The Impact of Transaction Tax on Stock Markets: Evidence from an emerging market

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Abstract

This paper provides empirical study on the behavior of the Shanghai and the Shenzhen stock exchanges after the Chinese government announced to increase the securities transaction tax from 0.3% to 0.5% in May 9th, 1997. We examine the impact of the increased transaction tax on the volatility of stock returns and tax revenue. We find that the return volatility significantly increased. We also find that because the volume decreased considerably, the increase in the tax revenue is relatively small compared to the increased level of the tax rate.

1.Introduction

There are quite divergent opinions on the effect of increasing the securities transaction tax on the stock markets. Proponents of the securities transaction tax have suggested that the tax is an instrument to reduce stock market volatility, raise tax revenue, direct the investors and managers to behave in the long-run prospective, improve market efficiency, and fairly reallocate the social wealth. But opponents have argued against it by both theory and empirical study. Schwert and Seguin (1993) reviewed those opinions with respect to the costs, benefits and unresolved questions on the transaction tax. We can find that whether the benefit of the transaction tax could outweigh its cost is still a hot polemic unsettled. The main controversies are presented as follows:

1) Reduce excess stock return volatility or not

Proponents believe that the securities transaction tax could act as a fundamental function to reduce excess stock return volatility. They argue that considerable price volatility in stock markets is from the activities of “noise traders”. Noise traders do not analyze the intrinsic value of stocks when they submit orders, and such behavior causes securities prices to diverge significantly from their fundamental values. Such behaviors are harmful to the economy. So the government should exert pressure to reduce noise traders’ activities. Proponents argue that increasing the transaction tax is a great tool to achieve the goal. When the transaction tax is increased, the transaction costs are increased. Noise traders would be “punished” for each of their short-term speculative activities. As their processing of speculative transactions turns out to meet resistance, the noise traders are encouraged to spend more time on studying the intrinsic value of the securities. Therefore, many speculative transactions would be replaced, and the influence of noise traders on the stock market would be reduced. Therefore, the short-term speculative trading volume, which is the source of excess volatility, would be diminished. This outcome will in turn benefit fundamental investors. Thus, many proponents hold the opinion that tax functions as a strong weapon against excessive speculation. One of Tobin's (1984) analyses best concluded this mechanism: "throw sand in the gears". The gears are looked at as our excessively well-functioning financial markets, and sand is the transaction tax. The "sand" limits activities of speculators. The financial market will be more balanced and stable.

However, there are also many opponents to show their doubts on such arguments. They believe that decreasing volatility would not surely happen as a consequence of increasing the transaction tax. This point is based on the fact that the transaction tax treats each trader indifferently. The transaction tax would influence not only the noise traders, but also those informed traders who play the role of decreasing volatility in the stock market. Only when the tax has a greater limiting effect on the activities of noise traders than on price-stabilizers and informed traders, we can say that the transaction tax could play a role in decreasing the volatility. The estimate of its effect on volatility is not reliable until all traders in the stock market are taken into consideration. We cannot exclude the possibility that the transaction tax could increase volatility by affecting rational traders more seriously than noise traders. Besides the theoretical analyses, researchers have also done some empirical tests on the effect of increasing transaction tax on price volatility. One example is Umlauf's (1993) study on Swedish stock market during 1980-1987. Umlauf found that, contrary to what some proponents expected, after imposing the transaction tax, daily variances were highest during the greatest tax regime (the tax rate was 2% from July 1986 to Dec 1987). Jones and Seguin (1997) examined the effect of commission deregulation in the United States during 1975, which reduces transaction costs, on price volatility. Their empirical results showed that the deregulation of fixed commissions increases volume, and "the effect of this volume increase was to reduce volatility of returns." So, opponents believe that the securities transaction tax would not decrease volatility.

2) Increase tax revenues or not

One of the fundamental motivations for increasing the transaction tax is to increase tax revenues. Proponents believe that as the tax rate increases, the tax revenue would increase significantly. Although this apparently seems so, opponents have strong doubts about it after more careful examination. They argue that in theory, tax revenue is the product of three parameters, tax rate, volume weighted average price level, and the quantity of transactions. By increasing the trading cost, one of the factors, tax rate, would increase, but at the same time, the other two factors, the quantity of transactions, as well as the price level, could considerably decrease. As the traders' profit is greatly affected by the increased cost of transaction tax, the traders will try to diminish their "loss" in paying taxes. One of their consequent actions is to reduce their transactions, which would directly decrease the quantity of transactions in the stock market. Another profitable action for traders is to shift their trades from securities of short-term nature to longer-maturity securities because the short-term securities are traded more frequently and thus have a higher tax burden. A more serious problem is for traders to migrate their investment from their home country to foreign exchanges in order to seek lower transaction tax and keep their profit. The stock market of their home country is therefore shrinking by losing transaction volume. Umlauf (1993) found that in the Swedish stock market, "when the 2% tax was introduced in 1986, 60% of the trading volume of the 11 most actively traded Swedish share classes migrated to London to avoid taxes." By using the Swedish and British systems to examine its international experience, Campbell and Froot (1993) pointed out that these three effects on trading volume "… can be important. Estimated revenues from increasing transaction tax will be correspondingly overstated if they ignore such behavioral effects." One empirical study to test the effects is to analyze the elasticity of trading volume with respect to trading cost. Schwert and Seguin (1993) pointed out that "based on the limited evidence available to date, it seems that the elasticity of trading volume with respect to transaction costs is between –0.25 and –1.35." So as the tax rate increases, the trading volume would decrease. Secondly, many researchers believe that the transaction tax would also reduce the prices of securities to reduce the tax revenue. As the transaction cost increases, the required rates of return would increase. And as the required rates of return increase, the prices of securities would be reduced. So, with the declining effect on the tax revenue by the decreased transaction volume and decreased transaction prices, it is unclear whether the transaction tax revenue would increase. In addition to the direct effect on transaction tax revenue, Umlauf (1993) argued that there would be a secondary effect of introducing a transaction tax on capital gains tax revenue. He pointed out that "the capital gains tax revenue fell so much in response to lower levels of trading that transaction tax revenues were entirely offset." So, both transaction tax revenue and capital gains tax revenue would be considerably affected by increasing the transaction tax rate.

3) Effects on capital market efficiency

Another controversial issue is whether the transaction tax would improve the efficiency in allocating resources in the capital market. Proponents believe that it could make both managers and traders have long-term horizons rather than short-term horizons. Sometimes managers' myopic allocation or traders' myopic investment on short-run projects may be harmful to long-run projects and constrain the development of both companies and the economy. The securities transaction tax may discourage such unproductive activities because these activities are heavily taxed and thus unprofitable. Lengthening the horizons of corporate managers would help allocate resources more efficiently. Opponents concede that the transaction tax may improve capital market efficiency in some respects, but they believe that its negative effects on the efficiency of the capital markets are considerable too. One of its negative effects is the distortion of optimal portfolios. They argue that the optimal portfolio would be most efficient when there are no tax burdens on securities. When taxes are added to the securities, the relative cost of different classes of securities would change, because the transaction tax has different effects on them. For example, those securities with short-term nature that are traded frequently would be affected most negatively by increasing the transaction tax. When relative transaction costs of various stocks' change, the optimal portfolio would change accordingly, distorting the allocation resources from the original portfolio and making a less efficient capital market. Another inefficiency caused by the transaction tax would be an indirect effect on the liquidity of financial assets. As the transaction cost increases, the frequency of transactions would be decreased to avoid a higher tax burden. When it happens that an asset's price is currently misleading and is inconsistent with its intrinsic value, it would take longer to correct for the discrepancy because of the lack of enough transactions. In these cases, the capital market becomes inefficient.

4) Fairly reallocate the social wealth or not

Proponents also believe that the securities transaction tax would help government reallocate the wealth in the society fairly. They argue that the wealthy have more financial assets and tend to trade them more frequently. So the wealthy would have to suffer more from the increased tax. A bigger proportion of the profits would be extracted from the wealthy for their frequent speculation and trading. Government collects these taxes and reallocates them to the non-wealthy by government spending. Thus, the transaction tax would alleviate the tension of the concentration of the social wealth in some particular groups. However, opponents find that this is not so optimistic as it seems. Instead, the transaction tax would hurt the whole population in the society. One fact is that the number of stockowners is huge, and not just the wealthy are direct owners. So, the increased transaction tax also hurts the non-wealthy each time they trade. Another fact is that all the stockowners suffer capital loss. The cost of transaction will directly reduce the asset value, as we have mentioned above, and cause the current owners to lose their wealth immediately. In the end, it is still uncertain whether the securities transaction tax could transfer part of the wealth from the wealthy to the non-wealthy or not.

After the market closed on May 9th, 1997 (Friday), the Chinese government announced the securities transaction tax to change from 0.3% to 0.5% immediately. In this paper, following Umlauf's (1993) empirical study on the Swedish stock exchanges, and Jones and Seguin's (1997) study on the United States stock exchanges, I provide additional study on the Chinese stock exchanges and add empirical evidence to current discussions on the securities transaction tax. Section 2 discusses the data. Section 3 presents the methodology and results, and section 4 concludes the paper.

2.Data

The data in this paper is from DataStream. The data includes the value-weighted average indexes, and shares of trading stocks for the Shanghai A stocks and the Shenzhen A stocks. The data spans from Nov 9th, 1996 to Nov 12th, 1997, excluding holidays when there were no transactions. In this paper, the rate of return is defined as $r_t = 100 * \log(Index_t / Index_{t-1})$, and the volume is defined as (trading volume)/ 1,000,000. Figure 1 and figure 2 show the daily rate of return in the Shanghai and the Shenzhen stock exchanges during our sample.

Now I provide a brief description of the Chinese stock market. There are two nationwide equity markets in China: the Shanghai stock exchange and the Shenzhen stock exchange. They are under the supervision of the China Securities Regulatory Commission. The transactions follow the rules of price priority and time priority. There are several kinds of stocks in China. Two major kinds are A stocks and B stocks. Their fundamental difference is that A stocks should traded by the Chinese domestic citizens with Chinese currency Renminbi (RMB: Chinese monetary unit) [1], while B stocks should be traded by foreign investors with foreign monetary unit. Despite their differences, in many respects, A stocks and B stocks follow the same rules. For example, except for the first exchange day, the percentage of change is limited to 10% per day. There are five major industrial sectors: Industry, Commerce, Real estate, Utility, and comprehensive.

The Shanghai stock exchange was established on Nov 26th, 1990. At the end of 1996, there were 293 listed companies. There were 287 A stocks listed companies, and 42 B stocks listed companies. The total market value was RMB 547.78 billion, and the outstanding market value was RMB 140.87 billion. The total shares of stocks were 57.08 billion. The Shenzhen stock exchange was established on Dec 1st, 1990. At the end of 1996, there were 237 listed companies. The total market value was RMB 436.4 billion, and the outstanding market value was RMB 45.8 billion. The total shares of stocks were 43.95 billion.

[1] The exchange rate was quite stable around $1 = RMB 8.29 through the sample period in this paper.

On May 9th, 1997, the tax rate was announced to increase from 0.3% to 0.5%. The central government conserved 88% of the securities transaction tax revenue, and the local government conserved 12% of them. Besides the transaction tax, the investors were charged a commission fee for each trade[2].

3.Methodology and Results

3.1.Analysis of Volatility

To examine the transaction tax effect on market volatility, we test the equity of variances before and after the announcement. Before using techniques and calculating test statistics, we should test for normality first, because some statistics in this paper are sensitive to normality assumption. For example, to test the significance level for Levene test statistics, we cannot check them with common F-table if the population is not normally distributed. In this case, we should use bootstrapping technique, which is robust under non-normality. So, we must first examine the normality.

3.1.1Test for normality

The samples used in this paper are defined as follows: May 9th, 1997 was defined as –1 event day, because the announcement was made after market closed on that day, and such announcement had no effect on that day's trading. May 12th, 1997, which was

[2] The commission was regulated by not to exceed RMB 4.0 (which is approximately US$ 0.48).

Monday, was defined as +1 day, because it was the first day after the announcement. May 8^{th} was –2 day, and May 13^{th} was +2 day, and so on.

I use samples of +/-15 days, +/-30 days, +/-45 days, +/-60 days, and +/-75 days around the announcement respectively to test for normality of return.

Table 1 and table 2 show the results for the Shanghai and the Shenzhen stock exchanges. For the Shanghai stock exchange, the signs for skewness are all negative, which indicates that the distribution for rate of return skewed left, and all the signs for kurtosis are positive, which indicates that the distribution are heavy tailed. Examining the significance levels, we should use the Shapiro-Wilk test because the sample size is less than 2000[3]. I find that all the p values in all the samples are smaller than 1%, so we can reject the null hypothesis that the distributions are normal at 1% significance level. We find similar results for the Shenzhen stock exchange, skewed left, and heavy tailed, and not normally distributed. Using another method, the Jarque-Bera test, which jointly tests the skewness and kurtosis, I get the same results. All the p values are less than 1% in all the samples in both the Shanghai and the Shenzhen stock exchanges. So, I can reject the null hypothesis of normal distribution at 1% significance level.

[3] Note: If the sample size is less than 2, 000, the Shapiro-Wilk statistic W is computed to test normality. W is the ratio of the best estimator of the variance to the usual corrected sum of squares estimator of the variance.

3.1.2 Levene test statistic

Our null hypothesis for testing volatility is: H$_0$: $\sigma_1^2 = \sigma_2^2$, and H$_1$: $\sigma_1^2 \neq \sigma_2^2$, where σ_1^2 is the variance before the announcement, and σ_2^2 is the variance after the announcement. Levene (1960) proposed a statistic for a test of the equality of variance. We use the Levene test statistics to test the null hypothesis.

Let x_{ij} be the j th ($j = i,..., n_i$) observation in the i th group ($i = 1, ,..., g$) where g is the number of groups in the sample (in our model, g =2), and let $z_{ij} = | x_{ij} - \bar{x}_i |$, where $\bar{x}_i$ is the sample mean for each group. The Levene test statistic is defined as:

$$W_0 = \frac{\sum_i n_i (\bar{z}_i. - \bar{z}..)^2 \big/ (g-1)}{\sum_i \sum_j (z_{ij} - \bar{z}_i.)^2 \big/ \sum_i (n_i - 1)}$$

where

$\bar{z}_i = \sum z_{ij} \big/ n_i$ and $\bar{z}.. = \sum \sum z_{ij} \big/ \sum n_i$

Levene test is the ratio of between group variation and within group variation. Table 3 and table 4 show the results of the Levene test statistics in the Shanghai and the Shenzhen stock exchanges. Brown and Forsythe (1974) pointed out that the common F-test could check the significance levels of Levene test statistics if the underlying population is distributed Gaussian. The critical values of W_0 are obtained from the F-table with g – 1 and $\sum_i (n_i - 1)$ degree of freedom. So I get the asymptotic p-values, which are shown in table 3 and table 4.

In the Shanghai stock exchange, we can reject the null hypothesis at 1% significance level for the +/-45 days samples, at 5% confidence level for the +/-30 days and +/- 75 days samples, at 10% level for the +/-15 days sample. We don't reject the null at 10% level for the +/- 60 days sample. In the Shenzhen stock exchange, we can reject the null hypothesis that the volatility does not change after the announcement at 1% confident level for the samples of the +/-30 days, +/-45 days, +/-60 days, and +/-75 days. We can reject the null hypothesis at 5% level for the +/-15 days sample.

But the result above would be misleading when the assumption of normality were violated. I will resort to the bootstrapping method to deal with this complication.

3.1.3. Bootstrapping for Levene test statistic

First, I draw $2k$ daily returns randomly from our samples, and divide the random sample into two groups: k days before the announcement and k days after the announcement. And we calculate the Levene test statistic W. Then we repeated such procedure m times. In this way, we get a series of Levene test statistics: $W^1, W^2, ... W^m$. Secondly, we calculate the bootstrapping P value for W_0. The significance level of W_0 is known as the percentiles in the distribution of the bootstrapping series we get in the first step. Let's suppose it ranks U in the sample. The p value is Prob { $N(x) > W_0$ } (where the

$N(x)$ is the bootstrapping series), and it is equal to 1-U/m. Further, in order to avoid arbitraries of sample size, we let k = 15, 30, 45, 60, 75. See Efron and Tibshirani (1993) for detailed bootstrap techniques.

Table 3 shows the bootstrapping p values in the Shanghai stock exchange. The variances are significantly different at 5% significant level for the samples of +/-45 days and +/-75 days, and at 10% level for the +/- 30 days sample. Table 4 shows the bootstrapping p values in the Shenzhen stock exchange. The variances are significantly different at 1% significant level for the samples of +/-30 days, +/-45 days, and +/-75 days, and at 5% level for the +/-60 days sample, and at 10% level for the +/-15 days sample.

3.1.4 Modified Levene test statistic: median adjusted Levene and 5% - trimmed Levene

There are more robust estimators than the original Levene test statistic when the underlying population is skew. These estimators are to use median, or 5% - trimmed mean (the choice of percent of trimming is arbitrary), in place of the mean to calculate Levene statistic. The 5% - trimmed mean is the mean after deleting the largest 5% observations and the smallest 5% observations in that group. Considering our samples are skew, we resort to these modified Levene estimators.

Table 3 shows the modified Levene test statistics and their bootstrapping P values in each sample in the Shanghai stock exchange, and Table 4 shows the results in the

Shenzhen stock exchange. In the Shanghai stock exchange, using the median-adjusted Levene test, the variances are significantly different at 1% significance level for the +/-45 days sample, at 5% level for the +/-30 days sample, and at 10% level for the +/-75 days sample. Using the 5%-trimmed Levene test, the variances are significantly different at 1% significance for the +/-45 days and +/-75 days samples, and at 5% level for the +/-30 days and +/-60 days samples, but they are not significantly different for the +/-15 days sample. So by using the 5%-trimmed mean Levene test, the null hypothesis could be rejected at 5% significance in four out of five samples.

In the Shenzhen stock exchange, using the median-adjusted Levene test, I find that for the +/-15 days sample, the variances are significantly different at 5% significance level. For all the other samples, the variances are significantly different at 1% significance level. Using the 5%- trimmed Levene test, the variances are significantly different at 1% level for the samples of +/-30 days, +/-45 days, +/-60 days, and +/-75 days. For the +/-15 days sample, we can reject the null hypothesis at 10% significance level.

By using the original Levene test and the modified Levene test, we find that the volatility changed significantly. By examining Table 5 and Table 6, we can see that the market volatility increased with the tax rate, contrary to the scenario described by the proponents of the stock transaction tax.

3.1.5 GARCH models

As we know, the reference of ordinary regression analysis is based on the assumption of homoskedasity (that is, the variance of the error term is constant for all observations). When the variance is not constant, the OLS estimators become inefficient. To correct for heteroscedasticity, Engle (1982) introduced the Autoregressive Conditional Heteroscedasticity (ARCH) models. The time series are assumed to have constant means, while the variance can change overtime. He assumed $\varepsilon_t \mid \psi_{t-1} \sim N(0, h_t)$, where ε_t is the disturbance, ψ_{t-1} is all the information set at time $t-1$. The form of the conditional variance is $h_t = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \cdots + \alpha_q \varepsilon_{t-q}^2$. So, the conditional variance is a function of past squared disturbances. Engle (1982) found that the lag length q is required to be very large. To deal with this problem and get a more flexible form, Bollerslev (1986) proposed the Generalized ARCH (GARCH) model, which performs as well as or better than ARCH model by using quite a small number of parameters. The conditional variance function in GARCH (p,q) is $h_t = \alpha_0 + \sum_{i=1}^{q} \alpha_i \varepsilon_{t-i}^2 + \sum_{i=1}^{p} \beta_i h_{t-i} = \alpha_0 + A(L)\varepsilon_t^2 + B(L)h_t$, where p is the order to the autoregressive part. See Bollerslev and Kroner (1992) for more theory and empirical evidence of the ARCH modeling.

Before using the GARCH model, we should test GARCH effect first. The idea of this test is to examine the autocorrelations of the squares of residuals. The null hypothesis is no ARCH effects (that is: ARCH (q) against ARCH (0)). The LM test statistic is $\chi^2 = TR^2$, where R^2 is from the regression of ℓ_t^2 on a constant and q lagged values. The test statistic follows a limiting chi-squared distribution with q degrees of freedom. If it is greater than the critical value, we can reject the null hypothesis. Bollerslev (1986) suggested a Lagrange multiplier statistic, which is even easier to compute. I use ARCHTEST option to test the absence of ARCH effects. I find that in our sample of +/-6 months, all the p > LM values of the twelve lags in the Shenzhen stock exchange are smaller than 0.01, and in the Shanghai stock exchange, the p values of the first five lags are smaller than 0.05. So, we can reject the null hypothesis that there are no ARCH effects. We should use GARCH models to examine the volatility.

We estimate the GARCH models using the maximum likelihood estimators' method. It maximizes the following function based on the assumption of normal distribution. The log-likelihood function is:

$$\ln L = \sum_{t=1}^{T} -\frac{1}{2}\left[\ln(2\pi) + \ln\sigma_t^2 + \frac{\varepsilon_t^2}{\sigma_t^2}\right].$$

I defined a dummy variable *After*, which equals 1 when the observation is after the announcement, and equals 0 otherwise. In the GARCH (1,1) model, I add the *Volume* and *After* in both the mean function and the variance function. The result in the Shanghai stock exchange is:

$$
\begin{array}{lccccccc}
 & -0.23 & & 0.10 Volume & & 0.27 After & & \\
r_t = & (0.42) & + & (0.06) & - & (0.38) & + & \varepsilon_t \\
 & (t=-0.56) & & (t=1.50) & & (t=-0.72) & &
\end{array}
$$

$$
\begin{array}{lccccccccc}
 & 1E-8 & & (1.69E-20) h_{t-1} & & 0.25 \varepsilon_{t-1}^2 & & 2.02 After & & 0.82 Volume \\
h_t = & (5.3E-15) & - & (6.5E-15) & + & (0.07) & + & (0.52) & + & (0.11) \\
 & (t=1994119) & & (t=-0.00) & & (t=3.81) & & (t=3.86) & & (t=7.33)
\end{array}
$$

In the mean function, the coefficient on “after” indicates the effect of raising the transaction tax on the mean of rate of return. “Volume” can be considered as a proxy for arrived information in the market. [See Hiemstra and Jones (1994)]

In the mean function in the Shanghai stock exchange, the coefficient on *After* is negative, but it is not significant. The coefficient on *Volume* is positive. In the variance function, the coefficient on *After* is positive and significant at 1% significance level. The coefficient on *Volume* is positive and significant at 1% level. It indicates that the variance of rate of return increases as the volume increases.

The result in the Shenzhen stock exchange is:

$$
\begin{array}{lccccccc}
 & -0.51 & & 0.13 volume & & 0.08 After & & \\
r_t = & (0.98) & + & (0.11) & - & (0.57) & + & \varepsilon_t \\
 & (t=-0.53) & & (t=1.15) & & (t=-0.15) & &
\end{array}
$$

$$
\begin{array}{lccccccccc}
 & 0.82 & & 0.46 h_{t-1} & & 0.30 \varepsilon_{t-1}^2 & & 0.46 After & & 0.18 volume \\
h_t = & (1.29) & - & (0.15) & + & (0.10) & + & (0.74) & + & (0.20) \\
 & (t=0.64) & & (t=3.13) & & (t=2.84) & & (t=0.62) & & (t=0.94)
\end{array}
$$

In the mean function, the coefficient on *After* is negative but insignificant. The coefficient on *Volume* is positive but insignificant. In the variance function, the coefficients on *After* and *Volume* are both positive, but neither of them is significant.

I find that the results of GARCH models in the Shanghai stock exchange support that the volatility increased after the announcement, but those in the Shenzhen stock exchange do not sufficiently support it.

3.2.Analysis of tax revenue by examining trading volume;

Table 7 and table 8 show the trading volumes in 15, 30, 45, 60, and 75 days before and after the announcement and their changes in the Shanghai and Shenzhen stock exchanges respectively. We find that they decrease considerably. In the Shanghai stock exchange, we find that the volume in the +/-60 days sample decreases 43.86%, and in the +/- 45 days sample, it decreases 43.62%. The effect on the trading volume in the Shenzhen stock exchange is considerable too. In the +/-15 days sample, it decreases 35.81%, and in the +/-60 days sample, it decreases 34.13%, and so on.

Assuming the stock price constant and using the volume change percentage as that in the +/-75 days sample, I calculate the effect of increasing the securities transaction tax on tax revenue in the Shanghai and the Shenzhen stock exchanges. In Shanghai, the volume decreases 38.47%, and in the Shenzhen stock exchange, it decreases 32.79%. The tax rate in both stock exchanges increases 66.67%. So, the result is that the tax revenue increases 0.26% in Shanghai and increases 12.02% in the Shenzhen stock exchange after the announcement of raising the transaction tax rate. Comparing the change level of tax revenue to the increased level of the tax rate, I find that the increased level of tax revenue is much smaller because the volume decreases considerably after raising the tax rate, and it significantly offsets the benefit on tax revenue.

The elasticity of trading volume with respect to tax rate is the percentage change in volume when the tax rate changes 1%. The elasticity in the Shanghai stock exchange is –0.58 and is –0.49 in the Shenzhen stock exchange. The elasticity of tax revenue with respect to tax rate is the percentage change in tax revenue when the tax rate changes 1%. The elasticity in the Shanghai stock exchange is 0.004 and is 0.18 in the Shenzhen stock exchange. However, I do not measure other factors that could affect the elasticity, such as commission and other transaction costs, so my estimate on the elasticity is limited to these assumptions. As summarized by Schwert and Seguin (1993), the elasticity of trading volume with respect to the transaction cost lies between –0.25 and –1.35. Our results are consistent with previous studies.

4.Conclusion

In this paper, by examining the Chinese stock markets, I add one observation to the literature on the impact of transaction cost (tax) on the stock markets.

For the relationship between the securities transaction tax and the stock return volatility, I conclude that the volatility increases significantly in both the Shanghai and the Shenzhen stock exchanges after increasing the transaction tax. It is contrary to many experts and government officials' speculation before the event. The theory that the increased transaction tax would reduce market volatility is not supported by our empirical evidence.

On the tax revenue, I conclude that the tax revenue did not increase as much as the proponents of the tax expected. Investors reacted to the increased tax dramatically. The decrease in trading volume significantly offsets the increased tax rate. Thus, the tax revenue didn't increase much.

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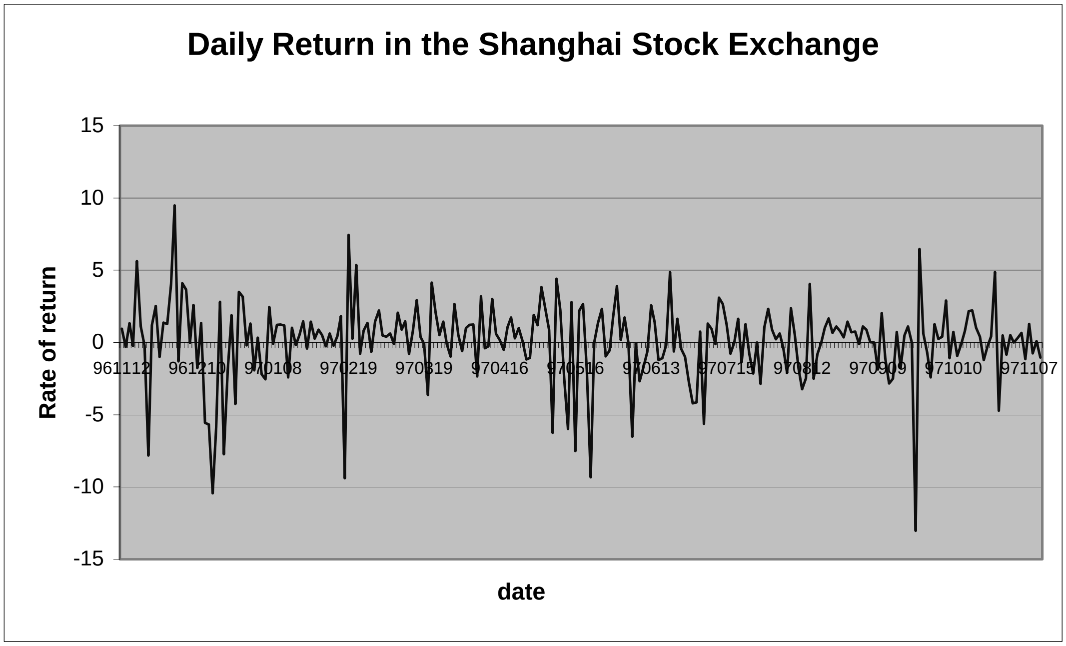
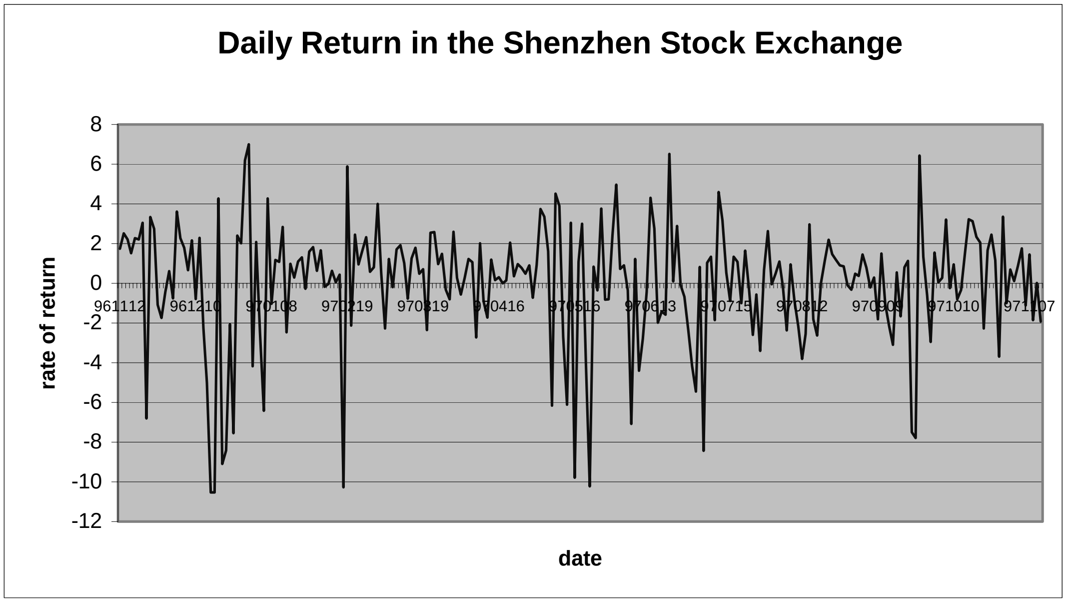
Figure 1:



Note: This graph shows the daily rate of return in the Shanghai stock exchange from Nov 9th, 1996 to Nov 12th, 1997.

Figure 2:



Note: This graph shows the daily rate of return in the Shenzhen stock exchange from Nov 9th, 1996 to Nov 12th, 1997.

Table 1

Test for Normality in the Shanghai Stock Exchange

	Mean (Standard Deviation)	Skewness	Kurtosis	Shapiro-Wilk statistic test P <W
+/-15 days	-0.122 (3.31)	-1.38	1.54	0.0012
+/-30 days	0.097 (2.80)	-1.31	2.38	0.0001
+/-45 days	0.125 (2.63)	-1.23	2.13	<0.0001
+/-60days	0.184 (2.64)	-1.13	3.02	<0.0001
+/-75 days	0.189 (2.46)	-1.13	3.41	<0.0001

Table 2

Test for Normality in the Shenzhen Stock Exchange

	Mean (Standard Deviation)	Skewness	Kurtosis	Shapiro-Wilk statistic test P <W
+/-15 days	-0.128 (3.77)	-1.39	1.63	0.0008
+/-30 days	-0.007 (3.25)	-1.09	2.00	0.0009
+/-45 days	0.06 (3.05)	-1.19	2.21	<0.0001
+/-60days	0.09 (2.97)	-1.28	2.87	<0.0001
+/-75 days	0.11 (2.76)	-1.31	3.29	<0.0001

Table 3

Shanghai Levene Test Statistics and Modified Levene Test Statistics

Test statistic & pval / Sample	W_0	Asymptotic p-value	Bootstrapping p-value	w-median	w-median bootstrapping p-value	5%-trimmed mean	5%-trimmed bootstrapping p-value
15days	3.31	0.0797	0.144	2.51	0.133	3.31	0.201
30days	4.69	0.0345	0.059	4.10	0.043	6.87	0.024
45days	7.29	0.0083	0.011	6.42	0.008	11.27	0.009
60days	2.19	0.1418	0.184	1.85	0.159	8.68	0.042
75days	4.54	0.0347	0.044	3.96	0.057	14.56	0.004

Table 4

Shenzhen Levene Test Statistics and Modified Levene Test Statistics

Test statistic &Pval / Sample	W_0	Asymptotic p-value	Bootstrapping p-value	w-median	w-median bootstrapping p-value	w-trimmed mean	5%-trimmed bootstrapping p-value
15 days	6.38	0.01750	0.058	4.88	0.036	6.38	0.082
30days	10.98	0.00160	0.006	10.64	0.001	15.18	0.000
45days	17.44	0.00007	0.000	16.07	0.000	23.14	0.000
60days	7.85	0.00590	0.014	7.40	0.009	17.72	0.003
75days	11.02	0.00110	0.007	10.36	0.002	23.58	0.000

Table 5

Descriptive Statistics Before and After the Event in the Shanghai Stock Exchange

	Before the event Mean (Standard Deviation)	After the event Mean (Standard Deviation)
+/-15 days	0.65 (2.48)	-0.89 (3.90)
+/-30 days	0.62 (2.03)	-0.43 (3.35)
+/-45 days	0.70 (1.93)	-0.45 (3.10)
+/-60 days	0.71 (2.41)	-0.34 (2.77)
+/-75 days	0.66 (2.20)	-0.28 (2.63)

Table 6

Descriptive Statistics Before and After the Event in the Shenzhen Stock Exchange

	Before the event Mean (Standard Deviation)	After the event Mean (Standard Deviation)
+/-15 days	0.86 (2.44)	-1.12 (4.62)
+/-30 days	0.50 (1.99)	-0.51 (4.12)
+/-45 days	0.65 (1.78)	-0.53 (3.87)
+/-60 days	0.58 (2.33)	-0.40 (3.44)
+/-75 days	0.62 (2.15)	-0.39 (3.20)

Table 7

Changes of Volume in the Shanghai Stock Exchange

	Average Daily Volume		Change in volume	Change in percentage
	Before event	After event		
15 days	9134285 (1263125)	6189811 (2154759)	-2944474	-32.24%
30 days	8984944 (1469147)	5357383 (142866)	-3627561	-40.37%
45days	8774662 (1375007)	4946797 (907139)	-3827865	-43.62%
60days	8297178 (1966375)	4658198 (1764090)	-3638980	-43.86%
75days	7218617 (2811436)	4441693 (1703339)	-2776924	-38.47%

Note: Standard errors in parentheses

Table 8

Change of Volume in the Shenzhen Stock Exchange

	Average Daily Volume		Change in volume	Change in percentage
	Before event	After event		
15 days	9471867 (2212593)	6080413 (2836048)	-3391454	-35.81%
30days	8366990 (2107157)	5717920 (2160118)	-2649070	-31.66%
45days	8199398 (1986069)	5555187 (1992839)	-2644211	-32.25%
60days	7991515 (1927437)	5263710 (1831698)	-2727805	-34.13%
75days	7395728 (2193489)	4970339 (1800531)	-2425389	-32.79%

Note: Standard errors in parentheses