"Market Liquidity and the Impacts of the Computerized Trading System: Evidence from the Stock Exchange of Thailand"

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Market Liquidity and the Impacts of the Computerized Trading System: Evidence from the Stock Exchange of Thailand

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Abstract

This paper studies the impacts of the computerized trading system on the market liquidity in the Stock Exchange of Thailand (SET). The findings suggest that the automated trading system accomplishes its mission of increasing volume; however, it fails to reduce the asymmetric information among market participants. This may in general suggest that automation improves the trading efficiency and lowers the transaction costs. On the other hand, it fails to improve information asymmetry as the computerized trading system is outweighed by the information loss from the floor system.

JEL Classification: G10; G14

Key words: Market Liquidity; Securities market; Stock exchange; Trading system; Bid/Ask spread.

1. Introduction

The Stock Exchange of Thailand (SET) has changed its trading system from a sequential open auction system to a computerized trading system in 1991. One of the appealing features of the computerized trading is that it offers transparency to the system, as is the market information that they make available. Theoretically, the computerized trading system should provide all market participants with the equal opportunities to the same set of information, improve the trading efficiency, lower the transaction costs, as well as increase market liquidity.

However, the computerized system is sometimes designed to provide only a specific set of information to the market participants on computer terminal and, inevitably, that information set is too limited. Therefore, there are some cases that less amount of information are available for investors to trade. As a result, the automation may hurt the trading volume.

The key is which information set outweighs the other and, as a result, has more impact on the trading behavior as we use volume and bid/ask spread as our proxy for liquidity distribution in the Stock Exchange of Thailand (SET). We hypothesize that there should be an increase in trading volume and a narrower bid/ask spread after introducing such a floorless equity trading system. The evidence suggests that there is a significant increase in trading volume, but the bid/ask spread is wider in the course of the study period.

The rest of the paper is organized as follows. Section 2 presents the automated trading environment in Thailand. Section 3 provides literature surveys of the computerized trading system and its impacts. Section 4 discusses the data and sample design. Section 5 presents the empirical results and the last section concludes the study.

2. The Automated System for the Stock Exchange of Thailand (ASSET)

In May 1991, the Stock Exchange of Thailand has changed its trading system from the traditional floor trading system to the continuous computerized trading system. All trade and flow of information were to be processed electronically through terminals of the computerized order processing system: The Automated System of the Stock Exchange of Thailand, shortly, the ASSET[2].

The new system which is the computerized trading is designed to improve the efficiency of the trading mechanism. The ASSET provides efficiency in securities trading in terms of capacity and speed of execution of orders. It can execute more than 100,000 transactions per hour without human interference at high speed.

ASSET also provides the same information disclosure to all brokers and investors. For example, everyone sees only the top three bid and ask price levels. The information asymmetry between investors, who get access to the trading floor, insiders, and the uninformed traders, is, therefore, reduced. However, whether the system accomplishes its missions is truly an empirical question.

3. Literature Reviews

3.1. Impacts of the computerized trading system

The advantages of the automated trading system over the traditional floor-type trading mechanism are lower informational asymmetry, more volume trading, and narrower the bid/ask spreads. Glen (1994) emphasizes the important role of the extent to which the information is dispersed among market participants. The computerized order processing permits dispersion of information equally across investors so that the differences in information available to investor groups are reduced substantially. This implies that trading volume should be improved and the bid/ask spread should be narrower.

Hedvall (1996) contends that the automated trading system increases the trading volume and reduces the bid/ask spread in the Helsinki Stock Exchange (HETI) due to lower asymmetric information, when compared to the traditional floor trading system. This is accelerated by time efficiency in processing orders and the information services that tremendously facilitate the trading volume.

However, floor traders claim that information is lost by moving from the trading floor to the anonymity of a computer terminal[1]. On the floor, traders have to develop a reputation for honesty in their dealings that may make them less likely attempt to conduct trades at the expense of uninformed colleagues. Such is not the case with computerized systems, where reputation can be lost as a control factor, and informed traders can take advantage of the uninformed traders[2].

Therefore, there are two issues here, the benefit from less information asymmetry *vis-à-vis* the cost of having less trading information. The key is which information set outweighs the other and, as a result, has more impact on the trading behavior as we use volume and bid/ask spread as our proxy for liquidity distribution in the SET[3]. In other words, if the computerized trading offers less information asymmetry, and provides sufficient amount of information for trading, given that all market participants can absorb the technology instantaneously, the liquidity in the market should improve.

3.2. Measure of market liquidity

3.2.1. Volume

Unexpected trading volume was used as early as Beaver (1968) as a measure of information content. More recently, many studies have used unexpected trading volume besides unexpected price changes to test information content of some particular announcement of some events such as earnings announcements and annual reports or the changing of the trading system. Computerized trading system provides efficiency in reporting the limit orders to the participants and reduces the execution and waiting time which, in turn, increases the trading volume.

3.2.2. Bid/ask spread and its components

Computerized trading system benefits the bid/ask spread by narrowing down the information gap between traders having superior information and the ones without it. Changing the trading system in the SET will offer a more efficient flow of the information to uninformed investors. This reduction of information asymmetry decreases the bid/ask spreads because the informed traders and uninformed ones are using similar information set. The size of the spread is reduced because managers, security dealers, liquidity traders, and information traders are now utilizing more symmetric information set (Glosten and Milgrom, 1985).

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[1] See Glen (1994) for more details.

[2] For example, informed traders can intentionally place conceived orders for a purpose of to lead or to dump a particular stock or market, then cancel as when these orders get closer to the execution queue.

[3] There are also other candidates for liquidity distribution such as median daily volume, the number of trading days, days with a spread established, and the number of trade per day (Hedvall, 1996). However, the only two available information in SET are bid/ask spread and the trading volume.

In this paper, the bid/ask spread reaction to the announcement of changing from the traditional floor trading system to the computerized trading system for the SET is tested. Bid/ask prices are changed to reflect less asymmetric information conveyed by automation in trading. We expect to find a significant change in the proportional bid/ask spread following the introduction of computerized trading system in the SET.

4. Data and Methodology

4.1. Data

All information are gathered from the daily quotation of the SET during the period from April 16, 1991 to June 18, 1991 for samples from finance and securities sector and from April 29, 1991 to July 2, 1991 for all sectors sample, excluding finance and securities sector. The quotation documents closing bid/ask prices, closing execution prices, high/low execution prices during each trading days, total volume traded (both in shares and in baht).

We define the event date as the day the computerized trading is implemented. The sample consists of 21 days before and after the event date. We have classified them into the estimation period and the event period. The estimation period is defined as the period covering from $t = -21$ to -6 and the event period covers from $t = -5$ to 21; where $t = 0$ represents the day that the computerized trading is applied.

There are two different implementing event dates with the computerized trading system, we have to separate the observations into two groups. The first group is the finance and securities sector in which the computerized trading is implemented on May 17, 1991. The second group contains all other companies excluding those in the finance and securities group. This latter group has the event date on May 31, 1991.

4.2. Methodology

The analysis proceeds as follows. First, the behavior of the bid/ask spread and the trading volume are examined when automating the stock trading system at the SET. Tests for differences in volume and bid/ask spread are conducted, for the period of before and after the introduction of the computerized trading system.

The proportional bid/ask spread is calculated as follows:

$$PS_{i,t} = \frac{Ask_{i,t} - Bid_{i,t}}{\left[\dfrac{Ask_{i,t} + Bid_{i,t}}{2}\right]} \, , \tag{1}$$

where

$PS_{i,t}$ =   Proportional spread of stock i on day t,
$Ask_{i,t}$ =   Ask price of stock i on day t,
$Bid_{i,t}$ =   Bid price of stock i on day t,
t =   Sample period covering from $t = -21$ to 21.

For the investigation on the bid/ask spread, there are two approaches employed in this study, Charoenwong (1994) and Forjan and McCorry (1995). These two approaches are quite similar except for the standardized abnormal proportional spread of the former methodology.

First, following Charoenwong (1994), we calculate the mean of the proportional spread of stock i during the estimation period for the comparison after calculating the proportional spread. Next, for the event period, the standardized abnormal spread of stock i on day t_2 is calculated as follows:

$$SAPS_{i,t_2} = \frac{PS_{i,t_2} - \mu_{t_1}}{\sigma_{t_1}} \, , \tag{2}$$

where

$SAPS_{i,t_2}$ = Standardized abnormal proportional spread of stock i on day t_2,

PS_{i,t_2} = Proportional spread of stock i on day t_2,

μ_{t_1} = Sample mean of proportional spread of stock i during t_1,

σ_{t_1} = Sample standard deviation of proportional spread of stock i during t_1,

t_1 = Estimation period covering from $t = -21$ to -6,

t_2 = Event period covering from $t = -5$ to 21.

Then, the mean standardized abnormal proportional spread on day t_2 can be obtained by averaging the standardized abnormal proportional spread across all securities.

$$MSAPS_{t_2} = \frac{\sum_{i=1}^{N} SAPS_{i,t_2}}{N} , \qquad (3)$$

where

$MSAPS_{t_2}$ = Mean standardized abnormal proportional spread on day t_2,

N = Number of stocks.

So, the z-statistics is calculated to assess the statistical significance of the mean standardized abnormal proportional spread using the following statistic:

$$z_{t_2} = MSAPS_{t_2} \sqrt{N} . \qquad (4)$$

For the second approach, we follow Forjan and McCorry (1995). The differences from the first one are, first, we do not standardize the abnormal proportional spread here, and, second, we use t-statistics instead of z-statistics as recommended in the literature. The following equations are applied in the second approach:

$$PS_{i,t} = \frac{Ask_{i,t} - Bid_{i,t}}{\left[\dfrac{Ask_{i,t} + Bid_{i,t}}{2}\right]},$$

$$APS_{i,t_2} = PS_{i,t_2} - \mu_{t_1} , \qquad (5)$$

$$MAPS_{t_2} = \frac{\sum_{i=1}^{N} APS_{i,t_2}}{N} , \qquad (6)$$

$$t_{t_2} = \frac{MAPS_{t_2}}{\sigma_{MAPS}} , \qquad (7)$$

where

$PS_{i,t}$ = Proportional spread of stock i on day t,

$Ask_{i,t}$ = Ask price of stock i on day t,

$Bid_{i,t}$ = Bid price of stock i on day t,

t = Sample period covering from $t = -21$ to 21,

APS_{i,t_2} = Abnormal proportional spread of stock i on day t_2,

PS_{i,t_2} = Proportional spread of stock i on day t_2,

μ_{t_1} = Sample means of proportional spread of stock i during t_1,

t_1 = Estimation period covering from $t = -21$ to -6,

t_2 = Event period covering from $t = -5$ to 21,

$MAPS_{t_2}$ = Mean abnormal proportional spread on day t_2,

N = Number of stocks,

σ_{MAPS} = Standard deviation of mean abnormal proportional spread during t_2.

5. Empirical Results

Figures 1 and 2 present the average daily trading volume for the two groups. After the introduction of computerized trading of finance stocks, volumes for finance and securities stocks have increased sharply but overall volumes have not increased.
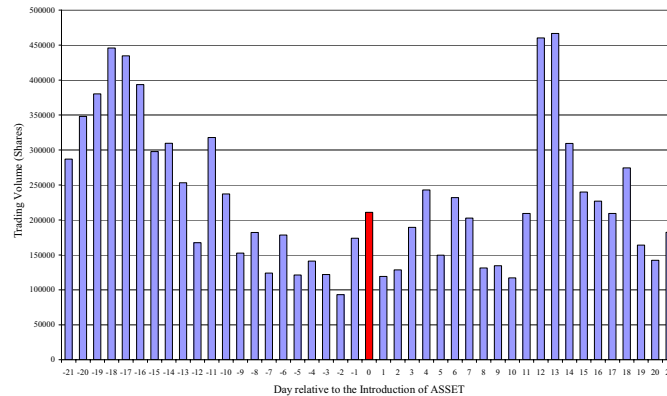

Fig. 1. Trading Volume for Finance and Securities Sector

This figure presents the average daily trading volume for Finance and Securities sector. The event date (t = 0) is the day the computerized trading is implemented. The sample consists of 21 days before and after the event date.
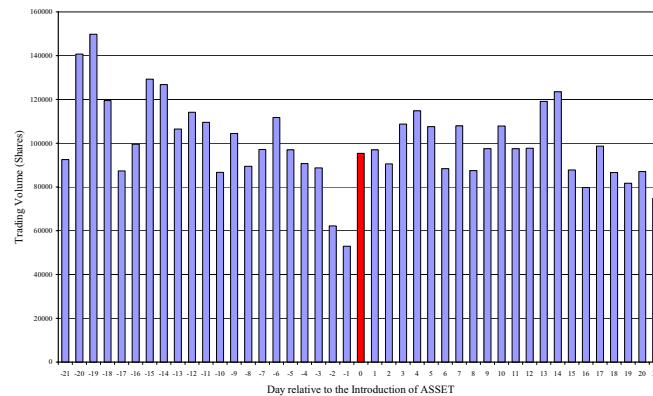

Fig. 2. Trading Volume for All Sectors (excluding Finance and Securities)

This figure presents the average daily trading volume for all sectors (excluding Finance and Securities). The event date (t = 0) is the day the computerized trading is implemented. The sample consists of 21 days before and after the event date.

For the finance and securities sector, the proportional bid/ask spread has increased dramatically on the event date and stays at the approximate level for a while. In addition, after an introduction of the computerized trading system to all stocks, the proportional bid/ask spread has sharply widened on the event date and remains so for the rest of the sample period. These are shown in Figures 3 and 4.
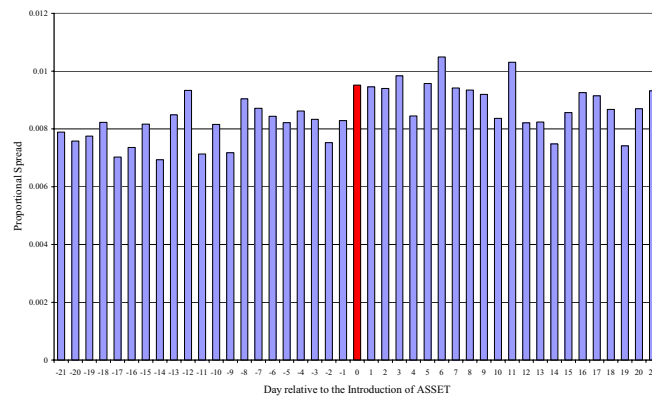
Fig. 3. Proportional Bid/Ask Spread for Finance and Securities Sector

This figure presents the proportional bid/ask spread for Finance and Securities sector. The event date (t = 0) is the day the computerized trading is implemented. The sample consists of 21 days before and after the event date.
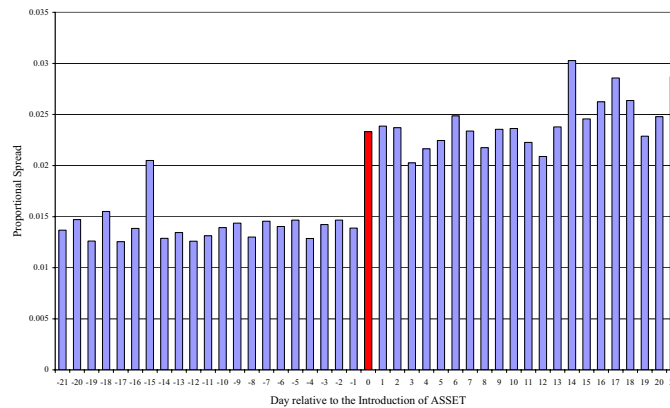

Fig. 4. Proportional Bid/Ask Spread for All Sectors (excluding Finance and Securities)

This figure presents the proportional bid/ask spread for all sectors (excluding Finance and Securities). The event date (t = 0) is the day the computerized trading is implemented. The sample consists of 21 days before and after the event date.

These results are inconsistent with the microstructure theory that the bid/ask spread should reduce after such event. From the technical viewpoint, all brokers and investors need some times to learn and catch up with the new system. In other words, though there were all information available on screen, but these retail investors could not utilize them efficiently. Therefore, it is probably the case that the retail investors could not benefit from less asymmetric information among market participants, created by the new trading system, and even worse, they could not get information the way they used to. This is evidenced by higher proportional spread during this time.

Next, the deviation of the percentage spread during the event period from the mean of the estimation period is calculated. There are two approaches employed in this paper which are Charo-enwong (1994) and Forjan and McCorry (1995). The results for finance and securities sector are presented in Table 1 and Figure 5.

Table 1

Mean Standardized Abnormal Proportional Spread and Mean Abnormal Proportional Spread of Finance and Securities Sector

This table presents the Mean Standardized Abnormal Proportional Spread (MSAPS) and the Mean Abnormal Proportional Spread (MAPS) of Finance and Securities sector. The event date (t = 0) is the day the computerized trading is implemented. The sample consists of 21 days before and after the event date.

Date	t	Approach 1			Approach 2		
		MSAPS	z-statistics		MAPS	t-statistics	
1	2	3	4		5	6	
16-Apr-91	-21	0.056899	0.278748		-0.000056	-0.063011	
17-Apr-91	-20	-0.195060	-0.955593		-0.000424	-0.474529	
18-Apr-91	-19	-0.058478	-0.274286		-0.000267	-0.298835	
19-Apr-91	-18	0.009848	0.048244		0.000196	0.219725	
22-Apr-91	-17	-0.235816	-1.106075		-0.000983	-1.100833	
23-Apr-91	-16	-0.177297	-0.731012		-0.000656	-0.734290	
24-Apr-91	-15	-0.071247	-0.334178		0.000085	0.095639	
25-Apr-91	-14	-0.233615	-1.144477		-0.000948	-1.060944	
26-Apr-91	-13	0.295028	1.319407		0.000437	0.489475	
29-Apr-91	-12	0.471692	2.056060	**	0.001458	1.631829	
30-Apr-91	-11	-0.339663	-1.698314	*	-0.000798	-0.892732	
02-May-91	-10	-0.019826	-0.090855		0.000451	0.504402	
03-May-91	-9	-0.247432	-1.212164		-0.000719	-0.805119	
07-May-91	-8	0.470155	2.254784	**	0.001201	1.344877	
08-May-91	-7	0.254586	1.272928		0.000784	0.878034	
09-May-91	-6	0.106149	0.520020		0.000433	0.484717	
10-May-91	-5	1.622851	7.782922	***	0.000247	0.276368	
13-May-91	-4	2.067503	10.128654	***	0.000779	0.871494	
14-May-91	-3	0.260120	1.274325		0.000334	0.373659	
15-May-91	-2	0.092346	0.442876		-0.000239	-0.267606	
16-May-91	-1	0.279726	1.370371		0.000390	0.436064	
17-May-91	0	2.262813	11.314067	***	0.001583	1.772136	*
20-May-91	1	0.905959	4.529793	***	0.001520	1.701630	*
21-May-91	2	0.647295	3.236476	***	0.001470	1.645228	*
22-May-91	3	1.682855	8.414273	***	0.001905	2.132699	**
23-May-91	4	0.176069	0.880345		0.000516	0.577470	
24-May-91	5	1.631337	7.991884	***	0.001566	1.752881	*
27-May-91	6	1.090397	5.451987	***	0.002554	2.859068	***
29-May-91	7	1.378088	6.890439	***	0.001485	1.662767	*
30-May-91	8	0.563388	2.816938	***	0.001416	1.585427	
31-May-91	9	0.081297	0.406483		0.001264	1.415362	
03-Jun-91	10	0.402931	2.014655	**	0.000432	0.483302	
04-Jun-91	11	2.136952	10.684761	***	0.002375	2.658161	***

Table 1 (continuous)

1	2	3	4		5	6	
05-Jun-91	12	0.558759	2.679712	***	0.000415	0.464249	
06-Jun-91	13	0.313799	1.537294		0.000342	0.383172	
07-Jun-91	14	-0.035805	-0.175407		-0.000335	-0.375135	
10-Jun-91	15	0.361698	1.808489	*	0.000771	0.862510	
11-Jun-91	16	2.050289	10.251447	***	0.001483	1.659612	*
12-Jun-91	17	0.643424	3.217122	***	0.001370	1.533615	
13-Jun-91	18	1.200693	6.003464	***	0.000668	0.747277	
14-Jun-91	19	-0.461934	-2.309672	**	-0.000428	-0.479504	
17-Jun-91	20	0.288829	1.444146		0.000899	1.006576	
18-Jun-91	21	0.736133	3.680664	***	0.001541	1.724662	*

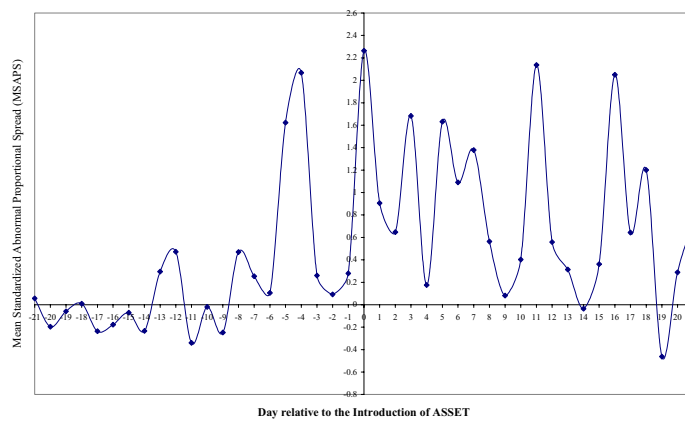***, **, and * denote significance at the 0.01, 0.05, and 0.10 levels, respectively.

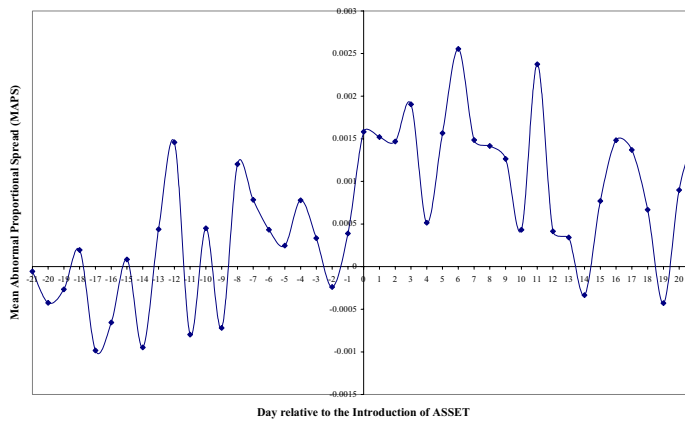Fig. 5a. Mean Standardized Abnormal Proportional Spread (MSAPS)

Fig. 5b. Mean Abnormal Proportional Spread (MSAPS)

Fig. 5. Mean Standardized Abnormal Proportional Spread and Mean Abnormal Proportional Spread of Finance and Securities Sector

This figure presents the Mean Standardized Abnormal Proportional Spread (MSAPS) and the Mean Abnormal Proportional Spread (MAPS) of Finance and Securities sector. The event date (t = 0) is the day the computerized trading is implemented. The sample consists of 21 days before and after the event date.

Table 2 and Figure 6 show the results for all sectors excluding the finance and securities.

Table 2

Mean Standardized Abnormal Proportional Spread and Mean Abnormal Proportional Spread of All Sectors (excluding Finance and Securities)

This table presents the Mean Standardized Abnormal Proportional Spread (MSAPS) and the Mean Abnormal Proportional Spread (MAPS) of all sectors (excluding Finance and Securities). The event date (t = 0) is the day the computerized trading is implemented. The sample consists of 21 days before and after the event date.

Date	t	Approach 1			Approach 2		
		MSAPS	*z*-statistics		*MAPS*	*t*-statistics	
1	2	3	4		5	6	
29-Apr-91	-21	-0.078602	-0.909888		-0.000651	-0.132148	
30-Apr-91	-20	0.060123	0.682867		-0.000045	-0.009155	
02-May-91	-19	-0.207433	-2.253300	**	-0.001252	-0.253911	
03-May-91	-18	0.089292	1.060284		0.000279	0.056500	
07-May-91	-17	-0.080351	-0.891134		-0.000872	-0.176946	
08-May-91	-16	-0.037588	-0.441564		-0.000587	-0.119130	
09-May-91	-15	-0.096097	-1.153161		0.005521	1.119863	
10-May-91	-14	-0.117521	-1.276606		-0.001251	-0.253718	
13-May-91	-13	-0.026443	-0.299169		-0.000094	-0.019148	
14-May-91	-12	-0.144135	-1.680886	*	-0.000963	-0.195382	
15-May-91	-11	-0.003241	-0.037523		-0.000368	-0.074621	
16-May-91	-10	0.077827	0.940383		-0.000219	-0.044395	
17-May-91	-9	0.172756	1.946863	*	0.000031	0.006274	
20-May-91	-8	0.003560	0.041214		-0.000908	-0.184117	
21-May-91	-7	0.183392	2.200708	**	0.000382	0.077393	
22-May-91	-6	0.154273	1.785843	*	0.000183	0.037094	
23-May-91	-5	0.524650	6.118415	***	0.000874	0.177370	
24-May-91	-4	0.057961	0.668442		-0.001424	-0.288931	
27-May-91	-3	0.477888	5.734651	***	0.000220	0.044618	
29-May-91	-2	0.203786	2.479160	**	0.000586	0.118890	
30-May-91	-1	0.173837	2.100484	**	-0.000041	-0.008310	
31-May-91	0	5.432377	70.620898	***	0.008735	1.771810	*
03-Jun-91	1	4.690597	61.873224	***	0.009299	1.886175	*
04-Jun-91	2	1.931365	25.033346	***	0.008276	1.678777	*
05-Jun-91	3	2.361037	31.500159	***	0.005226	1.060045	
06-Jun-91	4	1.592612	20.826099	***	0.006504	1.319341	
07-Jun-91	5	1.922587	25.722466	***	0.006327	1.283452	
10-Jun-91	6	2.155231	28.429456	***	0.008306	1.684732	*
11-Jun-91	7	1.301457	17.363599	***	0.007520	1.525310	
12-Jun-91	8	1.656417	22.346284	***	0.005439	1.103324	
13-Jun-91	9	2.453080	33.365496	***	0.007440	1.509153	

Table 2 (continuous)

1	2	3	4		5	6	
14-Jun-91	10	2.206433	29.929519	***	0.008375	1.698898	*
17-Jun-91	11	2.549046	34.103916	***	0.006889	1.397448	
18-Jun-91	12	1.275027	17.153732	***	0.005728	1.161818	
19-Jun-91	13	1.534252	20.584150	***	0.008800	1.785048	*
20-Jun-91	14	5.667491	76.037367	***	0.015334	3.110457	***
21-Jun-91	15	2.912460	39.074749	***	0.009499	1.926819	*
24-Jun-91	16	2.918194	39.151678	***	0.011619	2.356794	**
25-Jun-91	17	2.869875	38.610213	***	0.013305	2.698768	***
26-Jun-91	18	4.850663	64.897441	***	0.010837	2.198124	**
27-Jun-91	19	2.229590	29.996067	***	0.007043	1.428695	
28-Jun-91	20	5.444117	72.837318	***	0.008544	1.733108	*
02-Jul-91	21	3.277138	43.476144	***	0.013396	2.717294	***

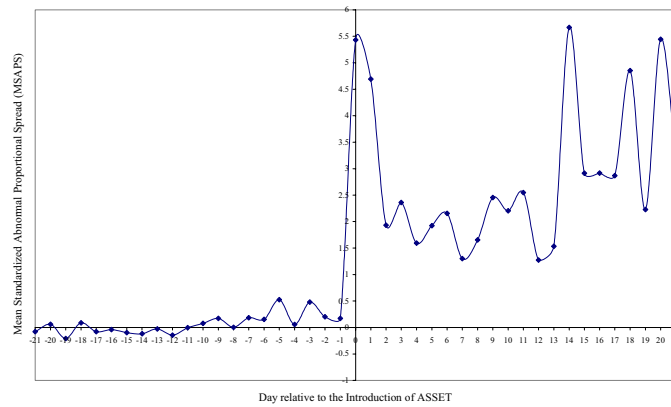***, **, and * denote significance at the 0.01, 0.05, and 0.10 levels, respectively.

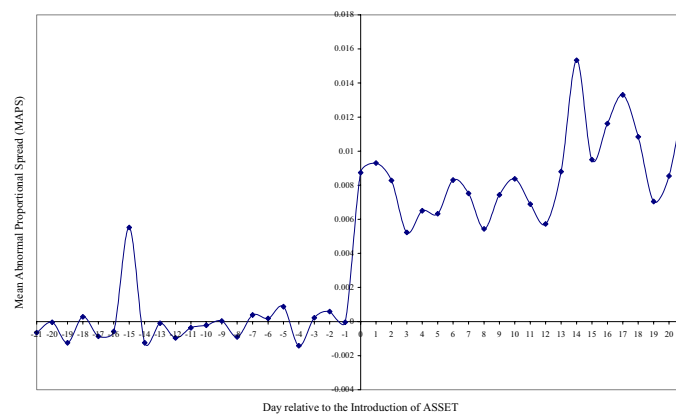Fig. 6a. Mean Standardized Abnormal Proportional Spread (MSAPS)

Fig. 6b. Mean Abnormal Proportional Spread (MSAPS)

Fig. 6. Mean Standardized Abnormal Proportional Spread and Mean Abnormal Proportional Spread of All Sectors (excluding Finance and Securities)

This figure presents the Mean Standardized Abnormal Proportional Spread (MSAPS) and the Mean Abnormal Proportional Spread (MAPS) of all sectors (excluding Finance and Securities). The event date (t = 0) is the day the computerized trading is implemented. The sample consists of 21 days before and after the event date.

From the above tables and figures, there emerge observations. First, both the mean standardized abnormal percentage spread (MSAPS) and mean abnormal percentage spread (MAPS) for both groups reveal that the bid/ask spread tend to be higher after the introduction of the computerized trading. Second, the significance appears more in the standardized case than the non-standardized abnormal spread.

6. Conclusion

A significant change in the market mechanism on the Stock Exchange of Thailand (SET) was examined in order to study the impacts of the computerized trading system on the liquidity distribution. The volume and the proportional bid/ask spread are used as a proxy for a shift in liquidity of the market. We hypothesize that the computerized stock trading improves trading efficiency in the market shown by a rise in volume and a decrease in spread.

In our study, we find evidence of an increase in volume on event date but an increase in spread surrounding the introduction of the computerized stock trading program at the SET. The bid-ask spread does not conform to our hypothesis. Less information asymmetry created by the computerized trading system is outweighed by the information loss from the floor system as retail investors could not catch up with the technical issue and have slower learning process than the institutional investors.

When the volume increases resulted from the net buy of the institutional investors, the retail investors hesitate to trade for immediacy and pursue a wait-and-see strategy due to a change in trading system. Thus, leaving wider bid/ask spread than before the event date. However, this situation is relieved and moves back to the theory as documented by the introduction of computerized system to all sectors.

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