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Turnover Tax and Trading Volume: Panel Analysis of Stocks Traded in the Japanese and US markets

Hiroyuki Ono
Faculty of Economics,
Toyo University
5-58-20 Hakusan, Bunkyo-ku, Tokyo, 112-8606, Japan
Email: hiroono@toyonet.toyo.ac.jp
Phone: 81-3-3945-7413
Fax: 81-3-3945-7667

Minoru Hayashida
Faculty of Economics and Business Administration,
The University of Kitakyushu
4-2-1 Kitagata, Kokura-Minami-ku, Kitakyushu, 802-8577, Japan
Email: hayasida@kitakyu-u.ac.jp
Phone: 81-93-964-4089
Fax: 81-93-964-4115

Abstract

Japan eliminated turnover tax on stock trading through the end of the 1990's to revitalize its ailing stock market by reducing the overall stock trading transaction cost. This paper empirically examines the effect of this exogenous, institutional change in tax policy on stock trading volume in the Japanese market. To do so, we use panel data of stocks traded both in the Japanese and United States markets and compare changes in their trading volumes at the times of the tax changes. A statistically significant increase in the trading volume was found in the Japanese market but not in the United States market for April 1999. However, such a result was not obtained for April 1996. These results indicate that the *abolition* of turnover tax in 1999, but not the *rate reduction* in 1996, contributed to the trading volume increase.

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1. Introduction

Japan's stock market fell into the deepest slump in its history when the bubble economy burst at the beginning of 1990s. Within a few years, the NIKKEI price index had plunged to below half its peak value at the end of the 1980s[a]. After some fluctuations, it started to drop again in the mid-1990s and continued to do so until it finally hit a 21-year low of some 7,600 yen in April 2003. It was widely believed that this slump in the stock market caused the weakening of the Japanese economy at large by damaging the balance sheets of its financial institutions and other major corporations. With the rapid globalization of financial markets, it was also believed that this market

[a] The NIKKEI average hit a historical high of 38,915 yen on December 29, 1989, and dropped below 15,000 yen in August 1992.

turmoil would lead to the loss of status of Tokyo as a world financial center, which once almost matched that of New York. The widespread concern about such loss of status is best expressed in the 1998 Tax Commission interim report stating:

> "as financial globalization advances, financial transactions are becoming more and more sensitive to transaction cost. Therefore, if the cost including transaction fees and turnover taxes remains high relative to the international standard, transactions themselves may shift outside Japan[b]."

Accordingly, to revitalize the stock market, thereby alleviating the said loss of status, the Japanese Government cut the rate of the securities transactions tax (hereafter STT) levied on each transaction of shares and bonds twice in the 1990s, before completely abolishing it in April 1999, as a part of the Japanese Big Bang.

Sometime prior to the tax changes in Japan, an intensive policy debate was ignited in the United States (US) in the aftermath of the stock investment boom in the 1980s and the subsequent Black Monday market plunge in October 1987. This concerned the *introduction* rather than *abolition* of a turnover tax on stock trading. Opinions were widely divided. Stiglitz (1989), and Summers and Summers (1989), for instance, were in favor of the introduction, arguing that the tax would reduce excess volatility and thus increase the efficiency of the stock market, as well as serve as a good revenue source[c]. On the other hand, Hakkio (1994) criticized this line of argument as lacking sufficient evidence. He argued that, because the tax would also suppress "rational" trading based on market fundamentals, the damage to the market would outweigh the benefit to it[d].

In parallel with those policy debates, several studies formally investigated the effects of transaction cost in general, and of a turnover tax in particular, on stock market behavior, including Barclay et al. (1998), Epps (1976), Hu (1998), Jackson and O'Donnell (1985), Keifer (1987, 1990), Lingrend and Westlund (1990), Roll (1989), and Umlauf (1993). They conducted empirical studies with data from the US, United Kingdom (UK), Sweden, and four Asian countries, and reported that transaction cost exerts an adverse effect on transaction volume, but that its effects on price and return volatility are not clearly supported one way or the other. On the other hand, Constantinides (1986) and Vayanos (1998), for instance, explored the issue theoretically, deriving the results consistent with the findings of the empirical studies. In short, these academic studies were not clear-cut on the effects of a turnover tax on stock markets. In referring to the Japanese STT, the aforementioned Tax Commission report states: "theoretically a turnover tax is generally believed to have a negative effect on the trading and efficiency of the market and a positive effect on the reduction of volatility, but it is not made clear as of yet to what extent the present STT … affects the actual trading.[e]"

As this statement infers, a concrete, academic investigation of the Japanese STT to date is essentially non-existent despite various simulations and reform plans having been suggested in the midst of policy debates on stock market reforms in the mid-1990s[f]. We aim to partially fill this gap and quantitatively examine the effects of the STT on Japan's stock market, thereby evaluating the tax changes in the late 1990s. There are at least three important aspects of a stock market of concern: trading volume, prices, and volatility. As a first exploration into this ambitious research agenda, in the present paper we take up only the first, leaving the other two for future investigation. That is, we investigate whether the STT reduction during the 1990s achieved the aimed objective of increasing transactions in the Japanese market.

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[b] The authors' own translation.

[c] The US had already abolished all turnover taxes on financial transactions by 1981, but in 1987 then House Speaker Jim Wright proposed legislation to re-introduce the tax. In 1991, the Republican leadership also reportedly considered a similar bill under the Bush Administration.

[d] Other opponents to the financial turnover tax include Kupiec (1996), Ross (1989), Schwert and Seguin (1993), and Stultz (1994).

[e] The authors' own translation.

[f] Examples of such simulations and policy suggestions include Onnda (1995), Niimi (1996), and Yoshikawa (1995). Tominaga (1994), an exception, conducted a simulation using data up to 1994 from the Tokyo Stock Exchange to investigate the price effect using the framework of Jackson and O'Donnell (1985), and Kiefer (1987, 1990).

This paper is organized as follows. The next section overviews Japan's STT, including the history of its reform. Section 3 briefly reviews the related literature focusing on trading volume only. Section 4 explains the methodologies and data employed in this analysis, with the results reported in Section 5. The final section summarizes the findings and offers concluding remarks in a broader perspective, with caveats of this analysis and venues for future research.

2. Japan's STT: institutional overview.

Japan's STT was an ad valorem tax levied on the value of transactions of shares and bonds to be paid by the seller. It is classified as a turnover tax, because the tax base is the volume of transactions, namely, transfers of ownerships of financial assets. It is different from income taxes on interest payments and dividends in that it is not levied on the *fruit* of capital. It is also different from a capital gains tax, because it is payable whether or not assets are transacted for at a higher price than the previous transaction. In Japan, such turnover taxes include, besides the former STT, real estate and automobile transaction taxes.

Japan first introduced a turnover tax in 1937[g], but abolished it in 1950 following Shoup's *Advisory Opinion*[h]. As early as 1953, however, it was reintroduced when the new capital gains tax under Dr. Shoup's advice was abolished on the grounds that it would have an adverse effect on capital accumulation, which was much needed for recovery after the war. In the period following, the STT rate on stock trading was increased four times: 1957, 1973, 1978, and 1981. In the late 1980s, with the stock market booming and the proposed abolition of a tax-free treatment on small-amount savings[i], a strong voice arose that the mounting capital gains from stock trading accruing only to a small number of investors should be taxed for the equity of the overall tax system. The securities industry was vehemently opposed, claiming that the addition of this new tax would dampen the stock market[j]. It also argued that the plan would run against the gradually prevailing notion that the high transaction cost of Japan's financial markets must be reduced if they were to become internationally competitive markets[k]. As a political compromise in 1989, the STT rate was reduced for the first time when the capital gains tax was reintroduced in 1989 at the peak of the stock investment boom.

When the stock market fell into a great slump in the 1990s, further tax cuts were seriously debated. The industry pushed for it, invoking the aforementioned notion, and politicians in general were supportive; this was because the tax cuts were expected to reduce the transaction cost and thus to boost stock market trading. The Finance Ministry, on the other hand, was against it, arguing that it would aggravate the revenue shortage due to the downfall of the economy. The Ministry also argued that the commission fees must be liberalized first to reduce the transaction cost. As a result of this debate, which continued throughout the latter half of the 1990s, the STT was cut in April 1996 and April 1998, and finally was completely abolished in April 1999, while the fees were liberalized in April 1998 and October 1999 (see Table 2-1)[l]. The tax cut in 1996 was partial in that it was not applied to brokerage firms' own trading; only the tax rate for other trading was reduced from 0.03% to 0.021%. The reduction in 1998 applied to both types of trading, however. The rate for brokerage firms' trading was reduced from 0.012% to

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[g] It was called securities transfer tax.

[h] This reform plan by the occupation forces after World War II drastically changed the Japanese tax system. It was named after Dr. Carl Shoup of Columbia University, who headed the expert group to formulate the opinion. Although termed an *advisory opinion*, it was a de facto order from the occupation forces command.

[i] Known as "Maruyu," this treatment allowed households to hold such assets as bank and postal savings deposits and bonds of up to 3 million yen tax-free at the time of abolition. Households with heads disabled or older than 64 years continued to be able to eligible even after the 1989 tax reform.

[j] Nihon Keizai Shinbun, February 29, 1988, page 5.

[k] Such a notion was best expressed in newspaper articles such as that in Nihon Keizai Shinbun, December 24, 1986, page 13.

[l] More detailed description of the historical changes of the STT can be found in Shouken Dantai Kyougikai (1992), for instance.

0.006%, while that for other trading was reduced from 0.021% to 0.01%. A year later, these two rates were both cut to zero in the reform to abolish STT.

Table 2-1: Recent Historical Changes in STT Rates and Commission Fees

Date	STT rates		Fees on Customers' Transaction Accounts
	Brokerage firms	Non-brokerage firms	
Apr 1996		From 0.03% to 0.021%	
Apr 1998	From 0.012% to 0.006%	From 0.021% to 0.01%	Liberalized for trading over 50 mill. yen
Apr 1999	Abolished		
Oct 1999			Liberalized for all trading

Source: STT rates, National Tax Agency, Statistical Annuals (various years)**;** fees, Appendix in *Shoken Roppou* or the Compendium of Security Trading Laws.

These measures were in accord with similar changes that were already happening in other countries. For example, the US abolished federal tax on stock trading in 1965 and the last remaining New York state tax in 1981. In Europe, the UK reduced its turnover tax, known as stamp duty, by half in 1984 and again in 1986**.** In the 1990s, France and Denmark followed the same path as the UK, while Germany and Sweden completely abolished turnover tax in 1991. See Table 2-2 below for details.

Table 2-2: Turnover Taxes on Stock Trading in Various Countries

Country	Outline
United States	Abolished federal tax in 1965 and New York State tax in 1981
United Kingdom	Reduced the rate from 2% to 1% in 1984 and from 1% to 0.5% in 1986
France	Reduced the registration tax rate from 4.8**%** to 1**%** and placed a limit on exchange tax in 1993
Denmark	Reduced the rate from 1% to 0.5% in 1995
Germany	Abolished turnover tax in 1991
Sweden	Abolished turnover tax in 1991
Switzerland	Implemented federal stamp duty of 0.085%; various Kanton taxes also apply
Korea	Implemented sales tax of 0.15%
Taiwan	Implemented sales tax of 0.30%
Hong Kong	Implemented STT of 0.01%

Sources: SIA (1994), Niimi (1996), Campbell and Froot (1994), and inquiries to several brokerage firms.

It is obvious that a turnover tax like the STT constitutes a cost to transactions. It is not the only cost to stock trading, however. An individual or corporate investor usually transacts shares and bonds through security dealers, and pays them various fees such as sales fees, security deposit fees, and account opening fees, which are also

considered as costs to transactions. Under Japanese tax laws, consumption tax is also levied on these fees. Further, in the finance literature, the bid-ask spread is often considered as a cost to transactions, too[m]. In the same period that the STT was cut, the Japanese Government implemented large-scale stock market deregulation in the Japanese Big Bang and considered lowering these other costs to transactions as well. For example, as shown in Table 2-2, in April 1998, fees levied on large volume transactions in excess of five million yen were liberalized. In October 1999, fees on all transactions were liberalized. It is important to note these concurrent changes in transaction fees, because they would have qualitatively the same effect as a reduction in the STT rate. We separate their effect from that of the STT reduction in the following analysis.

3. Review of previous studies

This section reviews some earlier studies empirically investigating the effect of a turnover tax on the volume of stock trading[n]. Epps (1976) is essentially the earliest study on the subject. He estimated the elasticity of trading volume with respect to transaction cost, treating taxes, bid-ask spread, and broker commissions as its three components. He examined the daily data of 20 common stocks listed on US stock exchanges for 90 days before the fee liberalization in 1968. His work was an ambitious attempt to derive a theoretical model of the demand function for brokerage service and deduced a concrete expression to estimate transaction volume. However, the function becomes nonlinear and very complex, necessitating some restrictive assumptions.

Jackson and O'Donnell (1985) attempted to answer the question with the British stamp duty over the period 1964 to 1984 in a much simpler framework on an aggregate market level. They supposed that price changes likely represent news affecting individual investors' evaluations on stock values, thereby causing transactions to occur. They accordingly regressed the transaction volume on price change and transaction cost, together with other variables thought to affect the trading volume in the UK market in a time-series setup, and report a large effect of the tax increase on transaction volume. Lindgrend and Westlund (1990) examined the Swedish securities transaction tax for the period between 1970 and 1988 using a similar method, and report also a strong, but somewhat smaller effect. These regression models may be criticized as atheoretical, but have an unequivocal advantage in that they can be applied to aggregate market data for a longer period. Umlauf (1993) also took up the Swedish case and claimed that turnover declined in response to the introduction of a turnover tax. However, mainly concerned with the volatility, he did not conduct any formal statistical analysis but merely observed a change in the turnover rate between tax regimes.

Hu (1998) inquired, for four East Asian countries including Japan, whether there was a statistically significant difference in turnover before and after tax changes by a test of equality in population means. With 14 tax changes between 1975 and 1994 in the four countries, using 40 weekly observations, he concluded that overall there was no statistically meaningful effect of tax changes on turnover. For Japan in particular, he found that while the 1981 tax increase reduced trading volume significantly, the movement was statistically significant in the opposite direction for the 1978 tax increase. This is the only study known to the authors that deals with the Japanese STT[o]. However, it only covers the period before the major changes were enacted. Moreover, Hu's (1998) simple test of equality does not exclude the possibility of other factors affecting turnover. A closer look at Japanese institutional details of STT in the present study addresses these shortcomings.

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[m] See, for instance, Barclay et al. (1998).

[n] Other studies such as Constantinides (1986) and Vayanos (1998) theoretically analyzed the effect of transaction cost in general, not a turnover tax per se, on trading volume and derived a significant negative effect. Barclay et al. (1998) estimated a strong effect of the bid-ask spread as a proxy for transaction cost empirically.

[o] Sakata (1994) investigated the effect of transaction tax and volume in the context of stock index futures, however, there has not been any attempt in regard to stock spot transactions.

4. Methodologies and data

4.1. Methodologies

This study attempts to establish whether or not the reductions in the STT enacted during the 1990s increased trading volume significantly. In addressing this issue, we note that the US markets provide a useful control for institutional changes and compare the trading volume of stocks traded in *both* the Japanese and US markets around the dates of the tax changes in the former. If the tax changes in the Japanese markets had any impact on the trading volume of such stocks, we should be able to observe a significant change in the Japanese market but not in the US market because such institutional changes did not take place in the latter. In this comparison, we also note that tax reform is not the only source of changes in trading volume and, therefore, need to control for other possible determinants. In particular, we exploit a well-documented asymmetric V-shape relationship between the trading volume and price change in daily data (e.g., Karpoff [1987]). That is, we regress trading volume on returns and their absolute values in panel data regressions. This is considerably more general than the previous studies that conducted a simple test of equality in population means.

Our testing strategy is to identify the aforementioned significant change in structural breaks or "shifts" of the V-shape relationship before and after the tax change. There are two practical issues to address, however, in order to implement the estimation. First, we need to model how those price change variables relate to the trading volume *across stocks and markets*. That is, we need to make an assumption on whether, for example, the coefficients of the price change variables are the same for Sony and Toyota in the same market and/or whether the coefficients for Sony are the same in both markets. Unfortunately, we do not know which assumption is the correct one. Therefore, we will execute three types of panel regressions with different assumptions and consider the robustness in evaluating the results. The second issue is that we need to model how the effect of the tax change materializes itself in the V-shape relationship. That is, we need to make an assumption on whether shifts occur in the intercept and/or in the "slopes" in the first and second quadrants of the price change−trading volume plane. Unfortunately, once again, we do not know which one is correct. Therefore, we will first allow for both types of shifts in the estimation (hereafter referred to as "general model"), and will consider an alternative setup if they fail to yield any solid results.

The first among those three (hereafter referred to as Specification I) is our preferred benchmark:

$$V_{it} = \alpha_i + \beta_1 V_{it-1} + \beta_2 r_{it} + \beta_3 |r_{it}| + \gamma_{jp} D_{jpt} + \gamma_{us} D_{ust} + \beta_{2jp}^{shift} r'_{jpt} + \beta_{3jp}^{shift} |r'_{jpt}| + \beta_{2us}^{shift} r'_{ust} + \beta_{3us}^{shift} |r'_{ust}| + \varepsilon_{it} \quad (1)$$

where

$$D_{jpt} = \begin{cases} 1, & \textit{if stocks are traded in the Japanese market and } t \geq t_0 \\ 0, & elsewhere \end{cases},$$

$$D_{ust} = \begin{cases} 1, & \textit{if stocks are traded in the US market and } t \geq t_0 \\ 0, & elsewhere \end{cases},$$

$$r'_{jpt} = r_{it} D_{jpt},$$

and

$$r'_{ust} = r_{it} D_{ust},$$

where date t_0 is the date when the tax change was put in effect, V is the turnover rate, and r is the return. The turnover rate, defined as the number of shares traded divided by the number of shares listed, is used instead of the trading volume itself, in order to control for any changes in the number of shares listed. ε is a disturbance term. The

subscripts jp and us denote Japan and the US, respectively. Also, the subscripts i=1,2,…,N, and t =1,2,…T, represent stock and date, respectively. Here, we are interested in (i) whether γ_{jp} is significantly greater than 0 while γ_{us} is not, and/or (ii) whether the slope shifts for Japan represented by $\beta_{2\,jp}^{shift}$ and β_{3jp}^{shift} are positive in absolute terms while those for the US represented by $\beta_{2\,us}^{shift}$ and β_{3us}^{shift} are not. This is based on the assumption that the tax cut had a greater impact on trading volume at a greater price change.

In this simple specification, we are assuming that the coefficients are common for *all* stocks traded in *both* markets; for example, the coefficients for Sony and Toyota are the same in the Japanese market as well as in the US market. This assumption, although simple and easy to understand, may be a little restrictive. Therefore, we also employ the following two somewhat unrestrictive specifications. In the second specification (hereafter referred to Specification II), we assume that the coefficients are the same for all stocks traded in the same market, but are different for each market. That is, the coefficients are different even for, say, Sony, if they are traded in the different markets. This assumption prompts us to sort the data by market, pool them from the same market, and then run the following regression *for each of the two markets*:

$$V_{i\,t} = \alpha_i + \beta_1 V_{i\,t-1} + \beta_2 r_{i\,t} + \beta_3 \left| r_{i\,t} \right| + \gamma D_t + \beta_2^{shift} r_{it}^{'} + \beta_3^{shift} \left| r_{it}^{'} \right| + \varepsilon_{i\,t} \qquad (2)$$

where

$$D_t = \begin{cases} 1, & t \geq t_0, \\ 0 & elsewhere, \end{cases}$$

$$r_{it}^{'} = r_{it} D_t .$$

In the third specification (hereafter referred to Specification III), we assume that the coefficients are the same for the same stock traded in both markets, but are different for different stocks within each market. For example, the coefficients for Sony are the same in the two markets, but are different from those for Toyota in both markets. This assumption prompts us to sort the data by stock and pool them from the two markets, and then to run the following regression *on a stock by stock basis*:

$$V_{c\,t} = \alpha_c + \beta_1 V_{c\,t-1} + \beta_2 r_{c\,t} + \beta_3 \left| r_{c\,t} \right| + \gamma_{jp} D_{jp\,t} + \gamma_{us\,t} D_{us\,t} + \beta_{2\,jp}^{shift} r_{\mathrm{jp}\,t}^{'} + \beta_{3\,jp}^{shift} \left| r_{\mathrm{jp}\,t}^{'} \right| + \beta_{2\,us}^{shift} r_{\mathrm{us}\,t}^{'} + \beta_{3\,us}^{shift} \left| r_{\mathrm{us}\,t}^{'} \right| + \varepsilon_{c\,t} \qquad (3)$$

where

$$D_{jp\,t} = \begin{cases} 1, & c = jp \ \ and \ \ t \geq t_0, \\ 0 & elsewhere, \end{cases}$$

$$D_{us\,t} = \begin{cases} 1, & c = us \ \ and \ \ t \geq t_0, \\ 0 & elsewhere, \end{cases}$$

$$r_{jp\,t}^{'} = r_{ct} D_{jp\,t},$$

$$r_{us\,t}^{'} = r_{ct} D_{us\,t}.$$

In these two specifications, our interest is on the coefficients of the shift variables in a similar manner as in Specification I.

4.2. Data

As noted in Section 2, there were four tax cuts since 1989: April 1 in 1989, 1996, 1998, and 1999. In addition to the fact that the aim of this paper is to examine the effect of the STT reform on revitalization of the ailing

stock market *after* the bubble burst, however, we will not look at 1989 for the following three reasons. First, in April 1, 1989, after abolition some fifty years ago, the capital gains tax was reintroduced simultaneously with the STT cut. Second, on the same date, consumption tax was introduced for the first time in Japan and its levy on commission fees became a new addition to transaction cost. Third, the 1989 tax cut was implemented when the stock market was on its way to the peak in December, whereas the other three tax cuts took place when it had been stagnant for quite a long time. Because of these reasons, it is considered that investors' behavior at the time of the 1989 tax cut would be different from that at the other three tax cuts. Among the three tax cuts after the bubble burst, we will not analyze the 1998 reform because, on the same date, the commission fees were liberalized for large transactions. We wanted to pick up only the pure effect of the tax cut, which would otherwise be difficult to distinguish from that of the fee liberalization in 1998 (see Table 2-1) if that year were included. In the periods relevant to the remaining two dates of the tax change, there were 26 Japanese stocks traded in the US market[p], which were also traded in the Tokyo Stock Exchange (TSE) First Section. They are listed in Table 3 below. Finally, the return r is calculated based on the closing price of the day. All the data are obtained from *Datastream*$^{\circ,R}$**.**

Table 3: Stocks Traded in Both the Tokyo Stock Exchange and US Stock Exchanges

Advantest, Canon, Daiei Sponsored, Fujifilm Holdings, Mitsubishi UFJ Financial Group, Hitachi, Honda Motor, Internet Initiative Japan, Konami, Kubota, Kyocera, Makita, Matsushita Electric Industrial, Millea Holdings, Mitsui and Company, NEC, NIS Group, Nissan Motor Sponsored, Nomura Holdings, Nippon Telegraph and Telephone (NTT) Sponsored, NTT Docomo Sponsored, ORIX Sponsored, Sony, TDK, Toyota Motor, Wacoal Holdings.

5. Estimation results

5.1 Tax Abolition in April 1999

We first examine the tax abolition enacted on April 1, 1999. We compare the turnover rates, taking 120 weekdays[q] before and after the date of the tax change, t_0 = April 1, 1999; that is, from October 15, 1998, to September 16, 1999. A longer period may be desired but cannot be employed, because on October 1, 1999, the transaction fees were completely liberalized, and, therefore, we would not be able to separate the effect of the STT abolition in April from that of this additional event if we took a longer period. Among 26 stocks listed in both markets, the necessary data are continuously available only for 17 stocks. Table 5-1-1 reports their descriptive statistics.

5.1.1. The general model

The result for Specification I is reported in Table 5-1-2. The V-shape relationship between the price change and trading volume, implied by $(\beta_1 + \beta_2) > 0$ and $(\beta_1 - \beta_2) < 0$[r], is well maintained before and after the tax change

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[p] NYSE and NASDAQ.

[q] However, the "weekday" includes national holidays; so, the data sets contain less than 120 trading days. This is the reason why the following tables report less than 240 observations.

[r] $|r| = r$ when $r > 0$ and $|r| = -r$ when $r < 0$. Because of this, the slope in the first quadrant is $(\beta_1 + \beta_2)$ and in the second quadrant is $(\beta_1 - \beta_2)$.

for both the Japanese and the US markets. The adjusted r-squared is considerably high. The coefficients for the slope shift for Japan imply that, after the tax change, the slopes became significantly steeper, while those for the US did not. These results are consistent with the hypothesis that the tax change in Japan had a significant effect of increasing the trading volume. However, note that the exact opposite is observed on the intercept shifts; γ_{jp} is negative and highly significant. In fact, the two types of shifts are opposite for both Japan and the US.

Table 5-1-1: Descriptive Statistics for 17 Japanese Company Stocks Examined for April, 1999

		Japan					US				
Stock	variable	N	mean	standard deviation	min. value	max. value	N	mean	standard deviation	min. value	max. value
Canon	V	216	0.002996	0.001396	0.0005	0.00889	223	0.000121	9.8E-05	0.000019774	0.000913
	r	216	0.000662	0.026256	-0.08756	0.067821	223	0.001677	0.028109	-0.100346	0.091434
	|r|	216	0.020473	0.016393	0	0.087556	223	0.021147	0.018541	0	0.100346
Daiei SPN	V	216	6.87E-05	0.000101	4.62E-06	0.000832	223	2.01E-08	7.72E-08	0	5.60E-07
	r	216	0.001067	0.035086	-0.10559	0.169538	223	0.002301	0.053173	-0.1502822	0.251314
	|r|	216	0.025513	0.024046	0	0.169538	223	0.03268	0.041951	0	0.251314
Fujifilm HDG	V	216	0.0017	0.000898	0.000385	0.007646	223	6.3E-05	8.8E-05	5.12E-06	0.000889
	r	216	-0.00046	0.022448	-0.10833	0.067558	223	0.000261	0.023411	-0.1242139	0.077778
	|r|	216	0.01723	0.014347	0	0.108331	223	0.017582	0.015415	0	0.124214
Hitachi	V	216	0.001851	0.00094	0.000266	0.006734	223	0.000157	0.000121	0.000035897	0.000975
	r	216	0.002627	0.024773	-0.05683	0.094491	223	0.004	0.025513	-0.0777306	0.093526
	|r|	216	0.019679	0.015217	0	0.094491	223	0.019744	0.016595	0	0.093526
Honda Motor	V	216	0.003087	0.001436	0.000663	0.010739	223	0.000161	0.000133	0.000012332	0.001028
	r	216	0.001145	0.024258	-0.06717	0.06535	223	0.001774	0.020509	-0.0546114	0.082078
	|r|	216	0.019309	0.01467	0	0.067172	223	0.015625	0.013362	0	0.082078
Kubota	V	216	0.001119	0.00076	0.000166	0.00581	223	6.26E-05	9.66E-05	0	0.000545
	r	216	0.001084	0.026624	-0.07696	0.091859	223	0.001972	0.023059	-0.0779615	0.106517
	|r|	216	0.02012	0.017416	0	0.091859	223	0.0162	0.016492	0	0.106517
Kyocera	V	216	0.001798	0.001117	0.000142	0.008415	223	9.67E-05	5.43E-05	0.000012368	0.000341
	r	216	0.001854	0.022214	-0.05407	0.072176	223	0.002436	0.024988	-0.0553196	0.09844
	|r|	216	0.017113	0.014238	0	0.072176	223	0.019429	0.015847	0	0.09844
Makita	V	216	0.000921	0.000575	0.000169	0.003913	223	4.36E-05	0.00012	0	0.00148
	r	216	-0.00054	0.021299	-0.11108	0.084417	223	0.000236	0.029448	-0.0795121	0.090972
	|r|	216	0.014948	0.015147	0	0.111084	223	0.022149	0.019351	0	0.090972
Matsushita Electronic Industry	V	216	0.001434	0.001357	0.000207	0.016634	223	0.000397	0.000293	0.000038187	0.001976
	r	216	0.001548	0.023008	-0.05758	0.152969	223	0.001985	0.021789	-0.0486769	0.146859
	|r|	216	0.016029	0.016543	0	0.152969	223	0.015054	0.015846	0	0.146859
NEC	V	216	0.002912	0.002537	0.00028	0.027121	223	0.000227	0.000234	0.000011367	0.001991
	r	216	0.004748	0.023111	-0.0702	0.117262	223	0.005232	0.024972	-0.0512349	0.099948
	|r|	216	0.017109	0.016208	0	0.117262	223	0.018913	0.017082	0	0.099948
Nissan Motor SPN	V	216	0.001915	0.001488	0.000145	0.008482	223	0.000143	0.000164	0.000012975	0.001245
	r	216	0.002554	0.029865	-0.12687	0.124136	223	0.004354	0.031843	-0.1107514	0.124053
	|r|	216	0.021533	0.0208	0	0.126867	223	0.024118	0.021183	0	0.124053
NTT	V	216	0.000911	0.000576	0.000189	0.004355	223	5.45E-05	6.46E-05	1.64E-06	0.000554
	r	216	0.001085	0.021133	-0.06127	0.056695	223	0.001798	0.024235	-0.0666914	0.114238
	|r|	216	0.016346	0.013392	0	0.061273	223	0.018153	0.016111	0	0.114238
ORIX	V	216	0.002535	0.001469	0.000287	0.011297	223	1.54E-05	0.000132	0	0.001964
	r	216	0.00219	0.028332	-0.08922	0.110744	223	0.002828	0.024025	-0.0893787	0.127211
	|r|	216	0.020925	0.019173	0	0.110744	223	0.01516	0.018825	0	0.127211
Sony	V	216	0.006925	0.004715	0.000685	0.036184	223	0.001023	0.000749	0.000147554	0.005806
	r	216	0.002901	0.023616	-0.08265	0.084853	223	0.003454	0.022372	-0.0587386	0.091129
	|r|	216	0.017752	0.015798	0	0.084853	223	0.016871	0.015052	0	0.091129
TDK	V	216	0.002414	0.001387	0.000308	0.011187	223	2.58E-05	3.55E-05	0	0.000224
	r	216	0.001315	0.025368	-0.07085	0.083425	223	0.002982	0.024125	-0.0802853	0.082943
	|r|	216	0.019667	0.01602	0	0.083425	223	0.017872	0.016435	0	0.082943
Toyota Motor	V	216	0.000666	0.000344	0.000121	0.002424	223	9.26E-06	9.25E-06	4.84E-07	6.08E-05
	r	216	0.000732	0.025624	-0.10567	0.086742	223	0.001542	0.022363	-0.0590399	0.088728
	|r|	216	0.018891	0.01728	0	0.10567	223	0.01731	0.014194	0	0.088728
Wacoal	V	216	0.000944	0.000594	0.000117	0.003264	223	1.95E-06	1.01E-05	0	0.000133
	r	216	-0.00033	0.018592	-0.05526	0.074282	223	0.001036	0.017432	-0.0736118	0.051293
	|r|	216	0.014425	0.011693	0	0.074282	223	0.012502	0.012164	0	0.073612

Notes: V stands for the daily turnover rate, *i.e.* the number of traded stocks divided by the number of listed stocks. r stands for the price return, calculated as the logarithm of the closing price of the day minus that of the previous day. $|r|$ is the absolute value of the price return.

Table 5-1-2: Regression Results for Specification I,
General Model, April 1999

	coefficient	P-value
β_1	0.540991	<.0001
β_2	0.002649	<.0001
β_3	0.008629	<.0001
γ_{jp}	−0.000158	0.0001
γ_{us}	0.000136	0.0008
$\beta_{2\,jp}^{shift}$	0.011276	<.0001
$\beta_{3\,jp}^{shift}$	0.018465	<.0001
$\beta_{2\,us}^{shift}$	−0.002432	0.0217
$\beta_{3\,us}^{shift}$	−0.006364	<.0001
adjusted R^2	0.7530	
number of observations	238	

Notes: The regression specification is (1) on page 10, which is to regress daily turnover rates on price returns, its absolute values, dummies for the Japanese and US markets for April 1, 1996, and their products with the price returns and its absolute values for the Japanese and US markets for April 1, 1999. The estimation is OLS. The first and second columns report the coefficient estimates and their associated P-values for each of the key parameters. Those for the idiosyncratic intercepts, α_i, are not reported, however, to economize on space.

The results for Specification II are reported in Table 5-1-3. For both countries, the V-shape relationship is maintained *before* the date of the tax change. The adjusted r-squared values are reasonably high. However, for Japan, the slope became flatter in the second quadrant after the tax change. On the other hand, the intercept shift is positive and highly significant. These results are in sharp contrast with the corresponding results in Specification I. What's even worse is that the critical V-shape is not obtained for the US after the date of the tax change. These inconsistencies may even raise a question of whether the slope shifts are an appropriate way to model the effect of the tax change.

Table 5-1-3: Regression Results for Specification II,
General Model, April 1999

	Japan		US	
	coefficient	P-value	coefficient	P-value
β_1	0.532372	<.0001	0.527789	<.0001
β_2	0.005869	<.0001	0.0006655	<.0001
β_3	0.021944	<.0001	0.001387	<.0001
γ	0.000105	0.0961	-0.0000136	0.1074
β_2^{shift}	0.008051	<.0001	-0.000409	0.0798
β_3^{shift}	0.005298	0.0381	0.000667	0.0438
adjusted R^2	0.6734		0.6803	
number of observations	216		223	

Notes: The regression specification is (2) on page 11, which is to regress daily turnover rates on price returns, its absolute values, dummies for the Japanese and US markets for April 1, 1996, and their products with the price returns and its absolute values for the Japanese and US markets for April 1, 1999, for each of the two markets. The estimation is OLS. The first and second columns report the coefficient estimates and their associated P-values for each of the key parameters. Those for the idiosyncratic intercepts, α_i, are not reported, however, to economize on space.

Table 5-1-4 summarizes the results of Specification III. The V-shape relationship is maintained in 12 out of 17 cases. In 6 of these 12 cases, a rather small number positive, significant slope shifts occurred in both the first and second quadrants for Japan. However, for the US, there are no cases where the same shifts occurred. In addition, contradictory movement of the intercept occurs only in one out of the 6 cases. These results can be interpreted as a positive indication for the validity of the hypothesis. Even considering that this specification allows for various individual factors to affect the trading volume and therefore unanimous results cannot be expected, it is difficult to identify any tendency from these results to evaluate the hypothesis.

Table 5-1-4: Regression Results for Specification III, General Model, April 1999

V-shape acquired (12 cases out of 17)						
			US			
			slope shifts are positive and significant in both quadrants (0)			other cases (12)
			intercept shift is positive and significant (0)	intercept shift is negative and significant (0)	intercept shifts are insignificant (0)	
Japan	slope shifts are positive and significant in both quadrants (6)	intercept shift is positive and significant (0)	0	0	0	0
		intercept shift is negative and significant (1)	0	0	0	0
		intercept shifts are insignificant (5)	0	0	0	0
	other cases (6)		0	0	0	12

Notes: The regression specification is (3) on page 11, which is to regress daily turnover rates on price returns, its absolute values, dummies for the Japanese and US markets for April 1, 1996, and their products with the price returns and its absolute values for each of the firms in both markets. The estimation is OLS. The table reports the summary of only the 12 cases where the V-shape relationship is maintained in the regression results before the date of the tax change. The entry in each cell is the number of cases where the description of the row/column applies. For example, the entry "0" in the top-left cell indicates that, out of the 6 cases where the slope shifts are positive and significant both in the first

and second quadrants of the r-TV plane for Japan, there is no case where the intercept shift (γ_{jp} and γ_{US}) is positive and significant for both Japan and the US. The number in parentheses is the sum of the number in each row or column. The level of significance is 10%.

Overall, the indications of Specifications I through III are mixed and show no clear tendency in one way or the other. The slope shifts suggest the validity of the hypothesis in our preferred Specification I, but the intercept shift contradicts it. The slope shifts in the other two specifications are not in accord with those in Specification I. Not knowing how the tax change affects the V-shape relationship, this may even raise a concern that the slope shifts are an appropriate way to model; if the tax change has an effect only to the intercept, our current modeling might be a misspecification. In any case, the lack of clear tendency in the results made us consider an alternative setup.

5.1.2. The restricted model

In this subsection, we consider somewhat restricted versions of Specifications I through III. Particularly, we assume that the tax change has an effect of increasing the trading volume more or less equally at different price changes. This assumption implies that the shift after the tax change occurs in the intercept but not in the slopes (hereafter referred to as "restricted model"). First, let us look at the results for Specification I. The restriction here drops the seventh through tenth terms on the right hand side of Equation (1). Table 5-1-5 reports the result. The V-shape relationship is clearly maintained and the adjusted r-squared is reasonably high. We are interested in whether γ_{jp} is significantly greater than 0 while γ_{us} is not. The value for γ_{jp} is positive and significant at less than the 1% level, while the value for γ_{us} is insignificant. This result lends support to a view that the tax abolition on April 1, 1999, contributed to the increase in trading volume.

Table 5-1-5: Regression Results for Specification I, Restricted Model, April 1999

	coefficient	P-value
β_1	0.548138	<0.0001
β_2	0.004635	<0.0001
β_3	0.011287	<0.0001
γ_{jp}	0.00019	<0.0001
γ_{us}	0.0000301	0.3241
adjusted R^2	0.7364	
number of observations	238	

Notes: The regression specification is (1) on page 10, which is to regress daily turnover rates on price returns, its absolute values, and dummies for the Japanese and US markets for April 1, 1999, dropping the product terms of the dummies and price change variables. The estimation is OLS. The first and second columns report the coefficient estimates and their associated P-values for each of the key parameters. Those for the idiosyncratic intercepts, α_i, are not reported, however, to economize on space.

Now, let us examine the results for the other two specifications to see whether consistent results are obtained. In Specification II, the restriction that the slopes in the first and second quadrants do not change before and after the tax change implies that the sixth and seventh terms on the right hand side of Equation (2) are dropped. Table 5-1-6 reports the result. For both the Japanese and the US markets, the V-shape relationship is maintained. The adjusted r-squared is reasonably high. γ is estimated to be significantly positive at less than the 1% level for Japan, but not for the US. The results here are indeed consistent with those for Specification I.

Table 5-1-6: Regression Results for Specification II,
Restricted Model, April 1999

	Japan		US	
	coefficient	P-value	coefficient	P-value
β_1	0.5312	<0.0001	0.5283	<0.0001
β_2	0.0099	<0.0001	0.0005	<0.0001
β_3	0.0249	<0.0001	0.0016	<0.0001
γ	0.0002	<0.0001	-0.00002	0.7029
adjusted R^2	0.6708		0.6799	
number of observations	216		223	

Notes: The regression specification is (2) on page 10, which is to regress daily turnover rates on price returns, its absolute values, and dummies for the Japanese and US markets for April 1, 1999, for each of the two markets, dropping the cross product terms of the dummies and price change variables. The estimation is OLS. The first and second columns report the coefficient estimates and their associated P-values for each of the key parameters. Those for the idiosyncratic intercepts, α_i, are not reported, however, to economize on space.

In Specification III, the seventh through tenth terms on the right hand side of Equation (3) are dropped due to the restriction. The results are summarized in Table 5-1-7. The number of cases where the V-shape relationship is obtained is now 15, a considerable increase over that obtained in the previous subsection. In these cases, the coefficients for γ_{jp} are estimated to be significantly positive at the 10% level in 60% of the cases (9 cases). This is also an increase from that in the previous subsection, which is 50% (6 out of 12 cases). There are two cases where the estimated coefficients are negative, but they are insignificant. On the other hand, those for γ_{us} are not estimated to be significantly positive for any case. Given that this specification allows for various individual factors to affect the trading volume, we interpret, although not unanimously, these results are in line with those in the previous two specifications.

Table 5-1-7: Regression Results for Specification III,
Restricted Model, April 1999

V-shape maintained (15 cases out of 17)						
			γ us			
			positive (13)		negative (2)	
			significant (0)	insignificant (13)	significant (0)	insignificant (2)
γ jp	positive (13)	significant (9)	0	8	0	1
		insignificant (4)	0	3	0	1
	negative (2)	significant (0)	0	0	0	0
		insignificant (2)	0	2	0	0

Notes: The regression specification is (3) on page 10, which is to regress daily turnover rates on price returns, its absolute values, and dummies for the Japanese and US markets for April 1, 1996, for each of the firms in both markets, dropping the product terms of the dummies and price change variables. The estimation is OLS. The table reports only the 15 cases where the V-shape relationship is maintained in the regression results. The entry in each cell is the number of the coefficients for γ_{jp} and γ_{US} which fall in each category. For example, the entry "0" in the top-left cell indicates that there is no case where the coefficients for γ_{jp} and for γ_{US} are both positive and significant. The number in parentheses is the sum of the number in each row or column. The level of significance is 10%.

In all, the results of the three restricted models are basically consistent with one another. They indicate that the tax abolition on April 1, 1999, contributed to the increase in trading volume. Although we do not obtain such a clear-cut indication in the setup allowing for the slope and intercept shifts, we take this consistent indication in the restricted model as reasonably strong evidence for the hypothesis, provided that we do not know how the tax change should materializes itself in the V-shape relationship in the first place.

5.2. Tax Rate Reduction in April 1996

Next we examine the effects of the tax rate reduction enacted on April 1, 1996. To be consistent with the preceding analysis for 1999, we take 120 weekdays before and after this date: from October 16, 1995, to September 16, 1996. In the period under study here, out of 26 stocks, data are continuously available only for 16 stocks. Their descriptive statistics are reported in Table 5-2-1.

In the estimation, we follow the same procedure as in the previous section; that is, we will first consider the more general setup in each specification, and, if they fail to yield any clear-cut indications, move to the restricted model.

5.2.1. The general model

The result for Specification I is reported in Table 5-2-2. The V-shape relationship is well maintained before and after the tax change for both the Japanese and the US markets. The adjusted r-squared is reasonably high. The estimated coefficients are similar to those in the previous subsections. For Japan, they imply that, after the tax change, the slopes became significantly steeper, but the intercept became significantly lower. The exactly opposite occurs for the US markets.

Table 5-2-1: Descriptive Statistics for 16 Stocks Examined for April, 1996

		Japan					US				
Stock	variable	N	mean	standard deviation	min. value	max. value	N	mean	standard deviation	min. value	max. value
Canon	V	221	0.002949	0.001954	0.000578	0.012973	225	0.000418	0.00054	9.32E-06	0.003466
	r	221	0.000435	0.014672	-0.06733	0.041008	225	0.000854	0.014921	-0.04077	0.111665
	|r|	221	0.010952	0.009745	0	0.067331	225	0.010183	0.010918	0	0.111665
DaieiSPN	V	221	2.84E-05	2.3E-05	4.34E-06	0.000198	225	4.36E-08	1.63E-07	0	1.40E-06
	r	221	-0.00092	0.016337	-0.04567	0.038915	225	-0.00033	0.023212	-0.0698	0.066521
	|r|	221	0.012907	0.01002	0	0.04567	225	0.015157	0.017554	0	0.069796
Fujifilm HDG	V	221	0.001485	0.001657	0.000227	0.021303	225	0.000128	0.000196	8.13E-06	0.00133
	r	221	0.000686	0.01611	-0.06434	0.068729	225	0.001266	0.013813	-0.03922	0.060625
	|r|	221	0.011898	0.010854	0	0.068729	225	0.010147	0.009433	0	0.060625
Hitachi	V	221	0.000929	0.000452	0.000296	0.002734	225	5.05E-05	6.88E-05	9.13E-07	0.000963
	r	221	-0.00035	0.014499	-0.03847	0.04879	225	-0.00072	0.011456	-0.04082	0.0331
	|r|	221	0.011318	0.009036	0	0.04879	225	0.008898	0.007227	0	0.040822
Honda Motor	V	221	0.00318	0.002323	0.000466	0.019181	225	0.000155	0.000169	3.29E-06	0.001273
	r	221	0.001518	0.01388	-0.04046	0.049872	225	0.001728	0.015365	-0.05469	0.081625
	|r|	221	0.010358	0.009338	0	0.049872	225	0.011365	0.010456	0	0.081625
Kubota	V	221	0.000653	0.000482	7.09E-05	0.003897	225	9.34E-06	4.47E-05	0	0.000568
	r	221	-2.7E-05	0.012495	-0.0382	0.053407	225	-0.00026	0.012167	-0.05827	0.039221
	|r|	221	0.009265	0.008361	0	0.053407	225	0.008058	0.009104	0	0.058269
Kyocera	V	221	0.001886	0.001321	0.000214	0.007687	225	0.000105	0.000148	0	0.001615
	r	221	-0.00029	0.012827	-0.04736	0.029814	225	-0.00066	0.012468	-0.05794	0.029801
	|r|	221	0.009681	0.008395	0	0.047363	225	0.008922	0.008714	0	0.057938
Makita	V	221	0.00096	0.000665	3.73E-05	0.003863	225	1.26E-05	3.18E-05	0	0.000265
	r	221	-0.00036	0.017081	-0.05942	0.041673	225	-0.00068	0.017178	-0.05407	0.057158
	|r|	221	0.013107	0.010923	0	0.059423	225	0.013088	0.011113	0	0.057158
Matsushita Electronic Industry	V	221	0.001003	0.000576	0.000191	0.003954	225	0.000144	0.000202	0	0.001938
	r	221	0.000547	0.010874	-0.02778	0.039221	225	0.000439	0.010378	-0.03121	0.029754
	|r|	221	0.008401	0.006903	0	0.039221	225	0.007993	0.006613	0	0.031208
NEC	V	221	0.001686	0.0009	0.000394	0.006162	225	0.00013	0.000245	1.62E-06	0.002032
	r	221	-0.00051	0.015533	-0.04688	0.034486	225	-0.00083	0.014759	-0.04556	0.03548
	|r|	221	0.012056	0.009774	0	0.046884	225	0.011687	0.009018	0	0.045557
Nissan Motor SPN	V	221	0.000771	0.000784	0.000117	0.006793	225	5.24E-06	9.2E-06	1.59E-07	9.72E-05
	r	221	0.000805	0.014647	-0.05577	0.055186	225	0.000484	0.016659	-0.04983	0.04567
	|r|	221	0.010892	0.009798	0	0.055769	225	0.012509	0.010981	0	0.049827
NTT	V	221	0.000301	0.000157	0.000107	0.00105	225	1.82E-06	4.74E-06	0.00E+00	3.97E-05
	r	221	-0.00046	0.01124	-0.03455	0.060093	225	-0.00072	0.017431	-0.06714	0.073859
	|r|	221	0.008268	0.007607	0	0.060093	225	0.012651	0.011983	0	0.073859
Sony	V	221	0.004773	0.003427	0.001207	0.020248	225	0.000237	0.000187	3.9E-05	0.001001
	r	221	0.000946	0.012652	-0.03922	0.039796	225	0.001195	0.013022	-0.04523	0.070342
	|r|	221	0.009135	0.008783	0	0.039796	225	0.008942	0.009523	0	0.070342
TDK	V	221	0.00192	0.000966	0.00035	0.005899	225	1.4E-05	2.24E-05	0	0.000259
	r	221	0.000899	0.014358	-0.06442	0.051293	225	0.000791	0.01421	-0.05167	0.065847
	|r|	221	0.010585	0.009717	0	0.064416	225	0.009852	0.010249	0	0.065847
Toyota Motor	V	221	0.000732	0.000826	0.000116	0.005941	225	1.14E-05	1.13E-05	1.07E-06	6.81E-05
	r	221	0.001227	0.009705	-0.02806	0.029199	225	0.001214	0.009986	-0.03519	0.032381
	|r|	221	0.007378	0.006405	0	0.029199	225	0.007452	0.006739	0	0.035186
Wacoal	V	221	0.000885	0.000743	0.000143	0.005814	225	6.50E-06	2.43E-05	0	0.000266
	r	221	0.000284	0.015995	-0.04317	0.043172	225	-0.00017	0.016753	-0.04698	0.053245
	|r|	221	0.012388	0.010088	0	0.043172	225	0.012979	0.010557	0	0.053245

Notes: V stands for the daily turnover rate, *i.e.* the number of traded stocks divided by the number of listed stocks. r stands for the price return, calculated as the logarithm of the closing price of the day minus that of the previous day. $|r|$ is the absolute value of the price return.

Table 5-2-2: Regression Results for Specification I, General Model, April 1996

	coefficient	P-value
β_1	0.33556	<0.0001
β_2	0.002463	0.012
β_3	0.014243	<0.0001
γ_{jp}	−0.000215	<0.0001
γ_{us}	0.000133	0.0009
$\beta_{2\,jp}^{shift}$	0.010045	<0.0001
$\beta_{3\,jp}^{shift}$	0.01609	<0.0001
$\beta_{2\,us}^{shift}$	−0.002997	0.0985
$\beta_{3\,us}^{shift}$	−0.012571	<0.0001
adjusted R^2	0.6259	
number of observations	237	

Notes: The regression specification is (1) on page 10, which is to regress daily turnover rates on price returns, its absolute values, dummies for the Japanese and US markets for April 1, 1999, and their products with the price returns and its absolute values for the Japanese and US markets for April 1, 1999. The estimation is OLS. The first and second columns report the coefficient estimates and their associated P-values for each of the key parameters. Those for the idiosyncratic intercepts, α_i, are not reported, however, to economize on space.

Table 5-2-3 reports the result of Specification II. For Japan, the V-shape is obtained before the tax change, but the shifts of the slopes after the tax change are opposite in sign in the first and second quadrants. Table 5-2-3 summarizes the result of Specification III. The V-shape relationship is maintained in 11 out 16 cases, in which there are 5 cases where the positive and significant slope shifts occurred in both the first and second quadrants for Japan, but contradictory movement of the intercept occurs in three cases. However, for the U.S., there are no cases where positive, significant slope shifts occurred.

Table 5-2-3: Regression Results for Specification I, General Model, April 1996

	Japan		US	
	coefficient	P-value	coefficient	P-value
β_1	0.338011	<0.0001	0.178589	<0.0001
β_2	0.005333	0.008	0.0000593	0.8218
β_3	0.029569	<0.0001	0.002221	<0.0001
γ	-0.0000403	0.5317	-8.30E-06	0.3261
β_2^{shift}	0.007153	0.0184	-0.000534	0.1811
β_3^{shift}	0.00095	0.837	-0.000627	0.272
adjusted R^2	0.521963		0.303721	
number of observations	221		225	

Notes: The regression specification is (2) on page 11, which is to regress daily turnover rates on price returns, its absolute values, dummies for the Japanese and US markets for April 1, 1996, and their products with the price returns and its absolute values for the Japanese and US markets for April 1, 1999, for each of the two markets. The estimation is OLS. The first and second columns report the coefficient estimates and their associated P-values for each of the key parameters. Those for the idiosyncratic intercepts, α_i, are not reported, however, to economize on space.

Table 5-2-4: Regression Results for Specification III,
General Model, April 1996

V-shape acquired (11 cases out of 16)

			US: slope shifts are positive and significant in both quadrants (0)			
			intercept shift is positive and significant (0)	intercept shift is negative and significant (0)	intercept shifts are insignificant (0)	other cases (11)
Japan	slope shifts are positive and significant in both quadrants (5)	intercept shift is positive and significant (0)	0	0	0	0
		intercept shift is negative and significant (3)	0	0	0	0
		intercept shifts are insignificant (2)	0	0	0	0
	other cases (6)		0	0	0	11

Notes: The regression specification is (3) on page 11, which is to regress daily turnover rates on price returns, its absolute values, dummies for the Japanese and US markets for April 1, 1996, and their products with the price returns and its absolute values for each of the firms in both markets. The estimation is OLS. The table reports the summary of only the 11 cases where the V-shape relationship is maintained in the regression results before the date of tax change. The entry in each cell is the number of cases where the description of the row/column applies. For example, the entry "0" in the top-left cell indicates that, out of the 6 cases where the slope shifts are positive and significant both in the first and second quadrants of the r-TV plane for Japan, there is no case where the intercept shift (γ_{jp} and γ_{US}) is positive and significant for both Japan and the US. The number in parentheses is the sum of the number in each row or column. The level of significance is 10%.

Overall, as before, there is no clear tendency in the estimation results. The slope shifts in our preferred specification suggest that the tax change had a significant effect of increasing the trading volume, but the intercept shift is contradictory. The results in the other specifications do not support either of these opposing indications. Not

knowing how the effect of tax change should materialize itself in the V-shape relationship made us consider a more restrictive model, as mentioned before.

5.2.2. The restricted model

Here again, we consider restricted versions of Specifications I through III, assuming that the shift after the date of tax change occurs in the intercept but not the slopes. In Specification I, the restriction drops the seventh through tenth terms on the right hand side of Equation (1). Table 5-2-5 reports the result. We are interested in whether γ_{jp} is significantly greater than 0 while γ_{us} is not. The results reported in Table 5-2-5 show that this is not the case. At the 5% significance level, both γ_{jp} and γ_{us} are insignificant. The results thus fail to indicate that the rate reduction in April 1996 helped increase trading volume significantly.

Table 5-2-5: Regression Results for Specification I,
Restricted Model, April 1996

	coefficient	P-value
β_1	0.336333	<.0001
β_2	0.003798	<.0001
β_3	0.014079	<.0001
γ_{jp}	−0.0000553	0.0708
γ_{us}	0.000099	0.7437
adjusted R^2	0.6202	
number of observations	237	

Notes: The regression specification is (1) on page 10, which is to regress daily turnover rates on price returns, its absolute values, and dummies for the Japanese and US markets for April 1, 1996. The estimation is OLS. The first and second columns report the coefficient estimates and their associated P-values for each of the key parameters. Those for the idiosyncratic intercepts, α_i, are not reported, however, to economize on space.

The results for Specification II are reported in Table 5-2-6. For the Japanese market, while the V-shape relationship is well maintained, the γ value is negative, albeit insignificant. The results for the third type of regression are found in Table 5-2-7. In 14 out of 16 cases where the V-shape relationship is maintained, the coefficients for γ_{jp} are estimated to be significantly positive at the 10% level in 4 cases only. There are 8 cases where the estimated coefficients are negative, and they are significant in 4 cases. On the other hand, those for γ_{us} are insignificant in all cases. These results are more or less consistent with those for Specification I, which suggest that the STT reduction in April, 1996, did *not* contribute to the increase in trading volume. In spite of the fact that we do not obtain such consistent results in the more general setups, we are reasonably confident to take these consistent results as evidence for this conclusion.

Table 5-2-6: Regression Results for Specification II,
Restricted Model, April 1996

	Japan		US	
	coefficient	P-value	coefficient	P-value
β_1	0.3386	<0.0001	0.1776	<0.0001
β_2	0.0085	<0.0001	−0.0002	0.4133
β_3	0.0297	<0.0001	0.0020	<0.0001
γ	−0.00003	0.5010	−0.00002	0.0114
adjusted R^2	0.5215		0.3035	
number of observations	221		225	

Notes: The regression specification is (2) on page 11, which is to regress daily turnover rates on price returns, its absolute values, and dummies for the Japanese and US markets for April 1, 1996, for each of the two markets. The estimation is OLS. The first and second columns report the coefficient estimates and their associated P-values for each of the key parameters. Those for the idiosyncratic intercepts, α_i, are not reported, however, to economize on space.

Table 5-2-7: Regression Results for Specification III,
Restricted Model, April 1996

V-shape maintained (14 cases out of 16)						
			γ us			
			positive (12)		negative (2)	
			significant (0)	insignificant (12)	significant (0)	insignificant (2)
γ jp	positive (6)	significant (4)	0	3	0	1
		insignificant (2)	0	2	0	0
	negative (8)	significant (4)	0	4	0	0
		insignificant (4)	0	3	0	1

Notes: The regression specification is (3) on page 11, which is to regress daily turnover rates on price returns, its absolute values, and dummies for the Japanese and US markets for April 1, 1996, for each of the firms in both markets. The estimation is OLS. The table reports only the 14 cases where the V-shape relationship is maintained in the regression results. The entry in each cell is the number of the coefficients for γ_{jp} and γ_{US} which fall in each category. For example, the entry "0" in the top-left cell indicates that there is no case where the coefficients for γ_{jp} and for γ_{US} are both positive and significant. The number in parentheses is the sum of the number in each row or column. The level of significance is 10%.

5.3. Discussion

How should we interpret these results of the two STT changes? Given that the changes in the tax rates applicable to non-brokerage firms are more or less comparable, 0.009% (from 0.03% to 0.021%) in April 1996 and 0.01% (from 0.01% to 0%) in April 1999, can we make any sense out of these different results? Recall that the tax rate change in April 1996 was inapplicable to transactions by brokerage firms, *i.e.*, the rate applied to trading by brokerage firms was kept the same. In 1996 and 1999, the transactions made by brokerage firms on their own behalf were roughly one third and one fourth of all transactions, respectively. In view of this, the scope of the tax change was significantly wider in April 1999 than in 1996. In addition, the tax rate change in April 1996 is a mere reduction, while that in 1999 is a complete abolition. It is plausible that tax *abolition* may have a greater psychological impact on investors' behavior than a tax *reduction*, even when the magnitudes of the rate changes are comparable. Considering these differences, it is not surprising that the tax abolition in 1999 had a significant impact on turnover, while the mere rate reduction in 1996 did not.

6. Conclusions

In the midst of the stock market turmoil after the burst of the bubble economy, Japan first reduced then abolished its turnover tax levied on stock trading, in the hope that these institutional changes would revitalize the stock market, thereby alleviating concern about loss of its status as a world financial center. The effect of the turnover tax on trading volume has not been well established empirically, at least in the Japanese context. These facts motivated us to investigate whether or not the STT changes during the 1990s had the desired impact of increasing trading volume in the Japanese stock market. With a panel of data on stocks traded both in the Japanese and US markets, we compared changes in trading volume before and after the tax changes between the two markets in three types of specifications, exploiting the well-established V-shape relationship between the price change and volume in daily data. We did not obtain consistent results and therefore are unable to draw any conclusion in the setup allowing for shifts in both intercept and slopes. However, in a restricted model, allowing for the intercept shift only, we found consistently across the specifications that in April 1999, there was a significant increase in the volume in the Japanese market, but such an increase was not detected for the US market. Such contrasting results were not observed in April 1996; for both countries, no significant, positive shifts occurred in the intercept. This is consistent across the three specifications. Not knowing how the effect of tax change should materialize itself in the V-shape relationship, we take these consistent results in the restricted model as reasonably firm evidence that the tax abolition in April 1999 had an effect of increasing transaction volumes, but not the tax cut in 1996.

In concluding the paper, we would like to mention a few shortcomings of the present analysis as well as venues for future research. This paper only examined the effect of the STT reduction on trading volume. However, the STT tax is only a part of the transaction cost, which the overall reform measures aimed to eliminate. During periods in which these tax reductions were implemented, commission fees were also deregulated. In the present analytical setup, we carefully selected the estimation periods, thereby avoiding the possible influence of the fee deregulation. However, it would offer richer policy implications if we include other costs and investigate the relationship of stock trading and transaction cost in a broader perspective. Second, the effect of the STT on the stock market is not only limited to the trading volume; it can also affect market volatility. Some studies claim that a turnover tax has a positive effect of reducing excess volatility (e.g., Stiglitz [1989]). If true, the reduction in the STT in Japan should be evaluated on the grounds of increasing volume against increasing volatility. Therefore, one should investigate the effect of the STT on market volatility. Finally, the STT reduction under study is only a part of a greater picture of the securities tax reform. In January 2003, a new securities tax system was introduced, in which capital gains and dividend taxes were streamlined. In order to evaluate the overall policy changes to revitalize the Japanese stock market in the last decade or so, this new tax law should also be examined.

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