Intraday Returns Patterns of Malaysian Common Stock

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ABSTRACT

This study examines the intraday return and risk behavior of Malaysian stock prices. The volatility of the return is greater in the morning session for both period A and period B as measured by the standard deviation ratios. It is also observed that the intraday standard deviations showed two distinct U-shaped curves for Period A (where trading started at 10.00am and ended at 4.00pm) and also a U-shaped curve intraday for period B (where trading started at 9.30pm and ended at 5.00pm). The rank correlation which affects index return volatility is also observed. These observed volatility especially in the later period (Period B) seems to be consistent with the rational trading noise hypothesis as proposed by Kyle (1985), where insider's private information is assimilated into prices by the end of the trading session.

ABSTRAK

Kertas ini mengkaji gelagat pulangan dan risiko intra harian harga-harga saham di Malaysia. Kemudahubahan pulangan adalah lebih tinggi di sessi pagi bagi kedua-dua jangkawaktu A dan B mengikut ukuran kadar sisihan piawai. Didapati juga sisihan piawai intra harian menunjukkan 2 kelok berbentuk-U yang ketara bagi jangkawaktu A (dimana urusniaga bermula dari jam 10.00 pagi dan berakhir pada jam 4.00 petang) dan juga satu kelok berbentuk-U bagi jangkawaktu B (dimana urusniaga bermula pada jam 9.30 pagi dan tamat jam 5.00 petang). Juga diperhatikan terdapat korelasi taraf yang memberi kesan ke atas kemudahubahan pulangan. Kemudahubahan jangkawaktu diperhatikan terutamanya jangkawaktu B yang nampaknya tekal dengan hipotesis gangguan urusniaga rasional sebagaimana dianjurkan oleh Kyle (1985), di mana maklumat dalaman diterapkan ke dalam harga pada akhir sessi urusniaga.

INTRODUCTION

In many previous studies in the developed markets, market volatility has been observed to be high near the opening and closing of the trading day. The phenomenon has been pointed by studies such as that of Wood, Mc Inish, Ord (1985), Harris (1986), Mc Inish and Wood (1990), Lockwood and Linn (1990), Gerety and Mulherin (1992). Harris (1986), for example, reported systematic intraday return patterns which are common to all of the weekdays and they are pervasive over time and over market value groups. The study by Mc Inish and Wood (1990) showed that the graph of variability of index return across days against time of day has a crude U-shaped pattern. They also examined the variability of intra-minute return across individual stocks. The graph of variance of intra-minute return across stocks against the time of the trading day is also shown to have a crude U-shaped pattern. Their empirical results are also consistent with the view that differences in variance of intraday return across stocks can be explained by differences in market return over the trading day.

Market volatility has also been found to fall from the opening hour until early afternoon and rises thereafter and significantly greater for intraday versus overnight periods [Lockwood and Linn (1990)]. Lockwood and Linn (1990) also showed that market variance changed significantly over time.

Chang et al. (1993) observed a rapid decline of volatility as trade proceeds for Tokyo Stock Exchange with a U-curve pattern observed in the morning and afternoon trading sessions. The results of the study are consistent with the rational trading noise hypothesis proposed by Kyle (1985), and Admati and Pfleiderer (1988), where a rapid decline of volatility is observed as trade proceeds. This decline mirrors the phenomenon that informed traders' private information is assimilated into securities prices and the prices converge to unbiased estimates of the securities' underlying value. Chang et al. (1993) also reported that price reversals are more frequent and much larger during the bull market period than during the bear market period.

Cheung, Ho, Pope, et al (1994) also observed a double U- Shaped curve of the Hong Kong intraday return variance pattern. Their study confirms the double U-shaped pattern simply reflects the two active trading sessions with a lunch break in between.

In light of the above findings, this study will attempt to examine the intraday behavior of the Malaysian common stock using the KLSE Composite Index, a value weighted index of 85 stocks which is considered to be representive of the Malaysian Stock Market. It will provide an additional evidance about the nature of return-generating procees in the KLSE.

METHODOLOGY

The study is done using the KLSE Composite Index. The data consist of the return on the 15-minutes interval observations of the KLSE for two different trading periods: Period A and Period B. Period A is from February 19, 1991 to July 21, 1992 of which the morning session is from 10.00am to 12.30pm and the afternoon session is from 2.30pm to 4.00pm. Period B, on the other hand, is from July 22, 1992 to December 31, 1992 of which the morning session is from 9.30am to 12.30pm while the afternoon session is from 2.30pm to 5.00pm.

For the statistical measures of the distribution, we used the average return (mean), standard deviations, skewness and kurtosis.

Return is calculated as:

$$R_t = \text{Log}(I_t/I_{t-1})*100$$

where,

R_t is the return for period t,

I_t is the index at time t,

(I_{t-1}) is the index at the time t-1.

The distributions of return are tested for normality using goodness-of-fit test based on skewness and kurtosis. For normal populations both the skewness and kurtosis statistics approximate zero. To form a joint test, normality is rejected if either the skewness or kurtosis exceeds its respective critical value. In fact the distribution of return are found to be non normal.

The correlation is to test for the price change relation between the intervals. Since the normality is rejected we used the spearman's correlation which is defined as

$$p = \frac{\sum R_{xi} R_{yi} - C}{\{\sum R^2_{xi} - C\}^{1/2} \{\sum R^2_{yi} - C\}^{1/2}}$$

where,

P is the Spearman's Correlation,
R_{xi} represents the ranks of x_i,
R_{yi} represents the rank of y_i
n represents the sample size.

$$C = \frac{n(n+1)^2}{4}$$

FINDINGS

THE PATTERNS OF THE INTRADAY RETURNS FOR PERIOD A

Table 1 presents the summary statistics for intraday average return for period A. Figure Ia illustrates graphically the result. The result is similar to intraday return behavior observed in the NYSE [Wood, Mc Inish, and Ord (1985), Lockwood and Linn (1990), and Gerety and Mulherin (1992) and TSE (Chang, et al. (1993)]. Intraday average return tends to be large at the beginning (0.17663%) and at one hour before the end of the morning session (0.39009%). However the return in the afternoon session is negative, fluctuating gradually towards positive return approaching the closing of the day.

The results of the standard deviations of the intraday 15-minutes return are plotted in graph form as shown in Figure Ib. The standard deviations of the intraday 15-minutes return are large at the beginning of the session (1.50551%) and peaked at 11.30 am (6.43610%) and decline sharply within 15 minutes to 0.08845% at 11.45am. The standard deviations remain low throughout the afternoon session until about 15 minutes before the closing of the day in which they begin to rise to close to about the same as at the beginning of the morning session (1.20034%). The standard deviations show a major double U-shaped curve throughout the two sessions.

Skewness and kurtosis measures are shown to be non-normal distribution for each interval and not stable for all sessions. The coefficients of kurtosis are mostly positive during both period, indicating that the distributions are more peaked near their center.

TABLE 1 . Summary Statistics for IntradayAverage Returns for Period A

Time	Average Return	Standard Deviation	Kurtosis	Skewness
10.15	0.17663	1.50551	192.792	13.104
10.30	0.00198	0.16208	2.552	- 0.043
10.45	-0.02772	0.14564	8.439	- 1.094
11.00	-0.03878	0.14158	125.099	- 3.505
11.15	-0.20671	3.18641	250.326	-15.811
11.30	0.39009	6.4361	250.853	15.836
11.45	-0.01180	0.08845	7.159	0.366
12.00	-0.01190	0.15817	78.438	-6.692
12.15	0.00019	0.17453	73.790	3.964
12.30	-0.01172	0.27064	104.664	-9.167
2.45	-0.00102	0.29494	79.947	4.050
3.00	-0.02154	0.21354	79.312	-6.707
3.15	-0.01381	0.13305	18.690	-1.935
3.30	-0.00177	0.15240	21.547	3.020
3.45	0.00794	0.21602	109.384	8.622
4.00	0.00345	1.20034	237.552	-15.188

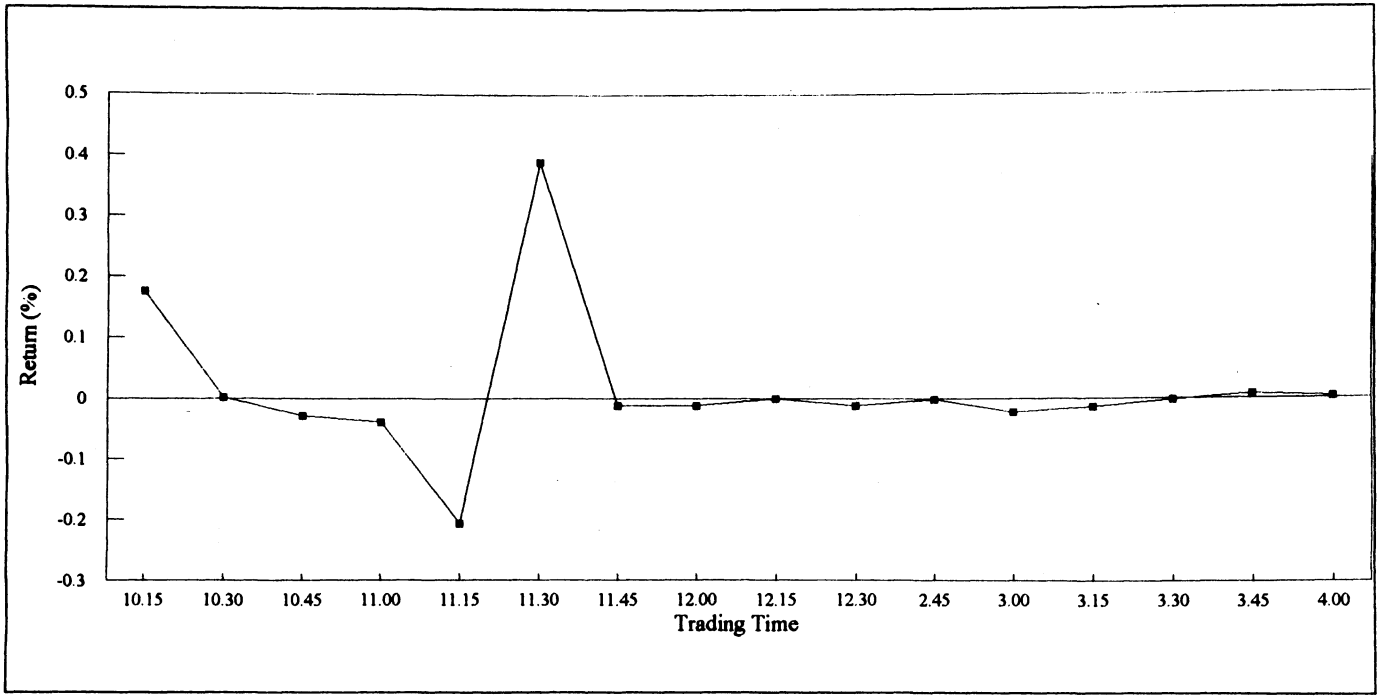

FIGURE Ia : The Mean Return For Period A

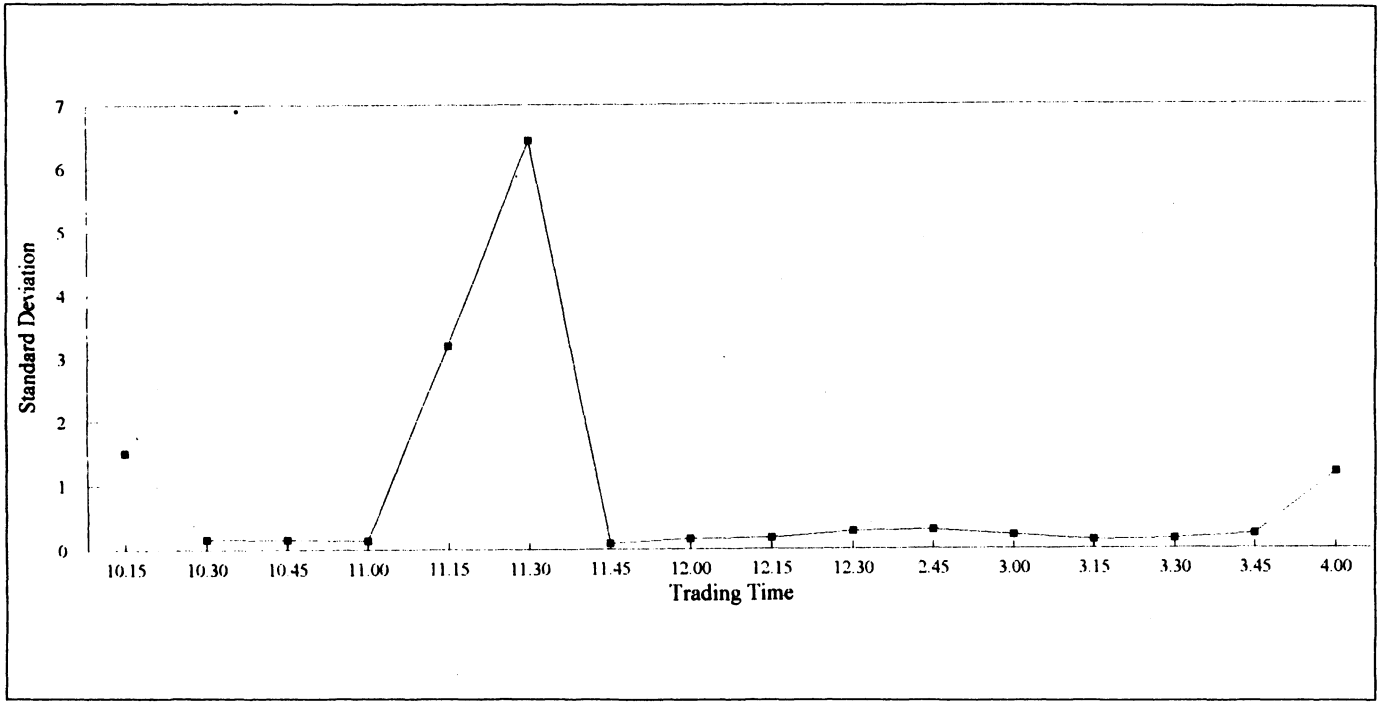

FIGURE Ib : Standard Deviations Of The Return For Period A

THE PATTERNS OF THE INTRADAY RETURNS FOR PERIOD B

Table 2 presents the summary statistics for intraday average return for period B. Figure IIa illustrates the results. The results are similar to the intraday return behavior observed in the NYSE and TSE. However, unlike period A, period B shows the typical behavioral patterns to occur in both morning and afternoon sessions. The return is large in the first 15 minutes of trading after the market opens in the morning (0.04423%) and declines to a negative return at 10.15am through 11.00am except for a very small positive return at 10.30am (0.00001%). Then the return from 11.30am is positive but very minimal until it drops sharply at 12.15pm (-0.38575%). Then after, it rises sharply and peaked at the closing of the morning session (12.30pm) a return of 0.71040%. Unlike period A, the first 30 minutes return in the afternoon session are positives. Then after, the returns decline to a negative return with a biggest negative return occurs at 3.45pm (-0.41570%). It rises sharply within 15 minutes to peak at 4.00pm, giving the largest return for the day (0.76685%). It drops sharply during the next 15 minutes to -0.00783%, then again gradually rises to peak at the closing of the day for a return of 0.08945%.

The standard deviations of the intraday 15-minutes return also show a U-shaped curve for the two sessions but the pattern is similar to the average return shape, where there are two high peaks. The first peak occurs at 12.30pm (i.e., is the same as time as the peak of the averagereturns). The second peak occurs at 4.00pm (i.e., the same time as the peak of average return). The results are plotted in the graph form as showned in Figure IIb.

Skewness and kurtosis measures also are shown to be non-normal distribution for each interval and not stable for all sessions. The coefficients of kurtosis are mostly positive during both period, indicating that the distributions are more peaked near their centre. However Period A has more negative skewness than Period B indicating the distribution is more to the right during this period.

TABLE 2 . Summarry Statistic for Intraday Average Returns for Period B

Time	Average Return	Standard Deviation	Kurtosis	Skewness
9.45	0.04423	0.35451	24.262	- 3.48
10.00	0.02677	0.33581	75.026	7.88
10.15	-0.04468	0.31053	82.856	- 8.49
11.30	0.00001	0.11238	11.136	2.11
11.45	-0.02656	3.11333	3.889	0.20
11.00	-0.01684	0.07952	1.104	- 0.04
11.15	-0.00273	0.08384	2.305	0.68
11.30	0.00991	0.09849	4.534	1.46
11.45	0.00437	0.09188	5.075	0.39
12.00	-0.00181	0.09485	5.314	- 1.04
12.15	-0.38575	4.37775	110.550	-10.50
12.30	0.71040	8.12093	110.044	10.47
2.45	0.04867	0.50444	96.862	9.50
3.00	0.01418	0.20589	41.295	5.10
3.15	-0.02725	0.11411	6.469	0.88
3.30	-0.03004	0.20377	47.642	-5.31
3.45	-0.41570	4.36353	110.912	-10.53
4.00	0.76685	8.06394	110.961	10.53
4.15	-0.00783	0.11000	4.564	- 0.56
4.30	0.01744	0.19000	2.356	0.89
4.45	0.00200	0.10000	1.948	0.26
5.00	0.08945	0.16000	1.160	- 0.02

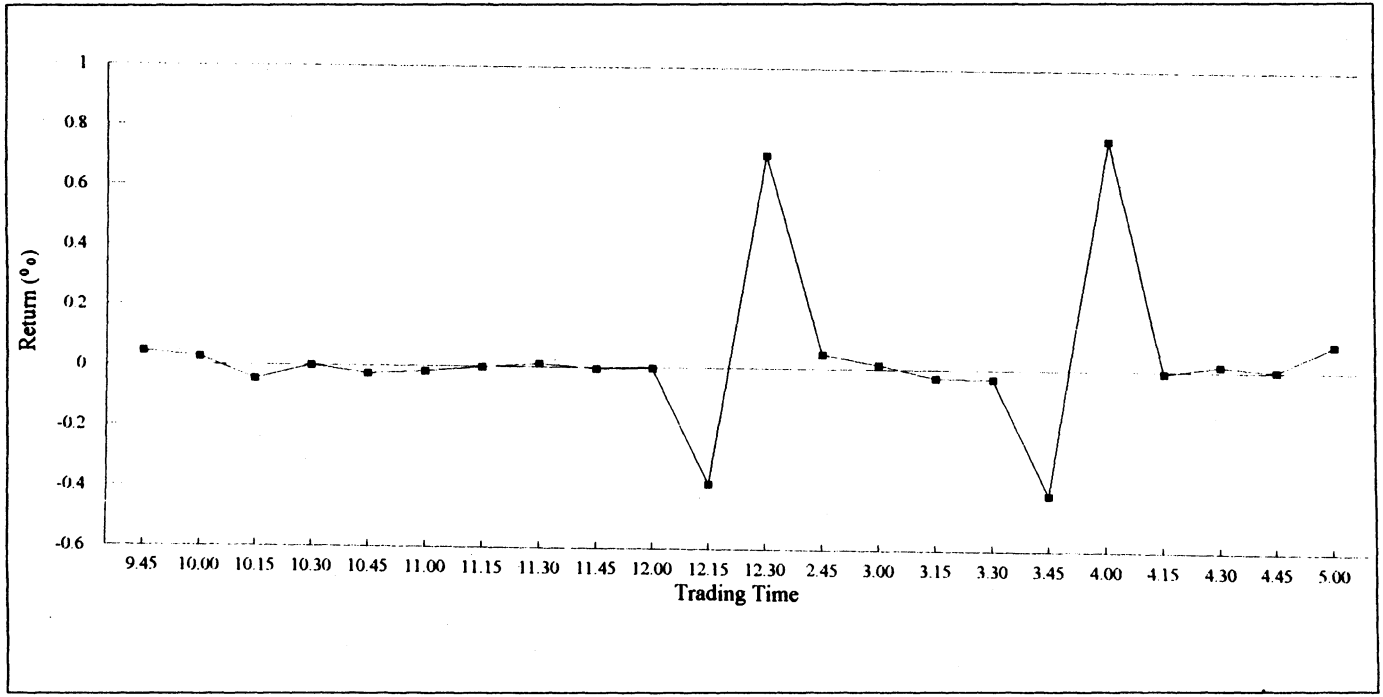

FIGURE IIa : The Mean Return For Period B

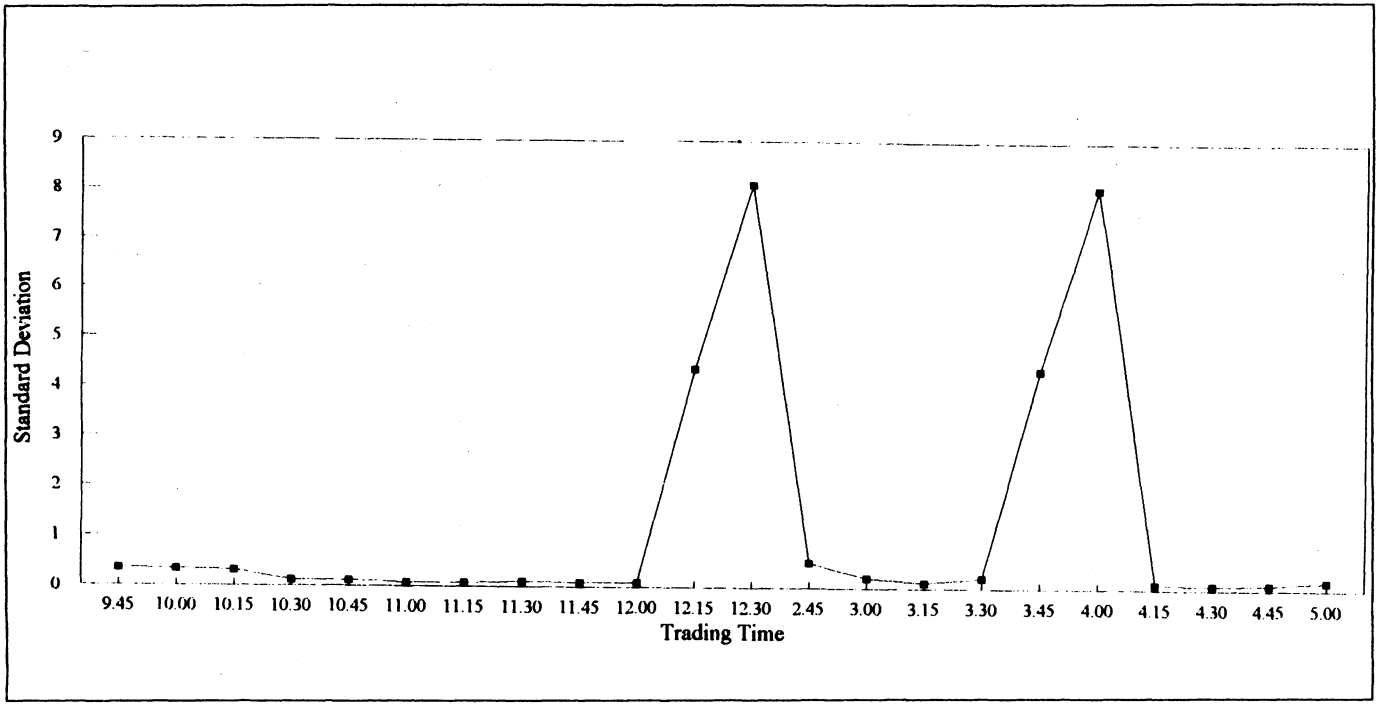

FIGURE II b : Standard Deviations Of The Return For Period B

RANK CORRELATION BETWEEN INTERVALS

Table 3 presents the matrix rank correlation between the intervals for period A. It is observed that the positive significant (denoted as *) seems to be dispersed throughout the session. This implies the relative influence of the preceding interval/intervals towards the next interval's return for the whole session. The negative rank correlation is observed between 4.00pm with 10.30am through 3.00pm but only one interval is significant i.e., between 4.00pm with 11.00 am.

Table 4 presents the matrix rank correlation between the intervals for period B. The positive significant (denoted as *) seem to be dispersed throughout the morning session and cluster around 2.45 through 3.15 to 11.45am through 2.45pm. This implies the relative influence of the preceding interval/intervals towards the next interval's return for the morning session and also at early opening of the afternoon session. However, a few significant negative rank correlations are observed between 10.30 am with 5.00 pm, 10.45am with 3.30pm, 3.45 with 11.15 and 12.30, and 4.45 with 12.15 and 12.30. These imply that there are some negative influence by the afternoon session. The negative rank correlations suggest that some prices set during the afternoon reverses the return set at the late morning session.

TABLE 3. The Matrix Rank - Correlation For Period A

TIME	S1 10 15	S2 10 30	S3 10 45	S4 11 00	S5 11 15	S6 11 30	S7 11 45	S8 12 00	S9 12 15	S10 12 30	S11 2 45	S12 3 00	S13 3 15	S14 3 30	S15 3 45	S16 4 00
10 15 S1	1 00000 0 0000 115	0 40654 0 0001 *115	0 21179 0 0231 *115	0 08872 0 3457 115	0 08515 0 3655 115	0 00097 0 9918 115	0 00029 0 9975 115	0 17282 0 0648 115	0 19431 0 0374 *115	0 16544 0 0772 115	0 25008 0 0070 *115	0 24838 0 0074 *115	0 09883 0 2933 115	0 02161 0 8187 115	0 05822 0 5365 115	0 04892 0 6036 115
10 30 S2		1 00000 0 0000 116	0 54313 0 0001 *116	0 29317 0 0014 *116	0 29666 0 0012 *116	0 24923 0 0070 *116	0 02068 0 8256 116	0 16295 0 0805 116	0 22862 0 0136 *116	0 13493 0 1487 116	0 28135 0 0022 *116	0 21816 0 0186 *116	0 20730 0 0256 *116	0 02832 0 7628 116	0 15792 0 0904 116	-0 10579 0 2584 116
10 45 S3			1 00000 0 0000 116	0 45270 0 0001 *116	0 36291 0 0001 *116	0 35861 0 0001 *116	0 11607 0 2147 116	0 19259 0 0383 *116	0 16112 0 0840 116	0 08902 0 3420 116	0 30402 0 0009 *116	0 21437 0 0208 *116	0 14199 0 1284 116	-0 08664 0 3551 116	0 06616 0 4804 116	-0 0818 0 3827 116
11 00 S4				1 00000 0 0000 116	0 41302 0 0001 *116	0 41080 0 0001 *116	0 23113 0 0125 *116	0 19308 0 0378 *116	0 13633 0 1445 116	0 18177 0 0508 116	0 33822 0 0002 *116	0 23582 0 0108 *116	0 19216 0 0388 *116	0 07682 0 4124 116	0 03999 0 67 116	-0 20689 0 0259 *116
11 15 S5					1 00000 0 0000 116	0 31892 0 0005 *116	0 30033 0 0011 *116	0 33358 0 0001 *116	0 26038 0 0047 *116	0 31507 0 0006 *116	0 33327 0 0001 *116	0 31142 0 0007 *116	0 37148 0 0001 *116	0 21974 0 0178 *116	0 16825 0 071 116	0 08458 0 3667 116
11 30 S6						1 00000 0 0000 116	0 34345 0 0002 *116	0 14795 0 1130 116	0 27799 0 0025 *116	0 14002 0 1338 116	0 27846 0 0025 *116	0 23195 0 0122 *116	0 18566 0 0460 *116	0 15581 0 0949 116	0 30995 0 0007 *116	-0 10412 0 266 116
11 45 S7							1 00000 0 0000 116	0 18417 0 0416 *116	0 28453 0 0013 *116	0 13542 0 1475 116	0 23401 0 0115 *116	0 18044 0 0526 116	0 26453 0 0041 *116	0 13597 0 1456 116	0 28214 0 0021 *116	0 03411 0 7163 116
12 00 S8								1 00000 0 0000 116	0 33987 0 0002 *116	0 32653 0 0003 *116	0 48959 0 0001 *116	0 23542 0 0110 *116	0 31533 0 0006 *116	0 23381 0 0115 *116	0 12512 0 1808 116	-0 08655 0 3556 116
12 15 S9									1 00000 0 0000 116	0 38559 0 0001 *116	0 38430 0 0001 *116	0 37360 0 0001 *116	0 33648 0 0002 *116	0 26257 0 0044 *116	0 22424 0 0155 *116	-0 02835 0 7626 116
12 30 S10										1 00000 0 0000 116	0 33890 0 0002 *116	0 48093 0 0001 *116	0 35923 0 0001 *116	0 10560 0 2593 116	0 19079 0 0402 *116	-0 13704 0 1424 116
2 45 S11											1 00000 0 0000 116	0 45569 0 0001 *116	0 48596 0 0001 *116	0 312594 0 0006 *116	0 21807 0 0187 *116	-0 12547 0 1796 116
3 00 S12												1 00000 0 0000 116	0 41259 0 0001 *116	0 21262 0 0219 *116	0 1599 0 0864 116	-0 00475 0 9596 116
3 15 S13													1 00000 0 0000 116	0 26718 0 0037 *116	0 32183 0 0004 *116	0 10192 0 2763 116
3 30 S14														1 00000 0 0000 116	0 23691 0 0105 *116	0 02583 0 7831 116
3 45 S15															1 00000 0 0000 116	0 02503 0 7897 116
4 00 S16																1 00000 0 0000 116

TABLE 4. The Matrix Rank - Correlation For Period B

MASA	9:45 S1	10:00 S2	10:15 S3	10:30 S4	10:45 S5	11:00 S6	11:15 S7	11:30 S8	11:45 S9	12:00 S10	12:15 S11
9:45	1.00000 0.0000 245	0.20326 0.0001 *245	0.18724 0.0033 *245	0.00600 0.9146 245	0.03402 0.5962 245	0.03484 0.5873 245	-0.02303 0.7105 245	0.08620 0.1787 245	0.10754 0.0931 245	0.17176 0.0070 *245	0.14180 0.0264 *245
10:00		1.00000 0.0000 246	0.20324 0.0001 *246	0.21405 0.0007 *246	0.07705 0.2250 246	0.14874 0.0213 *246	0.14565 0.0215 *246	-0.01270 0.8429 246	0.07104 0.2670 246	0.03711 0.5624 246	0.14390 0.0240 *246
10:15			1.00000 0.0000 246	0.15715 0.0138 *246	0.14032 0.0278 *246	0.12817 0.0481 *246	0.11322 0.0763 246	0.10887 0.0884 246	0.18827 0.0030 *246	0.17330 0.0064 *246	0.19167 0.0025 *246
10:30				1.00000 0.0000 246	0.11308 0.0787 246	0.09562 0.1348 246	0.08494 0.1842 246	0.12540 0.0495 *246	0.06530 0.3071 246	-0.00607 0.9246 246	0.09238 0.1485 246
10:45					1.00000 0.0000 246	0.10354 0.1052 246	0.15512 0.0149 *246	0.11800 0.0851 246	0.13471 0.0347 *246	0.03882 0.5331 246	0.04833 0.4504 246
11:00						1.00000 0.0000 246	0.13674 0.0320 *246	0.22111 0.0005 *246	0.16184 0.0111 *246	0.20395 0.0013 *246	0.18830 0.0020 *246
11:15							1.00000 0.0000 246	0.07575 0.2365 246	0.10033 0.1165 246	0.18890 0.0029 *246	0.09225 0.1492 246
11:30								1.00000 0.0000 246	0.02701 0.6733 246	0.22650 0.0003 *246	0.18286 0.0040 *246
11:45									1.00000 0.0000 246	0.07139 0.2647 246	0.03060 0.6329 246
12:00										1.00000 0.0000 246	0.18061 0.0045 *246
12:15											1.00000 0.0000 246

MASA	12:30 S12	2:45 S13	3:00 S14	3:15 S15	3:30 S16	3:45 S17	4:00 S18	4:15 S19	4:30 S20	4:45 S21	5:00 S22
9:45	0.26781 0.0001 *245	0.21183 0.0009 *245	0.02556 0.6905 245	0.04413 0.4917 245	0.00850 0.8947 245	0.04093 0.6711 110	-0.07286 0.4488 110	0.12961 0.1772 110	-0.02100 0.8204 110	-0.13319 0.1654 110	0.02102 0.8283 108
10:00	0.15512 0.0149 *246	0.14048 0.0278 *246	0.15478 0.0151 *246	0.07777 0.2242 246	0.06206 0.3324 246	0.10186 0.2884 111	0.02181 0.8203 111	-0.05581 0.5621 111	0.06788 0.4804 111	-0.11320 0.2365 111	-0.08212 0.3937 110
10:15	0.22828 0.0003 *246	0.11427 0.0736 246	0.00118 0.9853 246	0.11256 0.0781 246	0.01324 0.8363 246	-0.16207 0.0892 111	0.01832 0.8487 111	0.09482 0.3283 111	0.0325 0.7348 111	-0.11257 0.2395 111	-0.17484 0.068 110
10:30	0.15500 0.0148 *246	0.09095 0.1550 246	0.02981 0.6507 246	0.01790 0.7800 246	-0.03564 0.578 246	-0.09069 0.3438 111	-0.03878 0.6785 111	-0.06478 0.4995 111	-0.02231 0.8162 111	0.08613 0.3687 111	-0.28187 0.0029 *110
10:45	0.09083 0.1555 246	0.04385 0.4836 246	-0.04787 0.4624 246	0.19351 0.0023 *246	-0.13205 0.0305 *246	-0.10905 0.2546 111	0.00156 0.3302 111	-0.11258 0.2305 111	-0.05628 0.5574 111	-0.01881 0.8602 111	-0.18341 0.0881 110
11:00	0.15582 0.0144 *246	-0.02382 0.7089 246	0.08488 0.1855 246	0.07183 0.2610 246	0.01324 0.8383 246	-0.14794 0.1213 111	-0.11844 0.2157 111	-0.08783 0.4888 111	0.08838 0.5201 111	-0.02342 0.8072 111	-0.01551 0.8722 110
11:15	0.11341 0.0758 246	0.09017 0.1585 246	0.12348 0.0531 246	0.06806 0.2877 246	-0.07235 0.2583 246	0.33021 0.0004 *111	0.00847 0.9297 111	0.08968 0.3492 111	0.05637 0.5571 111	0.04283 0.6554 111	0.0167 0.8625 110
11:30	0.05278 0.4098 246	-0.00153 0.9809 246	0.08435 0.3148 246	0.02018 0.7528 246	-0.05300 0.4071 246	-0.11241 0.2401 111	-0.0338 0.7238 111	0.00054 0.9955 111	0.07633 0.4258 111	0.07265 0.4486 111	0.00667 0.9449 110
11:45	0.10611 0.0968 246	0.11388 0.0746 246	0.09523 0.1364 246	0.14150 0.0265 *246	-0.07034 0.2718 246	-0.02308 0.8037 111	0.27021 0.0041 *111	0.03683 0.7011 111	-0.04746 0.6209 111	0.07101 0.4589 111	0.06094 0.5271 110
12:00	0.21824 0.0005 *246	0.18286 0.0040 *246	0.10538 0.0982 246	0.05273 0.4103 246	-0.02708 0.6634 246	-0.05581 0.56 111	-0.11804 0.2134 111	0.01487 0.8761 111	0.01531 0.8733 111	-0.0003 0.4699 111	-0.08880 0.3504 110
12:15	0.27080 0.0011 *246	0.07450 0.2443 246	0.177 0.0054 *246	0.10006 0.0000 246	0.00328 0.1031 246	-0.13533 0.1587 111	-0.04711 0.6234 111	-0.03082 0.6774 111	0.11181 0.2435 111	-0.22420 0.018 *111	-0.11800 0.2118 110
12:30	1.00000 0.0000 246	0.12800 0.0431 *246	0.18314 0.0104 *246	0.21235 0.0008 *246	0.11190 0.0786 246	-0.20828 0.0288 *111	-0.05808 0.5850 111	0.10646 0.2661 111	0.00880 0.9186 111	-0.19480 0.0483 *111	-0.06254 0.5163 110
2:45		1.00000 0.0000 246	0.1287 0.0437 *246	0.17704 0.0052 *246	-0.05181 0.4186 246	-0.08041 0.4015 111	0.04004 0.6807 111	0.12280 0.1806 111	-0.1454 0.1278 111	-0.10584 0.2689 111	-0.08867 0.8204 110
3:00			1.00000 0.0000 246	0.08628 0.1321 246	0.11572 0.0700 246	-0.00124 0.9007 111	-0.07081 0.4118 111	-0.10525 0.2718 111	-0.02108 0.8281 111	-0.11087 0.2482 111	-0.09086 0.3482 110
3:15				1.00000 0.0000 246	-0.01785 0.7805 246	-0.05238 0.5857 111	0.10180 0.0900 111	0.08388 0.8077 111	-0.04887 0.6244 111	-0.01754 0.8550 111	0.04880 0.8112 110
3:30					1.00000 0.0000 246	0.02145 0.8232 111	-0.08884 0.3648 111	0.03438 0.7208 111	-0.08171 0.5208 111	-0.17522 0.0658 111	-0.08158 0.3413 110
3:45						1.00000 0.0000 111	0.05447 0.5702 111	0.15133 0.1128 111	0.11088 0.247 111	-0.03728 0.6978 111	0.04522 0.638 110
4:00							1.00000 0.0000 111	-0.04083 0.6688 111	0.01071 0.9112 111	0.05865 0.5408 111	0.10754 0.2634 110
4:15								1.00000 0.0000 111	-0.12485 0.1945 111	-0.03843 0.7043 111	0.02080 0.8285 110
4:30									1.00000 0.0000 111	-0.02108 0.8197 111	-0.03672 0.7110 110
4:45										1.00000 0.0000 111	0.01880 0.8447 110
5:00											1.00000 0.0000 110

VOLATILITY IN THE DIFFERENT TRADING TIME

The volatility for the different trading time for both periods, A and B, is compared using the standard deviation data for four particular time, morning open (M.0), morning close (M.C), afternoon open (A.O) and afternoon close (A.C).

TABLE 5. Standard deviations for Selected Trading Time

Period A Time	Designation	Std. Deviation
10:15	Morning Open (M.O)	1.50551
12:30	Morning Close (M.C)	0.27064
02:45	Afternoon Open (A.O)	0.29494
04:00	Afternoon Close (A.C)	1.20034
Period B Time	**Designation**	**Std. Deviation**
09:45	Morning Open (M.O)	0.35451
12:30	Morning Close (M.C)	8.12093
02:45	Afternoon Open (A.O)	0.50444
05:00	Afternoon Close (A.C)	1.16000

From the data above (table 5), the differences in return volatility between trading times are compared using the ratio of the standard deviation (S.D) as shown in table 6.

TABLE 6. Standard Deviation (S.D) Ratios for Selected Trading Time

No.	Trading Time	S.D Ratios Period A	Period B
1.	M.O to M.C	5.5628	0.0437
2.	M.O to A.O	5.1045	0.7028
3.	M.C to A.C	1.2542	2.2157
4.	M.C to A.O	0.9176	16.0989
5.	M.C to A.C	0.2255	50.7558
6.	A.O to A.C	0.2457	3.1528
7.	A.C to M.O	0.7973	0.4513

From table 6 above, we could see that the trading volatility for period A at the morning open is greater than the volatility at the morning close, the afternoon open, and the afternoon close by the ratio of 5.5628, 5.1045, and 1.2542 respectively. This shows that the volatility of the return is greater in the morning session and as the information flows during the trading session, the volatility decreases until at the closing time when it peaks up again.

As for period B, the volatility shows a different pattern from period A. The volatility is lower at the morning open as compared to morning close and afternoon open by the ratio of 0.0437 and 0.7028, respectively, but it is higher than the afternoon close by the ratio of 2.2157. This phenomenon probably occurs due to longer trading hours for session B which affects the mood of the investors toward the information disclosed.

The effect of the lengthening of the trading session in period B as compared to period A is clearly demonstrated by the volatility behavior for trading time M.C to A.C, A.O and A.C and A.C to M.O where in period A the volatility trend is up from 0.2255 to 0.2457 to 0.7973, respectively. Whereas for period B the trend is down, from 50.7558 to 3.1528 to 0.4513, respectively. There is a very interesting phenomenon occurs in period B where the volatility of "M.C to A.C" compare to "A.O to A.C" has shown a very sharp drop which might give an indication that the information flows during recess time (12.30 to 2.30) has very great influence.

CONCLUSIONS

This study examines the intraday return, risk and correlation of Malaysian stocks between the 15-minutes intervals using the KLSE composite index. The analysis is divided into two different trading period: (I) Period A - from 10.00am to 4.00pm, (II) Period B - from 9.30am to 5.00pm. For period A, it is observed that the intraday standard deviations show two distinct U-shaped curves which indicate the high uncertainty traders face in the late morning between 11.00am to 11.45am. For period B, it is also observed that a U-shaped curve intraday standard deviation with high return and volatility at the mid between 12.00pm to 2.45pm and near the closing of the trading session (between 3.30pm to 4.15pm). The skewness and kurtosis measures are shown to be non-normal. The rank correlation which affect index return volatility especially for period A and in the morning session of period B plus a small cluster effect in the afternoon session of period B, imply the relative influence of the preceding interval/intervals over the next interval for the whole sessions. The observed volatility especially in the later period (Period B) seems to be consistent with the rational trading noise hypothesis proposed by Kyle (1985), where the insider's private information is assimilated into securities prices, and the price converge to unbiased estimates of the securities underlying value towards the end of the trading session.

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