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Price Discovery Process on Regular Trade and Cross Trade Markets: Empirical Evidence from the Jakarta Stock Exchange⁺

**Rosita P. Chang^{*}, Mamduh Hanafi[#] and
S. Ghon Rhee^{*}**

^{*}University of Hawaii

[#]University of Rhode Island and Gadjah Mada University

Contacting Author: S. Ghon Rhee
University of Hawai'i
2404 Maile Way, C-304
Honolulu, Hawai'i 96822-2282, USA
E-mail: rheesg@hawaii.edu
Tel No.: (808) 956 2535
Fax No.: (808) 956 2532

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**Asia-Pacific Financial Markets Research Center
College of Business Administration
University of Hawai'i at Mānoa**

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I. Introduction

Transactions on the Jakarta Stock Exchange (JSX) can be classified into two major categories: regular trades and negotiated trades. Both categories of trades are processed using the Jakarta Automated Trading System (JATS) which was launched in May 1995 as part of JSX's effort to modernize its trading facilities. The JATS can process up to 140,000 orders daily. A total of 83% [89%] of JSX's trading value [volume] was conducted in the regular trade market during the 2½-year study period from January 3, 1996 to June 30, 1998. The remaining trading activities were conducted in the negotiated market.¹

Negotiated trades that are conducted through direct negotiations between buyers and sellers. Five forms of negotiated trades are available on the JSX: (i) cross trades; (ii) block trades; (iii) odd-lot trades; (iv) cash trades; and (v) foreign board trades. Cross trades are performed by one exchange member who has both buying and selling orders at the same price and quantity. Cross trading has been the dominant form of negotiated trades, accounting for over 85% of total negotiated trades.² During the study period, regular and cross trade value accounted for 83% and 14%, respectively (See Table 1).³

¹ Share prices determined on the negotiated market are not used to compute the JSX Indices.

² Block trades are performed through negotiations between buying and selling member brokers in the minimum amount of 200,000 shares whereas a standard lot for regular trades is 500 shares. Odd-lot trades deal with order sizes fewer than 500 shares. Cash trades are for exchange members who fail to

The proportion of cross trades used to be far more significant prior to the study period, reaching over 40%. However, after Indonesia was hit by the on-going financial crisis, cross trading volume declined for two reasons. First, the amount of portfolio investment by foreign investors decreased, whereas they were the dominant participants in cross trades. Second, much of the cross trades were diverted to the Surabaya Stock Exchange (SSX) since March 1997 after it lowered its commission rates applicable to cross trades. Nevertheless, the magnitude of cross trading volume is not small when compared with that of other equity markets in the region. Once investor confidence on the Indonesian capital market is restored, the magnitude of cross trades is expected to increase.

Summarized below are stylized facts about cross trades over the study period:

- The average trading value of cross trades is about 13 times greater than that of regular trades (See Table 1).
- The daily number of regular trades is 44.60, while that of cross trades is only 1.55 (See Table 1).
- Intraday returns from morning market open to afternoon market close are 0.65% for regular trades and -0.26% for cross trades while price

deliver securities on the T+4 settlement date and have to buy the shares for immediate payment and delivery (cash-and-carry). Prior to the Asian financial crisis that unfolded since July 1997, there was a 49%-ceiling on foreign ownership of JSX-listed companies. Once the 49%-ceiling was reached, foreigners could not buy additional shares from local investors. To facilitate trading of foreign-owned shares among foreign investors, therefore, the foreign board was created. However, after the financial crisis broke out, trading activities on the foreign board have remained insignificant because the 49%-ceiling was lifted for JSX-listed stocks with the exception of bank stocks.

³ Trading activities in the remaining four categories (which account for 15% of negotiated trades) are extremely thin, representing only about 3% of JSX's total trading value [volume].

fluctuation (as measured by the standard deviation of intraday returns) of cross trades is about 1.75 times greater than that of regular trades (See Table 2).

- Daily returns from today's afternoon market close to tomorrow's afternoon market close are 0.01% for regular trades and 1.50% for cross trades while price fluctuation of cross trades is 1.89 times greater than that of regular trades (Table 3).
- On the average, it takes 50 minutes for regular trades to open in the morning, which compares with 78 minutes recorded for cross trades. The closing regular trade occurs 23 minutes prior to market close while the last cross trade is executed 52 minutes before the market closes (See Table 4).

From the above-stylized facts, it is apparent that cross trades may be vulnerable to potential price manipulations because its frequency of trading is lower, but the trading size is much larger than that of regular trades. The problem of potential manipulations becomes evident when the price fluctuation between regular trades and cross trades is compared for thinly traded stocks. Price fluctuation of cross trades recorded for the bottom quartile of JSX stocks sorted by trading value is at least twice as large as that of regular trades. Relatively large price fluctuations observed on the cross trade market may be attributed to the lack of restrictions on pricing. Once a member broker reports the price and volume agreed upon by the buyer and the seller to JSX, the exchange has no control over that reported trade. Even if the agreed price appears

unreasonably high or low, no recourse is available to the JSX surveillance team. This is a very unusual practice in view of the handling of cross trades by other leading stock exchanges.

At the Tokyo Stock Exchange, cross trades are executed at the current market price. On the New York Stock Exchange, the current market price is the price applicable to cross trades with ± 1 tick (equivalent to one-eighth of \$1) limitation, i.e., the cross trade must be executed at a price no more than one tick below the bid or one tick above the offer. Since June 1991, the New York Stock Exchange introduced two after-hours trading sessions that are called cross sessions I and II. Cross session I (between 4:15 p.m. and 5:00 p.m.) facilitates trading of individual stocks at the daily closing price, while cross session II (between 4:00 p.m. and 5:15 p.m.) facilitates crossing of multi-stock baskets at an aggregated price based likewise on daily closing price of each component stock. On the Korea Stock Exchange, the restrictions on cross trades differ depending on when they are executed. Cross trades during regular trading hours are executed at either the morning opening price, afternoon opening price, or afternoon closing price. Cross trades conducted during after-hours trading session (between 3:10 p.m. and 3:40 p.m.) must be within five ticks above or below the afternoon closing price. The cross trade price, however, can not exceed daily high and low prices. The Paris Stock Exchange also imposes pre-determined tick limitations (± 10 ticks on the best bid or ask prices for large-sized trades and ± 5 ticks on small-sized trades).

On JSX, the buyer and the seller first negotiate the price over the counter and then select one member broker to report their transaction to the exchange.⁴ Many foreign investors rely on cross trades to take advantage of negotiated pricing without any restrictions. The member broker benefits from cross trades as its commission income can theoretically double. Another advantage for the member broker is that the counter-party risk in clearing and settlement is minimized. It is not clear whether individual investors gain or lose from this cross trade mechanism that is not subjected to competitive auction procedures.⁵ It is possible that individual investors may be able to pay a smaller amount of commission fees to the member broker by relying on cross trades. A large portion of cross trades (including block trades) is currently diverted to the SSX where the transaction fee is negotiable below 0.04%, which is JSX's fixed commission rate.⁶

What are the merits of allowing cross trades without any restrictions on cross trade prices? One may argue that cross trades may reduce price volatility associated with large volume trades in the regular market. Simply because cross trade prices are not reported as part of competitive auction prices of regular

⁴ Cross trades are recorded in the order file only after the prices and quantities are agreed.

⁵ See Rhee (1999), Chang, Hsu, Huang, and Rhee (1999), Comerton-Forde (1999), Chang and Rhee (1998), and Chang, Rhee, and Soedigno (1995) for detailed discussion on JSX's competitive auction method in the regular trade market.

⁶ Since March 1997, the SSX changed the transaction fee structure to attract block and cross trades from the JSX:

- a. If trading value \leq Rp. 10 million, then the fee is Rp. 2,000;
- b. If Rp. 10 million $<$ trading value \leq Rp. 50 trillion, then the fee is 0.032% of trading value; and
- c. If Rp. 50 trillion $<$ trading value, then the fee is 0.025%.

However, JSX's transaction fee remained at 0.04%.

trades, the problem is not solved. Rather, the problem is hidden behind the shield of cross trades that are not subjected to competitive auction procedures. A critical question is “Do investors gain from cross trades?” This question must be answered based on how efficient the price discovery process of cross trades is. The same question from another angle is “Does JSX provide a fair and orderly market for individual investors by allowing cross trades to be executed without any restrictions on their pricing?” If the price discovery process is not efficient and the market is not fair and orderly, investors pay a high price in the long run because an inefficient and unfair market is vulnerable to price manipulation.⁷

II. Price Discovery Processes of Two Types of Trades

In this section, price discovery processes of cross and regular trades are compared using five key variables measuring: (i) autocorrelations; (ii) price volatility; (iii) price impact of large order imbalance; (iv) trading noise; and (v) price reversal and continuation. One critical consideration for meaningful comparisons between two types of trades is to avoid the measurement errors associated with extreme thin trading. Although the thin trading problem is one of major characteristics of the Asian equity markets, it is much more severe in Jakarta than any other markets. For example, the bottom quartile of JSX-listed stocks did not trade on seven out of 10 trading days, on the average, during the study period. The distribution of cross trades indicates that only the top 20% [10%] of listed companies have at least 2 [3.5] trades or more on a daily basis.

⁷ Bonser-Neal, Linnan, and Neal (1999) find that trades initiated by foreigners tend to have significantly greater execution costs after controlling for the difficulty of the trade and the firm size.

Since intraday return series has to be examined, listed companies with one single trade per day do not represent an ideal set of sample companies. Therefore, identified first are 58 listed stocks with 2 or more cross trades per day. Of the 58 companies, we deleted 16 stocks because their trading activities are intermittent, lacking consecutive series of returns over a significant length of period, if not the whole period. As a result, a total of 42 listed stocks are selected for the analysis.

1. Autocorrelation

In a well-functioning capital market, the absence of predictability of stock price movement is a fundamental characteristic. Predictable prices imply that trades occur at prices that do not follow a random walk. A simple statistical measure to test the predictability of stock prices is autocorrelation. Large positive [negative] autocorrelations imply that prices are predictable. In an efficient capital market where prices follow random walk, autocorrelations are supposed to be zero.

For the final 42 companies selected for the experiment, first-order autocorrelations are computed for the return series under both regular and cross trades. Table 5 summarizes the results. Two interday return series are used to compute the autocorrelations: morning open-to-morning open return series and afternoon close-to-afternoon close return series. Two findings are noted. First, cross-sectional means of autocorrelations of the morning open return series are 0.0018 for regular trades and -0.1107 for cross trades, respectively. The absolute magnitude of autocorrelation estimated for cross trades is approximately

60 times greater than that for regular trades. Cross-sectional means of autocorrelations of afternoon closing returns are 0.023 for regular trades and – 0.207 for cross trades. The absolute magnitude of autocorrelation in the cross trade market is 9 times greater than in the regular trade market. The large magnitude of autocorrelations is an indication of inefficiency in the cross trade market. Second, autocorrelations computed for regular trades are positive, while those computed for cross trades are negative. Positive autocorrelations imply that buyers pay too much [little] after down [up]-moves, while negative autocorrelations imply that sellers receive too little [much] after down [up]-moves [Froot, Gammil, and Perold (1990)] (See Table 5).

2. Price Volatility

To compare price volatility in the regular trade and cross trade markets, variances of four interday returns were computed: (i) morning open-to-morning open returns; (ii) morning close-to-morning close returns; (iii) afternoon open-to-afternoon open returns; and (iv) afternoon close-to-afternoon close returns. The most remarkable finding is that very large price fluctuations are observed for cross trades. For example, the variance of afternoon close-to-afternoon close returns is about 5 times greater for cross trade returns than for regular trade returns [231.79 vs. 47.05] as presented in Table 6. Similar results are observed for other three variance measures (See Table 6).

3. Market Liquidity

To highlight the differential impact of the two types of trades on market liquidity, the “price impact” of large order imbalance is examined. For each of the

42 stocks in the sample, a liquidity ratio is calculated. It is defined as the ratio of sum of the 30-minute trading volume (as measured by lots consisting of 1,000 shares) to the sum of the absolute value of 30-minute price changes over the whole sample period (615 trading days). This ratio effectively measures the trading volume adjusted for price volatility. This ratio is an adequate liquidity measure because cross trades are associated with greater volatility than regular trades on an ex ante basis. Thus, without adjusting for volatility, a simple comparison of trading volume may produce misleading results. This measure of market liquidity is characterized by a small impact on market prices from the execution of large orders. Thus, a high ratio implies that a large order can be executed with only a small price movement, whereas a low ratio suggests market inability to absorb a large order without a large price movement.

Table 7 presents liquidity ratios for regular trade-based return series and cross trade-based return series for the 42 stocks in the sample at 30-minute intervals within a trading day as well as morning and afternoon trading sessions and the whole day sessions. It is not surprising that regular trades demonstrate much higher liquidity than cross trades consistently. As indicated in Table 7, during the first 30 minutes after the market open, liquidity in the regular trade market (4.92×10^4) is more than twice as much as that in the cross trade market (1.95×10^4).⁸ During the last 30 minutes of trading prior to market close, the liquidity ratio of regular trades is (4.37×10^4), while that for cross trades is

⁸ Opening and closing trades on JSX account for 30% [32%] of total daily volume [value]. Opening [closing] trades are defined as the trades conducted during the 30-minute period after the market open [prior to market close].

(2.69×10^4) . During the trading day, the liquidity ratio of regular trades is about 25% higher than that of cross trades (See Table 7).

4. Market Noise

The ratios of long- to short-term return variances is measured for the 42 stocks in the sample using two sets of return series, regular trade-based and cross trade-based returns. These ratios measure the noisiness of a market.⁹ Given market inefficiency observed for the cross trade market, these ratios provide some measure of the degree of noise in that market relative to the regular trade market. For each stock, three sets of variance ratios were estimated: (i) the whole day variance ratio; (ii) the morning session variance ratio; and (iii) the afternoon session variance ratio. The whole day variance ratio is measured by:

$$\text{Var}[R(\text{MO-AC})]/[10 \cdot \text{Var}(R_{30})],$$

where $\text{Var}[R(\text{MO-AC})]$ is the variance of morning open-to-afternoon close returns and $\text{Var}(R_{30})$ is the variance of 30-minute returns. The morning session variance ratio is defined as $\text{Var}[R(\text{MO-MC})]/[5 \cdot \text{Var}(R_{30}^{\text{am}})]$. Note that the numerator is replaced by the variance of morning open-to-morning close returns and the denominator is replaced by five times the variance of 30-minute returns during the morning session. Likewise, the afternoon session variance ratio is defined as $\text{Var}[R(\text{AO-AC})]/[5 \cdot \text{Var}(R_{30}^{\text{pm}})]$. The numerator is now the variance of afternoon open-to-afternoon close return and the denominator is five times the variance of 30-minute returns during the afternoon session. If the market is

⁹ For recent application of this variance ratio, see Kaul and Nimalendran (1990), Grunbichler, Longstaff, and Schwartz (1994), and Chang, Hsu, Huang, and Rhee (1999).

efficient and there exists no trading noise which causes market frictions, then variance ratios should be equal to one. The variance ratios smaller than one implies market inefficiency or the existence of trading noise. The smaller the variance, the noisier the market is.

Table 8 summarizes three sets of variance ratios estimated for the regular trade market and the cross trade market using the sample of 42 stocks. The variance ratios estimated for the regular trade market are consistently greater than those estimated for the cross trade market. For example, the whole period variance ratio is 0.41 for the regular trade market as opposed to 0.19 for the cross trade market. The differences in the variance ratios under the two types of trades are statistically significant. Similar results are observed for the morning session variance ratios and the afternoon session variance ratios. These results strongly suggest that the cross trade market suffers from greater noise than the regular trade market and investors in the cross trade market are subject to higher degree of market inefficiency (See Table 8).

5. Price Reversal/Continuation

Statistical measures of price reversal and continuation were used to examine the impact of cross trades on the price discovery process. Under normal circumstances one would expect stock prices to move up and down at random with no directions indicated. This would be indicated by a statistically insignificant measure of price reversal and/or continuation. Otherwise, one may suspect that some external factors cause price to move in one direction [Bollen and Whaley

(1999), Karolyi (1996), and Stoll and Whaley (1991)]. For example, if price manipulations are involved, one may observe that prices tend to continue.

Changes in the direction of price movement at the market close and at the market open, particularly, the effects of cross trades during the afternoon trading session on price reversals during the overnight nontrading period were examined. Focus was also placed on the effects of returns over the overnight nontrading period on price reversals at the market open. The degree of price reversals is measured at the market close using the following reversal measure:

$$\text{REV}(\text{AC})_t = +R(\text{AC-MO}) \text{ if } R_t < 0 \text{ and } -R(\text{AC-MO}) \text{ if } R_t \geq 0,$$

where $R(\text{AC-MO})$ denotes the overnight return from market close to next day's market open and R_t is return measured over the interval t prior to market close in the afternoon where t is the time-interval between afternoon market open and afternoon market close or the time-interval between the next-to-last trade and afternoon market close. The degree of price reversals at the market open was also measured using:

$$\text{REV}(\text{MO})_k = R_k \text{ if } R(\text{AC-MO}) < 0 \text{ and } -R_k \text{ if } R(\text{AC-MO}) \geq 0,$$

where $R(\text{MO})_k$ denotes return measured over interval k after morning market open and k is the time-interval between morning market open and the first trade and the time-interval morning market open to morning market close. A positive value of $\text{REV}(\text{AC})_t$ or $\text{REV}(\text{MO})_k$ signifies a reversal, while a negative value signifies a continuation.

Table 9 presents the average return reversals around afternoon close (Panel A) and morning open (Panel B). Each panel reports price reversals for the regular

trade market and the cross trade market. As expected, price reversals are dominant in the regular trade market, while price continuations are indicated in the cross trade market. However, the magnitude of price reversals in the regular trade market is very small, as is the case for the U.S. market. In contrast, the degree of price continuation in the cross trade market is much more pronounced. For example, a price continuation effect of -0.21% for the first two trades after the market open is relatively large, which may produce economically significant trading profits (See Table 9).

The Implications of Empirical Findings

Empirical evidence documented in the previous section indicates that unrestricted pricing of cross trades: (i) causes greater price volatility and (ii) makes the JSX market less efficient, less liquid, and noisier than necessary. The JSX should continue to encourage cross trades as a viable means of trading on the exchange. However, cross trades must be executed with as little disruption as possible to the regular trade market. Hence, cross trades should be allowed to be executed during regular trading sessions as well as during off-hours trading session, which may considered by the JSX to create.

Ideally, cross trades during regular trading sessions must be executed at the prevailing market prices to minimize any pricing distortions when they are executed during regular trading. Cross trades without pricing restriction work against the fundamental philosophy of creating a fair and orderly markets for listed securities. Hence, appropriate pricing restrictions must be imposed on cross trades to prevent them from occurring at prices away from the market.

The JSX may consider the creation of one after-hours session to facilitate cross trading. This additional session will provide crossing ability to investors without causing unnecessary noise during the regular trading hours. Naturally, unlike cross trades executed during the regular trading hours, cross trades executed during this after-hours session may be allowed more flexibility in pricing, for example, ± 5 ticks above and below the afternoon closing price.

Since March 1997, lower securities transaction fee schedules help the SSX generate operational revenue in competition with the JSX. However, the

SSX's operational difficulty must be resolved by other fundamental means (such as developing it as an inter-dealer broker for debt instruments and/or as a specialized exchange for financial derivatives, or consolidation with the JSX) rather than by facilitating cross trades with lower transaction fees.

Although they account for a very small portion of JSX's trading activities, block trades will gain importance as the role of institutional investors is enhanced in the Jakarta market. For example, block trades account for approximately two-thirds of the New York Stock Exchange volume.¹⁰ The treatment of block trades should be the same as that of cross trades. Although block trades must be encouraged by JSX, they should be executed at or near the market during the morning and afternoon sessions. Block trades during the proposed off-hours session may be allowed more flexibility as recommended for cross trades. No matter what, block trades can not be executed without any pricing restrictions.

¹⁰ Madhavan and Cheng (1997) report that about 80% of total dollar value of NYSE block trades are executed in the downstairs market (including the after-hour sessions) and the remainder by the upstairs market. They observe a signaling role of the upstairs market on liquidity-motivated trading.

References

- Bollen, Nicolas P.B. and Robert E. Whaley, 1999, Do Expirations of Hang Seng Index Derivatives Affect Stock Market Volatility? forthcoming in *Pacific-Basin Finance Journal*.
- Bonser-Neal, Catherine, David Linnan, and Robert Neal, 1999, Emerging Market Transaction Costs: Evidence from Indonesia, forthcoming in *Pacific-Basin Finance Journal*.
- Chang, Rosita P., Shuh-Tzy Hsu, Nai-Kuan Huang, and S. Ghon Rhee, 1999, The Effects of Trading Methods on Volatility and Liquidity: Evidence from the Taiwan Stock Exchange, forthcoming in *Journal of Business Finance & Accounting*.
- Chang, Rosita P. and S. Ghon Rhee, 1998, An Analysis of Return Behavior of Indonesian Stocks, *Advances in Pacific Basin Financial Markets* (edited by Theo Bose and Thomas Fetherstone) Volume 4, (Greenwood, CT: JAI Press), 171-184.
- Chang, Rosita P., S. Ghon Rhee, and Susatio Soedigno (1995), 'Price Volatility of Indonesian Stocks, *Pacific-Basin Finance Journal* 3, pp. 337-355.
- Comerton-Forde, Carole, 1999, Do Trading Rules Impact on Market Efficiency?: A Comparison of Opening Procedures on the Australian and Jakarta Stock Exchanges, forthcoming in *Pacific-Basin Finance Journal*.
- Froot, Kenneth A., James F. Gammil, Jr., and Andre F. Perold, 1990, New Trading Practices and the Short-Run Predictability of the S&P 500, in *Market Volatility and Investor Confidence* (New York, NY: New York Stock Exchange), G1-1-27.
- Grünbichler, A., F. A. Longstaff, and E. S. Schwartz, 1994, Electronic Screen Trading and the Transmission of Information: An Empirical Examination, *Journal of Financial Intermediation* 3, pp.166-187.
- Karolyi, G. Andrew, 1996, Stock Market Volatility Around Expiration Days In Japan, *Journal of Derivatives* 4 (Winter), 23-43.
- Kaul, G. and M. Nimalendran, 1990, Price Reversals: Bid-ask Errors or Market Overreaction?, *Journal of Financial Economics* 28, pp. 67-93.
- Madhavan, Ananth and Minder Cheng, 1997, In Search of Liquidity: Block Trades in the Upstairs and Downstairs Markets, *Review of Financial Studies* 10, 175-203.

Rhee, S. Ghon, 1999, Rising to Asia' Challenges: Enhanced Role of Capital Markets, Asian Development Bank Working Paper.

Stoll, Hans R. and Robert E. Whaley, 1991, Expiration-Day Effects: What Has Changed?, *Financial Analysts Journal* 47, 58-72.

Table 1 Autocorrelation

	Regular Trade	Cross Trade	Difference
A. Morning Open to Morning Open Returns			
Mean	0.0018	-0.1107	0.1125
Standard Deviation	0.1247	0.2306	-0.1059
Minimum	-0.3634	-0.6324	0.2690
Maximum	0.2303	0.2972	-0.0669
B. Morning Close to Morning Close Returns			
Mean	0.0392	0.1288	-0.0897
Standard Deviation	0.1090	0.7255	-0.6165
Minimum	-0.1858	-0.7476	0.5618
Maximum	0.2803	1.0000	-0.7197
C. Afternoon Open to Afternoon Open Returns			
Mean	0.0372	-0.1159	0.1531
Standard Deviation	0.1092	0.2729	-0.1638
Minimum	-0.2410	-0.6921	0.4511
Maximum	0.2489	0.8206	-0.5717
D. Afternoon Close to Afternoon Close Returns			
Mean	0.0230	-0.2070	0.2300
Standard Deviation	0.1449	0.2741	-0.1292
Minimum	-0.2523	-1.0000	0.7477
Maximum	0.2756	0.3790	-0.1034

Note: *** Significance level $\alpha = 1\%$

** Significance level $\alpha = 5\%$

* Significance level $\alpha = 10\%$

Table 2 Price Volatility

	Regular Trade	Cross Trade	Difference
A. Interday Variances			
<i>Morning Open to Morning Open</i>			
Mean	52.70	125.56	-72.86***
Standard Deviation	56.11	119.41	-63.31
Minimum	14.79	14.71	0.08
Maximum	358.74	625.98	-267.24
Number of Companies	42	42	42
<i>Morning Close to Morning Close</i>			
Mean	44.25	85.77	-41.52***
Standard Deviation	24.98	173.60	-148.62
Minimum	13.96	0.95	13.02
Maximum	108.25	584.33	-476.08
Number of Companies	42	12	12
<i>Afternoon Open to Afternoon Open</i>			
Mean	45.56	281.02	-235.45***
Standard Deviation	54.12	1016.00	-961.88
Minimum	10.13	18.50	-8.37
Maximum	363.72	6587.79	-6224.07
Number of Companies	42	41	41
<i>Afternoon Close to Afternoon Close (Daily Returns Variance)</i>			
Mean	47.05	231.79	-184.74***
Standard Deviation	43.36	634.87	-591.51
Minimum	11.64	18.79	-7.16
Maximum	274.98	4107.09	-3832.11
Number of Companies	42	42	42
B. Intraday Variances			
<i>Morning Open to Morning Close (Morning Trading Session)</i>			
Mean	22.70	108.97	-86.27
Standard Deviation	24.48	266.23	-241.75
Minimum	5.51	0.11	5.41
Maximum	156.01	1638.45	-1482.44
Number of Companies	42	40	40
<i>Morning Close to Afternoon Open Returns (Lunch Break Nontrading)</i>			
Mean	5.84	172.29	-166.46***
Standard Deviation	6.86	410.48	-403.62
Minimum	0.12	0.10	0.02
Maximum	33.59	1566.65	-1533.06
Number of Companies	42	31	31

Afternoon Open to Afternoon Close (Afternoon Trading Session)

Mean	26.97	102.33	-75.36***
Standard Deviation	50.40	132.08	-81.68
Minimum	3.19	4.44	-1.25
Maximum	331.36	692.64	-361.28
Number of Companies	42	42	42

Afternoon Close to Mornng Open (Overnight Nontrading)

Mean	54.99	159.84	-104.85***
Standard Deviation	85.30	195.44	-110.14
Minimum	2.83	13.71	-10.88
Maximum	500.36	1159.28	-658.92
Number of Companies	42	42	42

Note: *** Significance level $\alpha = 1\%$

** Significance level $\alpha = 5\%$

* Significance level $\alpha = 10\%$

Table 3 Market Liquidity

	Regular Trade				Cross Trade				Difference				
	Mean (x10 ⁴)	Standard Deviation (x10 ⁴)	Minimum (x10 ⁴)	Maximum (x10 ⁴)	Mean (x10 ⁴)	Standard Deviation (x10 ⁴)	Minimum (x10 ⁴)	Maximum (x10 ⁴)	Mean (x10 ⁴)	Standard Deviation (x10 ⁴)	Minimum (x10 ⁴)	Maximum (x10 ⁴)	
09:30 - 10:00	4.92	4.92	0.06	26.00	1.95	2.26	0.12	12.03	2.96	***	4.44	-5.82	23.72
10:01 - 10:30	4.70	4.11	0.11	21.30	4.67	6.62	0.11	29.91	0.03	*	7.63	-23.50	19.78
10:31 - 11:00	3.98	3.51	0.11	16.60	1.38	2.45	0.01	15.40	2.60	***	3.99	-10.89	15.63
11:01 - 11:30	4.24	3.77	0.14	18.06	1.32	1.45	0.07	6.16	2.92	***	3.56	-4.72	16.40
11:31 - 12:00	4.00	3.20	0.13	14.16	4.10	13.73	0.07	88.30	-0.10	***	12.96	-77.89	12.72
13:30 - 14:00	5.79	5.14	0.15	20.86	5.50	8.67	0.04	47.40	0.19	*	7.91	-31.15	18.44
14:01 - 14:30	7.50	6.75	0.22	26.10	9.66	17.68	0.02	90.79	-2.15		17.25	-83.18	22.73
14:31 - 15:00	4.92	4.67	0.19	22.32	3.90	12.60	0.09	82.37	1.02	***	13.39	-79.10	21.40
15:01 - 15:30	6.08	6.50	0.23	34.35	4.08	6.83	0.08	32.07	2.04	***	7.11	-13.94	32.30
15:31 - 16:00	4.02	3.72	0.35	18.45	3.47	5.25	0.17	32.30	0.61	*	5.18	-21.36	14.97
Morning Session	4.37	3.80	0.11	19.22	2.69	3.53	0.11	19.86	1.68	***	4.10	-9.48	17.65
Afternoon Session	5.66	5.10	0.23	24.42	5.46	7.11	0.15	29.05	0.20	*	7.01	-26.12	21.97
Whole Day	5.01	4.43	0.17	21.82	4.02	4.70	0.13	17.25	1.00	*	4.96	-12.13	19.81

Note: *** Significance level $\alpha = 1\%$
 ** Significance level $\alpha = 5\%$
 * Significance level $\alpha = 10\%$

Table 4 Market Noise

	Regular Trade	Cross Trade	Difference	
A. Whole Day Variance Ratio				
Mean	0.41	0.19	0.22	***
Standard Deviation	0.23	0.14	0.27	
Minimum	0.03	0.02	-0.37	
Maximum	1.03	0.59	0.87	
B. Morning Session Variance Ratio				
Mean	0.42	0.26	0.17	***
Standard Deviation	0.17	0.30	0.36	
Minimum	0.06	0.00	-0.73	
Maximum	0.85	1.16	0.72	
C. Afternoon Session Variance Ratio				
Mean	0.42	0.32	0.09	***
Standard Deviation	0.19	0.35	0.39	
Minimum	0.37	0.03	-1.14	
Maximum	1.41	1.47	0.65	

Note: *** Significance level $\alpha = 1\%$
 ** Significance level $\alpha = 5\%$
 * Significance level $\alpha = 10\%$

Table 5 Price Reversal/Continuation

	Regular Trade Returns (%)	Cross Trade Returns (%)	Difference (%)
A. At Market Close			
<i>REV^{AC}</i>			
Mean	0.18	0.39	-0.21
Standard Deviation	0.68	3.05	3.35
Minimum	-1.94	-4.72	-19.71
Maximum	1.93	17.77	4.12
<i>REV^{LAST}</i>			
Mean	0.15	-0.08	0.32
Standard Deviation	0.80	2.34	2.30
Minimum	-2.20	-7.21	-5.91
Maximum	2.10	7.23	5.01
B. At Market Open			
<i>REV^{MO}</i>			
Mean	0.15	3.04	-2.90 ***
Standard Deviation	0.52	6.81	6.83
Minimum	-0.74	-5.62	-32.71
Maximum	1.50	33.08	6.18
<i>REV^{FIRST}</i>			
Mean	0.05	-0.21	0.26
Standard Deviation	0.18	1.04	1.07
Minimum	-0.34	-3.23	-3.23
Maximum	0.67	3.23	3.21

Note: *** Significance level $\alpha = 1\%$
 ** Significance level $\alpha = 5\%$
 * Significance level $\alpha = 10\%$