficients will be significant.

4. Empirical Results

4.1 Effect on Traded Quantity

We test whether the quantity of traded shares at both the stock exchanges changed after the increase in tax rate. All the test statistics (G(c)) are significant at 5% level in both the Bombay Stock Exchange and the National Stock Exchange for the five sample lengths (k=15,20,30,50 and 75).

Thus suggesting the traded quantity significantly changed due to increase in taxes on equity trading from 0.1% to 0.125% on June 1, 2006. The results are given in Table 6. The sample length indicates the length of trading used in the calculation of the G(c) statistic. The ratio is the ratio of Mean value after the event (June 1, 2006) to the mean value before the event. The formula used to calculate G(c) is given in Section 3.2.1. The significance level was assessed using the confidence interval obtained from the bootstrapping distributions using code developed on MATLAB.

Table 6: Traded Quantity in shares

	±15	±20	±30	±50	±75
BSE					
Mean before the event	23.682	26.157	26.065	27.066	26.426
Mean after the event	16.714	16.009	14.707	14.024	15.513
Ratio (mean value after the event/before the event)	0.706	0.612	0.564	0.518	0.587
Test statistic G (c)	3.827 (0.000)	5.565 (0.000)	8.144 (0.000)	29.939 (0.000)	14.391 (0.000)
NSE					
Mean before the event	41.768	43.304	42.250	41.716	39.444
Mean after the event	31.118	28.956	26.738	25.099	26.267
Ratio (mean value after the event/before the event)	0.745	0.669	0.633	0.602	0.666
Test statistic G (c)	3.330 (0.000)	5.066 (0.000)	7.053 (0.000)	11.119 (0.000)	11.376 (0.000)

As can be seen from Table 6, the number of shares traded fell by 29-48% in BSE whereas the volume of shares fell by 25-39% in NSE. Thus clearly showing with a rise in tax there has been a fall in quantity of shares traded on both the stock exchanges. This indicates that the market responded to the increase in securities transaction tax by a large reduction in quantity of traded shares. This is in line with the basic principle of public finance, is that as tax rate increases, the tax base shrinks.

4.2 Effect on Returns of Indices

In this section, we examine the impact on return of indices due to the change in security transaction tax rate by modified version of GARCH Model. Both the Standard GARCH(1,1) model defined in the equations (3) and equation (4) and the modified GARCH in the equations (5) and (6) are estimated for the two indices. Table 7 provides the results of the GARCH Model and the Modified version of GARCH.

Table 7: Results of Standard GARCH and Modified Version of GARCH

	j_o	j_1	s_0	s_1	s_2	s_3	L
Panel A- BSE							
Standard GARCH	0.002261 (0.0001)		1.16E-05 (0.0001)	0.155597 (0.0000)	0.783848 (0.0000)		1467.47
Modified GARCH	0.002445 (0.0015)	(-)0.000364 (0.7534)	1.23E-05 (0.0003)	0.154575 (0.0000)	0.785109 (0.0000)	(-)1.51E-06 (0.5877)	1467.64
Panel B-NSE							
Standard GARCH	0.002115 (0.0003)		1.10E-05 (0.0002)	0.146536 (0.0000)	0.797666 (0.0000)		1461.38
Modified GARCH	0.002206 (0.0057)	(-)0.000212 (0.8593)	1.11E-05 (0.0004)	0.144253 (0.0000)	0.800765 (0.0000)	(-)6.55E-07 (0.7997)	1461.43

The standard GARCH Model is: $h_t = j_0 + \varepsilon_t$ and $var(\varepsilon_t | L_{t-1}) = \sigma_t^2 = s_0 + s_1 \varepsilon^2_{t-1} + s_2 \sigma^2_{t-1}$

The modified GARCH Model is $h_t = j_0 + j_1 D_t + \varepsilon_t$ and $var(\varepsilon_t | L_{t-1}) = \sigma_t^2 = s_0 + s_1 \varepsilon^2_{t-1} + s_2 \sigma^2_{t-1} + s_3 D_t$

As we can observe from Table 7, for both the indices, BSE and NSE, the coefficient of the dummy variable (j_1) in the mean equation of Modified GARCH (Equation 5) is negative though the coefficient is not significant. Thus indicating that an increase in tax has a negative impact on the rate of return. The coefficient of the dummy variable (s_3) in the variance equation (Equation 6) is insignificant. Thus we do not find a significant relationship between increase in STT and return volatility of the two indices as was expected by the imposition of increase in securities transaction tax by the proponents of STT.

5. Concluding Observations

Financial market volatility has always remained a concern for regulators. In recent years, governments and global organisations are involved in proposing and adopting various regulations to control the level of speculations. One of the popular mechanisms is Securities Transaction Tax. The proponents argue that imposition of STT discourages noise traders from trading, reducing unproductive speculations. Whereas the opponents are of the view that increased tax can lead to lower value of securities, increase volatility, and decrease stock market efficiency.

This paper throws light on the effect of STT on the quantity traded and returns of Indian stock markets. The effect of the increase in tax level leads to a fall in the traded volume of shares in the BSE and NSE Stock exchanges by more than twenty five percent. This is in line with the arguments given by Hayashida and Ono (2011), Chou and Wang (2006) and Baltagi et al (2006). With a rise in transaction tax leading to fall in quantity of shares traded, the changes proposed in the Budget 2012-13 to reduce STT on cash delivery transactions by 20 per cent from 0.125 per cent to 0.1 per cent to be effective from July 1, 2012 is justified.

Having estimated the returns, we study the volatility of the returns in the stock market. Our empirical analysis reveals that an increase in Securities Transaction Taxes does not lead to a significant change in return volatility in the stock market. Similar arguments were given by Pomeranets and Weaver (2011) and Su (2010) in their respective studies on the impact of change in tax on return volatility. Our results provide useful evidence for the ongoing Security Transaction tax debates across the world.

References

Baillie, R.T. and T. Bollerslev (1990). A multivariate generalized ARCH approach to modeling risk premia in forward foreign exchange rate markets, *Journal of International Money and Finance,* 9, 309–324.

Baltagi B., D. Li., and Q. Li(2006).Transaction tax and stock market behavior: evidence from an emerging market, *Empirical Economics*, Vol. 31(2), 393-408.

Bollerslev, T. (1986). Generalized autoregressive conditional heteroskedasticity, *Journal of Econometrics*, Volume 31, Issue 3, April 1986, 307–327.

Campbell, J. and K. Froot (1993).International Experience with Securities Transaction Taxes, NBER Working Paper 4587.

Chou, R. K. and G. H. K. Wang (2006).Transaction tax and market quality of the Taiwan stock index futures, Journal of Futures Market, 26: 1195–1216.

Efron, B. (1982). The jackknife, the bootstrap and other resampling plans, *Philadelphia: Society for Industrial and Applied MathematicsCBMS-NSF Monographs,* 38.

Habermier, K. and A.Kirilenko (2003).Securities Transaction Taxes and Financial Markets, IMF Staff Papers, Volume 50.

Hayashida M. and H. Ono (2011).Turnover tax, transaction cost and stock trading volume revisited: investigation of the Japanese case, *Applied Financial Economics*, 2011, 21, 1809–18.

Keynes, J. M. (1936). General Theory of Employment, Interest Rates and Money (New York:Harcourt Brace & World).

Kupiec, P. H. (1995).A Securities Transactions Tax and Capital Market Efficiency, *Contemporary Economic Policy*, 13: 101–112

Kupiec, P. H. (1996). Noise Traders, Excess Volatility, and a Securities Transactions Tax, *Journal of Financial Services Research*, Volume 10, Number 2 (1996), 115-129.

Liu, S.(2007). Securities Transaction Tax and Market Efficiency: Evidence from the Japanese Experience, *Journal of Financial Services Research*, Vol. 32(3), 161-176.

Phylaktis K. and A.Aristidou (2007). Security transaction taxes and financial volatility: Athens stock exchange, *Applied Financial Economics*, 17:18, 1455-1467.

Pomeranets, A. and, D.G. Weaver (2011). Security Transaction Taxes and Market Quality, Bank of Canada, Working Paper, 2011-26.

Pore, L. (2012). Analysis of Securities Transaction Tax, *SEBI Bulletin*, March 2012, Volume 10, Number 3.

Roll, R. (1989). Price Volatility, International Market Links and Their Implication for Regulatory Policies, *Journal of Financial Services Research,* 3(2-3), 211–46.

Saporta, V. and K.Kan (1997). Effects of Stamp Duty on the Level and Volatility of UK Equity Prices, Working Paper, Bank of England, London.

Stiglitz, J. E. (1989). Using Tax Policy to Curb Speculative Short-Term Trading, *Journal of Financial Services Research*, Vol. 3, 101–15.

Su, Y. (2010). The impact of the securities transaction taxes on the Chinese stock market, MPRA Paper 22695, University Library of Munich, Germany

Summers, L and V. Summers (1989). When Financial Markets Work Too Well: A Cautious Case for a Securities Transaction Tax, *Journal of Financial Services Research,* 3. 261–86.

Tobin, J. (1978). A Proposal for International Monetary Reform, *Eastern Economic Journal* 4(3–4), 153–59.

Umlauf, S.R. (1993). Transaction taxes and the behavior of the Swedish stock market, *Journal Financial Economics*, 33, (1993), 227-240.

Appendix

MATLAB Program for implementing Bootstrap Method

```
a= [Enter pre event values];
b= [Enter post event values];
c= [Enter value of k];

result=zeros(length(c),10000);
for i=1:length(c)
  for j=1:10000
     temp=floor((c(i)-1)*rand(1,c(i)))+1;
     bb=b(temp);
     aa=a(temp);
     result(i,j)=(mean(aa)-mean(bb))/sqrt((std(aa)^2)/c(i)+(std(bb)^2)/c(i));
  end
end

p=(result(1,:));
mini=min(p);
maxi=max(p);
interval=(maxi-mini)/100;
l=zeros(1,100);
for i=1:length(p)
   for j=1:100
      if(p(i)>=mini+interval*(j-1) && p(i)<mini+interval*j)
         l(1,j)=l(1,j)+1;
      end
   end
end
l=l/length(p);
m=[1:1:100];
m=mini+interval*(m-1);
ll=cumsum(l);
for i=1:100
```

```
   if(ll(i)>0.025)
      break;
   end
end
lower=(m(i)+m(i+1))/2
temp=[100:-1:1];
ll=l(temp);
m=m(temp);
ll=cumsum(ll);
for i=1:100
   if(ll(i)>0.025)
      break;
   end
end
upper=(m(i)+m(i-1))/2
```

Table A.1: Results from Bootstrapping Method using MATLAB

The table below indicates acceptance region of the statistics derived from the bootstrap distribution method for k=15,20,30,50 and 75 for quantity of traded shares on both the stock exchanges.

BSE					
	k=15	**k=20**	**k=30**	**k=50**	**k=75**
Lower (2.5%)	-1.8353	-1.5115	-1.4233	-1.5982	-1.9262
Upper (2.5%)	2.4281	2.1275	1.8117	2.2558	2.5352
NSE					
	k=15	**k=20**	**k=30**	**k=50**	**k=75**
Lower (2.5%)	-1.8986	-1.4929	-1.7432	-1.9117	-1.9718
Upper (2.5%)	2.0295	1.4158	1.7823	2.0051	2.1935

Table A.2: Results from Standard GARCH run using EVIEWS - BSE SENSEX

Dependent Variable: R
Method: ML – ARCH
Date: 30/06/12 Time: 10:06
Sample: 1 496
Included observations: 496
Convergence achieved after 12 iterations

	Coefficient	Std. Error	z-Statistic	Prob.
C	0.002261	0.000571	3.955785	0.0001
Variance Equation				
C	1.16E-05	3.06E-06	3.796645	0.0001
ARCH(1)	0.155597	0.032309	4.815873	0.0000
GARCH(1)	0.783848	0.039961	19.61544	0.0000

R-squared	-0.002495	Mean dependent var	0.001544
Adjusted R-squared	-0.008608	S.D. dependent var	0.014369
S.E. of regression	0.014431	Akaike info criterion	-5.901090
Sum squared resid	0.102463	Schwarz criterion	-5.867166
Log likelihood	1467.470	Durbin-Watson stat	1.845761

Table A.3: Results from Modified GARCH run using EVIEWS – BSE SENSEX

Dependent Variable: R
Method: ML – ARCH
Date: 30/06/12 Time: 10:07
Sample: 1 496
Included observations: 496
Convergence achieved after 15 iterations

	Coefficient	Std. Error	z-Statistic	Prob.
C	0.002445	0.000771	3.172596	0.0015
DUMMY	-0.000364	0.001158	-0.314096	0.7534
Variance Equation				
C	1.23E-05	3.42E-06	3.580090	0.0003
ARCH(1)	0.154575	0.032200	4.800537	0.0000
GARCH(1)	0.785109	0.039337	19.95866	0.0000
DUMMY	-1.51E-06	2.79E-06	-0.542176	0.5877

R-squared	-0.002300	Mean dependent var	0.001544
Adjusted R-squared	-0.012527	S.D. dependent var	0.014369
S.E. of regression	0.014459	Akaike info criterion	-5.893714
Sum squared resid	0.102443	Schwarz criterion	-5.842828
Log likelihood	1467.641	Durbin-Watson stat	1.846219

Table A.4: Results from Standard GARCH run using EVIEWS – NSE NIFTY

Dependent Variable: R
Method: ML – ARCH
Date: 30/06/12 Time: 10:10
Sample: 1 496
Included observations: 496
Convergence achieved after 14 iterations

	Coefficient	Std. Error	z-Statistic	Prob.
C	0.002115	0.000588	3.599429	0.0003
Variance Equation				
C	1.10E-05	2.91E-06	3.767850	0.0002
ARCH(1)	0.146536	0.030448	4.812630	0.0000
GARCH(1)	0.797666	0.036974	21.57365	0.0000

R-squared	-0.002139	Mean dependent var	0.001441
Adjusted R-squared	-0.008249	S.D. dependent var	0.014581
S.E. of regression	0.014641	Akaike info criterion	-5.876528
Sum squared resid	0.105471	Schwarz criterion	-5.842604
Log likelihood	1461.379	Durbin-Watson stat	1.874485

Table A.5: Results from Modified GARCH run using EVIEWS – NSE NIFTY

Dependent Variable: R
Method: ML – ARCH
Date: 30/06/12 Time: 10:11
Sample: 1 496
Included observations: 496
Convergence achieved after 21 iterations

	Coefficient	Std. Error	z-Statistic	Prob.
C	0.002206	0.000798	2.766169	0.0057
DUMMY	-0.000212	0.001198	-0.177209	0.8593
Variance Equation				
C	1.11E-05	3.15E-06	3.513329	0.0004
ARCH(1)	0.144253	0.030214	4.774335	0.0000
GARCH(1)	0.800765	0.036900	21.70102	0.0000
DUMMY	-6.55E-07	2.58E-06	-0.253685	0.7997

R-squared	-0.001982	Mean dependent var	0.001441
Adjusted R-squared	-0.012206	S.D. dependent var	0.014581
S.E. of regression	0.014670	Akaike info criterion	-5.868649
Sum squared resid	0.105455	Schwarz criterion	-5.817763
Log likelihood	1461.425	Durbin-Watson stat	1.874827