

## INFORMATION CONTENT OF INSIDER TRADING VOLUMES IN COLOMBO STOCK EXCHANGE

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### ABSTRACT

The information asymmetry between insiders and outsiders suggests that insiders may trade in large volumes when they have access to unpublished information that cannot be accessed by outsiders. Insiders may purchase (sell) securities in large volumes when they are aware of good (bad) news. Hence, the market could perceive that higher the trading volumes of insiders, higher would be the level of information content that underlies it. Accordingly, this study examines whether high trading volumes of directors' are more informative than low trading volumes of directors' and whether the market adjusts the security prices for this information immediately. This study analyzes a sample of high volume and low volume directors' purchases and sales reported to the Colombo Stock Exchange (CSE) during September, 2004 to August, 2012 using the standard event study methodology. The findings of the trading volume sample are consistent with the hypothesis that high volume directors' purchases (sales) are associated with more positive (negative) abnormal returns. However, only the excess abnormal returns of high volume directors' purchases are positive and significant on the event day. Further, the evidence implies that the market has reflected the high trading volumes of directors' purchases in security prices immediately around the event day and has reflected the high trading volume directors' sales during post event windows. The high trading percentage directors' purchases and sales have not been significantly informative on the event day as hypothesized whereas high trading percentage directors' sales have been significantly informative with a delay.

**Keywords:** *Abnormal trading volume, Abnormal returns, Information asymmetry, Insider trade, Market efficiency*

### INTRODUCTION

The Efficient Market Hypothesis (EMH) (Fama, 1970) assumes that all public information is reflected in market prices in the semi strong form efficient market and that trading volume does not play any role in that market. However, empirical evidence suggests that price changes and trading volume changes are not necessarily related to new information disclosure as market efficiency would imply. The stock markets often show sudden and large changes in prices and trading volumes without any new information disclosure, which could be attributed to the trades done by informed insiders.

Hence, information signaling hypothesis implies that insiders purchase (sell) securities when they are aware of good (bad) news (Louis, Sun, & White, 2010). Furthermore, the evidence suggests that the insiders tend to trade in large volumes when they are aware of more positive or negative information (Easley & O'Hara, 1992). Accordingly, the market could perceive that higher the trading volumes of insider purchases (sales), higher would be the level of positive (negative) information that underlie it.

The previous literature on insider trading reveals that insider purchases (sales) are associated with positive (negative) abnormal returns in the US market (Lakonishok & Lee, 2001), in Hong Kong market (Cheung, Wong & Wu, 2000), in UK market (Aktas, De Bodt, De Smedt & Riachi, 2007) and in New Zealand market (Etebari, Tourani-Rad & Gilbert, 2004). The evidence on trading volume first finds a significant and positive correlation between trading volume and the absolute value of price changes (Comiskey, Walkling & Weeks, 1984) and confirms this relationship both in equity and futures markets (Karpoff, 1987; 1986). Easley and O'Hara (1992) and Bajo (2010) state that traders with unreported information would prefer to trade in large volumes. Hence, this trade imbalance arising in the market due to insiders' purchases or sales in the same side could force security prices to reflect the underlying information content of these trades (Glosten & Milgrom, 1985). Further, Wong (2002) finds that there are abnormally significant volume fluctuations in the pre event windows for good (bad) news in Hong Kong market which he attributes to the trades done by insiders.

In addition, empirical evidence on the trading percentage of insiders indicate that if a significant proportion of the securities market turnover of a security within a particular day includes insider trades and insiders have a wide ownership on that security, outsiders consider these trades as more informative (Frankel & Li, 2004). In this regard, Bajo and Petracci (2006) confirm a positive relationship between the change of holding of the insiders and the sign of the securities market movement while Seyhun (1986) also confirms a positive relationship between the proportion of the firm traded and the insiders' abnormal returns.

However, the evidence on market reaction to insider trading information is not consistent. The US market has shown a delayed reaction in the long term for insider trades (Seyhun, 1986; Lakonishok & Lee, 2001). The Italian market (Barucci, Bianchi & Manconi, 2006), and the Hong Kong market (Cheung et al., 2000) have reacted in the short term for the information content of insider trades. Furthermore, in the Italian market, Bajo (2010) found that the market immediately reacted to the information content of abnormal trading volumes whereas Bajo and Petracci (2006) reported that the market reacted for the information content of change in holding percentages of insiders with a delay.

In the Colombo Stock Exchange, Perera and Nimal (2013) have found supportive evidence only under Risk Adjusted Return (RAR) model for the hypothesis that abnormal returns for directors' purchases are positive. The findings on directors' purchases under Market Adjusted Return (MAR) model are not significant and in contrary to the hypothesis that the abnormal returns for directors' sales are positive under both MAR and RAR models. Further, Pathirawasam (2011) discloses that stock returns are positively related to the contemporary changes in trading volume and the past trading volume change is negatively related to stock returns. However, the CSE does not provide consistent evidence on market efficiency. Dissabandara (2001) indicates that the CSE reacts with a delay for an increase or decrease in dividends; Gunathilake and Kongahawatte (2011) report that the CSE reacts to the information content of stock splits immediately on the event day.

However, it is hard to find any published evidences analyzing the information content of abnormal trading volumes of insiders in the CSE. Thus, studying the information content of abnormal trading volumes of insiders and the market reaction to such information would be an interesting topic to be tested in the Sri Lankan capital market.

Accordingly, this study would first analyze whether the high trading volumes of directors purchases (sales) are more informative than the low trading volumes of directors purchases (sales) and whether the high trading percentages of directors' purchases (sales) are

more informative than the low trading percentages of directors' purchases (sales). Finally, this study intends to analyze whether the market immediately adjusts security prices to reflect the information content of abnormal trading volumes of directors.

### **Research Questions and Hypothesis**

The research questions and the hypotheses of this study would be as follows.

RQ1: Are large volumes of directors trading transactions more informative?

H<sub>1</sub>: Positive abnormal returns of high trading volume directors' purchases are greater than the positive abnormal returns of low trading volume directors' purchases

H<sub>2</sub>: Negative abnormal returns of high trading volume directors' sales are greater than the negative abnormal returns of low trading volume directors' sales

H<sub>3</sub>: Positive abnormal returns of high trading percentage directors' purchases are greater than the positive abnormal returns of low trading percentage directors' purchases

H<sub>4</sub>: Negative abnormal returns of high trading percentage directors' sales are greater than the negative abnormal returns of low trading percentage directors' sales

RQ2: Does the market immediately adjust security prices to reflect information content of directors' trading volume?

H<sub>5</sub>: Market adjusts securities prices rapidly to reflect information content of directors' trading volume and trading percentage

### **Research Design**

In accordance with the disclosure requirements of the CSE, the quoted public companies in Sri Lanka are required to disclose only the insider trades of directors. Therefore, this study analyzes only the disclosed insider purchases and insider sales of directors of the quoted public companies in the CSE in order to achieve the above mentioned objectives.

Depending on the availability of data, the sample period of this study is from September, 2004 to August, 2012. The sample consists of events of directors' purchases from 156 companies and event of directors' sales from 131 companies. There were 220 events of directors' purchases and 941 events of directors' sales in the sample. The study developed two sub samples based on Rupee trading volume of directors' and the trading percentage of directors' over the daily market turnover of that security. The sub samples included the highest 10% and the lowest 10% of directors' purchases (sales) ranked according to trading volumes and trading percentages of directors'. Accordingly, high/low trading volume and trading percentage directors' purchases samples included 220 events of directors' purchases while high/low trading volume and trading percentage directors' sales samples included 94 events of directors' sales. Further, directors' purchases (sales) carried out under Employee Share Option Schemes (ESOPs), Trust Deeds, Share Warrants and directors' trades of non-voting ordinary securities have been excluded from the sample. In addition, certain directors' trading events have been excluded due to thin trading problem.

If efficient, the market is expected to react to the high volume of directors' trades on the day of transaction. Literature on insider trading discloses that a larger abnormal return is

reported around the trading period of insider trades than in the reporting period (Lakonishok & Lee, 2001). Hence, this study also considers directors' trading date as the event date ( $t = 0$ ) instead of considering the reporting date.

Due to the high volume of events included in this study, it was not practical to set event windows for each security and for each event separately. Therefore, this study adopted a fixed event window for both directors' purchases and sales events and for all the companies. The studies on analyzing insider trading have adopted different event windows such as -21 to +21 days (Bajo & Petracci, 2006) and -20 to +20 (Barucci et al., 2006). The underlying assumption of this event window length is that the insider trades would be reflected in security prices within a shorter time horizon. Therefore, it is decided that a shorter event window would be appropriate to measure the impact of abnormal trading volume of directors in the CSE as well. Accordingly, this study uses a fixed event window of -20 to +20 days. Further, a fixed estimation window of 41 days before the pre event window is considered to estimate the beta of securities in order to measure the risk adjusted rate of return of each security of each event.

Since the degree of information asymmetry between insiders and outsiders cannot be measured directly, following Seyhun (1986) and Rozeff and Zaman (1988), this study also uses the profitability of directors' trades as the proxy to measure the impact of insider trading. The profitability is measured following the event study methodology of MacKinlay (1997) and Brown and Warner (1985). According to MacKinlay (1997), there are several choices for modeling the abnormal returns. This study adopts only the Risk Adjusted Return (RAR) Model. The abnormal return under that model is calculated as follows.

$$\begin{aligned} &\text{Abnormal return under the RAR Model} \\ \mathbf{AR}_{it} &= \mathbf{R}_{it} - [\mathbf{R}_{ft} + \beta_i(\mathbf{R}_{mt} - \mathbf{R}_{ft})] \end{aligned} \quad (1)$$

Where,

$\mathbf{AR}_{it}$  = Abnormal return for security  $i$  at day  $t$

$\mathbf{R}_{it}$  = Actual return for security  $i$  at day  $t$

$\mathbf{R}_{ft}$  = Risk free rate of return i.e. 91 days Treasury bill rate at day  $t$

$\mathbf{R}_{mt}$  = Actual return for the market portfolio at day  $t$

$\beta_i$  = Systematic risk of security  $i$

Actual returns of securities are calculated after adjusting for capital gains, dividend payments, bonus issues, stock splits and right issues assuming that all the returns are reinvested in the same security. Further, beta coefficients of securities for each event are estimated using the market model mentioned below.

$$\mathbf{R}_{it} = \mathbf{a}_i - \beta_i(\mathbf{R}_{mt}) \quad (2)$$

Where,  $t$  goes from -61 to -21

Then, the Average Abnormal Return (AAR) and Cumulative Average Abnormal Return (CAAR) for each day of the event window are calculated using the equations given below.

$$\mathbf{AAR}_t = \frac{1}{N} \sum_{i=1}^n \mathbf{AR}_{it} \quad (3)$$

$\mathbf{AAR}_t$  = Average Abnormal Return at day  $t$

$N$  = Total number of events

$$CAAR_{(t1, t2)} = \sum_{t=t1}^{t2} AAR_t \quad (4)$$

CAAR<sub>(t1,t2)</sub> = Cumulative Average Abnormal Return from t1 to t2

In this study, the excess AAR/ CAAR are calculated as the difference between the AAR/CAAR of high volume directors' trades sub sample and the AAR/CAAR of low volume directors' trades sub sample. The t statistics of excess AAR and excess CAAR are calculated following the MacKinlay (1997) and Brown and Warner (1985) and the significance of these statistics is tested using the standard t test.

The test statistic for AAR for any day t;

$$t \text{ stat} = \frac{\text{Excess } AAR_t}{\hat{S}(\text{Excess } AAR_t)} \quad (5)$$

$\hat{S}(\text{Excess } AAR_t)$  = Standard deviation of the Average Abnormal Returns at day t

The test statistic for CAAR for any day t;

$$t \text{ stat} = \frac{\text{Excess } CAAR_{(t1,t2)}}{[\sigma^2(t1,t2)]^{1/2}} \quad (6)$$

$\sigma^2(t1, t2)$  =  $L\sigma^2(\text{Excess } AAR_t)$

$\sigma^2(\text{Excess } AAR_t)$  = Variance of the one period mean abnormal return

L =  $t_2 - t_1 + 1$  (i.e. the horizon length of the event time)

## FINDINGS

Following the methodology explained in the previous section, excess AAR, excess CAAR and their respective t statistics for each day of the event period for directors' purchases and sales under trading volume and trading percentage sub samples are presented in Appendix 1 and 2 respectively and graphically depicted in Figures 1, 3 and 2, 4 respectively. These graphs display whether the market has shown an early reaction, immediate reaction or delayed reaction for the information content of directors' trading volumes and directors' trading percentages. Further, CAAR for directors' purchases and sales under both sub samples over different event windows are presented in Table 1 and 2 in order to identify how the directors' trading volumes and directors' trading percentages information of insider purchases and sales are reflected on market prices during the event period.

The findings of this study suggest that both the excess AAR and CAAR (Appendix 1) of high trading volume sample over low trading volume sample of directors' purchases are positive but excess AAR is significant at 5% only on the event day. The high trading volume directors' sales sample has reported an excess AAR and CAAR, both negative but not significant on the event day. However, negative excess AAR and CAAR reported for high trading volume directors' sales sample have been significant from three days and five days after the event respectively. Accordingly, these findings support the hypothesis that high trading volume directors' purchases would be associated with more positive abnormal returns and high trading volume directors' sales would be associated with more negative abnormal returns on the event day.

Furthermore, the findings of this study reveal that the high trading percentage sample over low the trading percentage sample of directors' purchases (has reported positive excess AAR and negative excess CAAR (Appendix 2) on the event day) and that neither are significant. The high trading percentage directors' sales sample has also reported positive

excess AAR and negative excess CAAR on the event day but neither of their are events of e significant. However, both directors’ purchases and sales of this high trading percentage sub sample have reported negative and significant AAR on the next day following the event day. It is worth nothing that even before the event as well, negative AAR and CAAR have been reported for both directors’ purchases and sales of the trading percentage sub sample. Accordingly, these findings support the hypothesis that high trading percentage directors’ purchases would be associated with more positive abnormal returns , but do not support the hypothesis that high trading percentage directors’ sales would be associated with more negative abnormal returns on the event day.

As far as market efficiency is concerned, the evidence suggests that the CSE seems to be efficient with regard to the reflection of information content of high trading volume directors’ purchases but delayed in reacting for the information content of high trading volume directors’ sales. In addition, the CSE seems to be efficient with regard to the reflection of information content of high trading percentage directors’ purchases but delayed in reflecting the information content of high trading percentage directors’ sales.

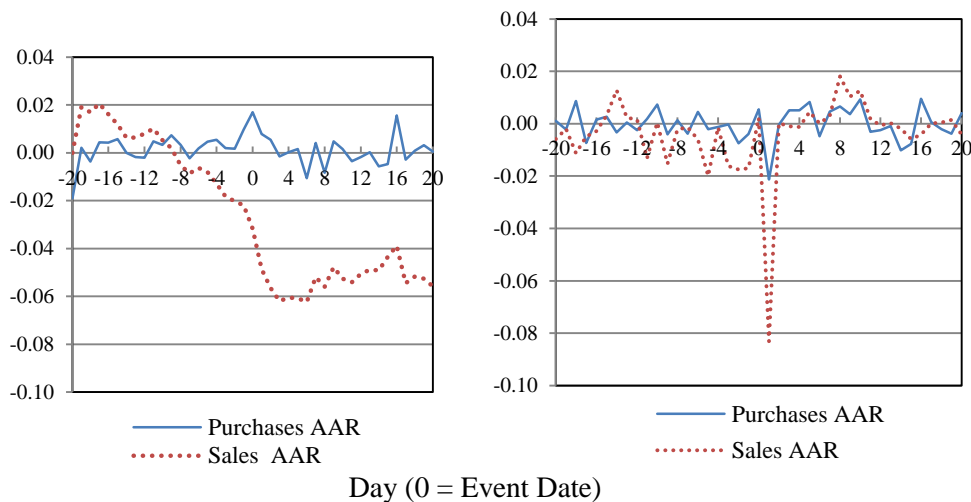


Figure 1 - Excess AAR of Trading Volume Percentage      Figure 2 - Excess AAR of Trading Percentage

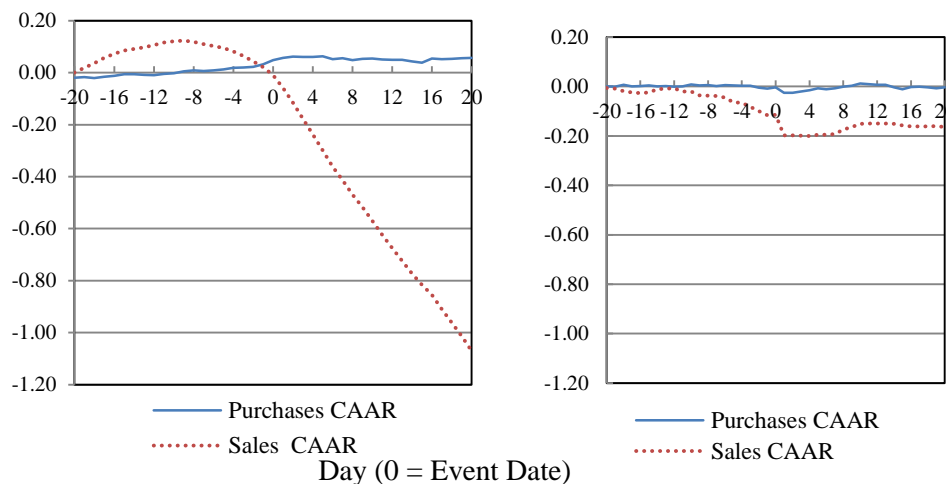


Figure 3 - Excess CAAR of Trading Volume Percentage      Figure 4 - Excess CAAR of Trading Percentage

Table 1 - Excess CAAR for different windows for directors' trading volume sub sample

Event Window	L	Purchases			Sales		
		CAAR	t stat	(+) Returns %	CAAR	t stat	(+) Returns %
W 1 = (-20, -1)	20	0.0317	1.13	45.00%	0.0214	0.17	100.00%
W 2 = (-10, -1)	10	0.0370	1.86	90.00%	-0.0942	-1.03	100.00%
W 3 = (-1, 0)	2	0.0267	3.00*	100.00%	-0.0537	-1.32	50.00%
W 4 = (0, +1)	2	0.0248	2.79*	100.00%	-0.0804	-1.97*	0.00%
W 5 = (-1, +1)	3	0.0345	3.17*	100.00%	-0.1023	-2.05*	66.67%
W 6 = (+1, +10)	10	0.0055	0.27	100.00%	-0.5593	-6.14*	0.00%
W 7 = (+1, +20)	20	0.0076	0.27	100.00%	-1.0589	-8.21*	0.00%
W 8 = (-20, +20)	41	0.0563	1.40	73.17%	-1.0693	-5.79*	48.78%

*Note. This table summarizes CAAR for high volume directors' purchases and sales for different window periods, respective t statistic and percentage of the number of days CAAR has been positive during the respective event window period. The samples consist of highest 10% and lowest 10% of directors' purchases and directors' sales ranked according to the trading volume. Accordingly, high/ low volume directors' purchases samples included 220 directors' purchases events and high/ low volume directors' sales samples included 94 directors' sales events. \* indicates statistical significance of test statistics at 0.05 level.*

Table 2 - Excess CAAR for different windows for directors' trading percentage sub sample

Event Window	L	Purchases			Sales		
		CAAR	t stat	(+) Returns %	CAAR	t stat	(+) Returns %
W 1 = (-20, -1)	20	-0.0089	-0.33	80.00%	-0.1166	-1.73	0.00%
W 2 = (-10, -1)	10	-0.0098	-0.51	80.00%	-0.0963	-2.02*	0.00%
W 3 = (-1, 0)	2	0.0014	0.17	0.00%	-0.0149	-0.70	0.00%
W 4 = (0, +1)	2	-0.0159	-1.86	0.00%	-0.0810	-3.81*	0.00%
W 5 = (-1, +1)	3	-0.0198	-1.91	0.00%	-0.0980	-3.76*	0.00%
W 6 = (+1, +10)	10	0.0163	0.86	20.00%	-0.0364	-0.77	0.00%
W 7 = (+1, +20)	20	0.0004	0.02	25.00%	-0.0493	-0.73	0.00%
W 8 = (-20, +20)	41	-0.0030	-0.08	51.22%	-0.1637	-1.70	0.00%

*Note. This table summarizes CAAR for high trading percentage directors' purchases and sales for different window periods, respective t statistic and percentage of the number of days CAAR has been positive during the respective event window period. The samples consist of highest 10% and lowest 10% of directors' purchases and directors' sales ranked according to the trading percentage. Accordingly, high/ low trading percentage directors' purchases samples included 220 directors' purchases events and high/ low trading percentage directors' sales samples included 94 directors' sales events. \* indicates statistical significance of test statistics at 0.05 level.*

## DISCUSSION

It is important to ensure the validity and reliability of the findings by comparing and contrasting the findings with evidences of previous literature. Firstly, the abnormal returns of the abnormal trading volume sub sample are compared with the findings of the previous studies. Secondly, the abnormal returns of the abnormal trading percentage sub sample are compared with the findings of the previous studies. Finally, the findings on market efficiency , i.e. the adjustments of prices on the information content of trading volume and trading percentage of directors' trades are compared with the literature.

### Insider Trading Volume and Market Efficiency

The first hypothesis of this study is that the positive (negative) abnormal returns of high volume directors' purchases (sales) are more than the positive (negative) abnormal returns of low volume directors' purchases (sales). The findings of this study provide evidence to support that high volume directors' purchases are associated with more positive and significant excess abnormal returns on the event day. However, the high volume directors' sales are associated with negative excess abnormal returns as hypothesized, but are not significant, on the event day. As shown in Figure 1 and 3, the direction of the market reaction is positive for abnormal trading volumes of directors' purchases whereas the direction is negative for abnormal trading volumes of directors' sales. Furthermore, this positive and negative reaction is seen immediately around the event day and the negative reaction seems to continue into the post event period as well.

The empirical evidences on direct analysis of information content of insider trading volumes are hardly found. In early studies, Karpoff (1987) finds that the trading volume is positively related to the magnitude of the price change in equity markets. Further, Karpoff (1987) states that analyzing the joint relationship between price changes and trading volume is important for event studies to study whether the volume has an information content that would create a price pressure in the securities market. This is consistent with the hypothesis that informed traders trade aggressively when they have received private information (Easley & O'Hara, 1992; Suominen, 2001). In this regard, Seyhun (1986) finds that insiders (i.e. officers, directors, officer-directors, chairmen of the boards of directors, and large shareholders) can distinguish the differences in the quality of information and therefore are willing to trade in large volumes when they have more valuable information.

For the Italian market, Bajo (2010) has computed abnormal returns using both market model and market and risk adjusted model in an event study for a 16 day event window. The evidence of that study reports positive and strong significant abnormal returns on (-2, +3) days around the abnormal trading volume event under market adjusted model and on (-1, +2) days around the abnormal trading volume event under market and risk adjusted model. Further, this evidence also supports the hypothesis that abnormal trading volumes are positively related with abnormal security returns in the Italian market. For the Hong Kong market, Wong (2002) finds that there are abnormally significant volume fluctuations in the pre event windows around day -15 for good (bad) news related to China affiliated stocks. These abnormal trading volumes reported are attributed for the trading by insiders using inside information.

The findings of this study are more conclusive and consistent with the hypothesis that high volume directors' purchases are associated with positive and significant excess AAR over the low volume directors' purchases on the event day. As Glosten and Milgrom (1985) argue, this could be due to the trade imbalances in the market that would force prices to change to its



full value. The high volume directors' sales sample has reported a negative excess AAR and CAAR over the low volume directors' sales sample on the event day but not significant. This is in line with the hypothesis that directors' sales would be associated with negative returns (though not significant). It implies that the market may not have relied more on the negative information content of the high trading volume of directors' sales immediately.

### **Insider Trading Percentage and Market Efficiency**

The second hypothesis of this study is that the positive (negative) abnormal returns of high trading percentages of directors' purchases (sales) are more than the positive (negative) abnormal returns of low trading percentages of directors' purchases (sales). The findings of this study provide supportive evidence that high trading percentage directors' purchases are associated with more positive excess abnormal returns but it is not significant. However, the high trading percentage directors' sales are also associated with positive excess abnormal returns which contradict the hypothesis that directors' sales are associated with negative excess returns. As shown in Figure 2 and 4, the direction of the market reaction is positive for both abnormal trading percentages of directors' purchases and sales on the event day whereas the direction is negative for both abnormal trading percentages of directors' purchases and sales on the day immediately following the event. Furthermore, this negative reaction seems to continue from the pre event period as well.

There is hardly any empirical evidence on direct analyses on the information content of insider trading percentages. In previous studies, Heinkel and Kraus (1987) found that insider purchases with high volume fractions reported positive abnormal returns and insider sales with high volume fractions reported negative abnormal returns on the event day but both being only marginally significant. Further, they discovered that insider trading events occurring during a week with a low volume fraction reported insignificant CARs in both pre and post event periods whereas insider trading during periods of high volume fraction was preceded by price increases, which might be due to the arrival of new information about the stock. Seyhun (1986) suggests that the proportion of the firm traded is positively related with insider's abnormal returns and significant at 1% level. Bajo and Petracci (2006) also confirm that there is a positive relationship between the change of holding of the insiders and the sign of the market movement.

Thus, in general, the findings of this study are consist with the hypothesis that high trading percentage directors' purchases are associate with more positive excess abnormal returns even though it is not significant on the event day. However, the findings of the high trading percentage directors' sales contradict the hypothesis. The negative and significant excess abnormal returns reported for high trading percentage directors' purchases and sales on day +1 might be due to the fact that market is relying more on some other negative information or could be just following a trend in the market.

### **CONCLUSION**

In conclusion, the evidence implies that high trading volumes of directors' purchases have been more informative even before the official disclosure of the event. This could be due to the trade imbalances arising in the market ultimately forcing the securities prices to reflect the new information. The high trading volumes of directors' sales have not been informative on the event day as hypothesized but significantly reflected in security prices with a delay. This suggests that the CSE has initially ignored the negative information content of high volume directors' sales but has reacted later. The high trading percentage directors' purchases and sales

have not been informative in the CSE on the event day as hypothesized. As in the high trading volume directors' sales, the negative information content of high trading percentage directors' sales also has been reflected in security prices with a delay.

Finally, it is suggested to conduct a further study to analyze whether the information content of directors' trading volume could be captured more precisely in the long term by considering either weekly or monthly returns and to analyze whether an optimal trading strategy could be developed by following the aggregate directors' trading volume patterns to predict the future movement of the market and the future movement of individual security returns.

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Appendix 1 Excess AAR and Excess CAAR for directors’ Trading Volume Sub Sample

Day	Purchases				Sales			
	Excess AAR	t stat	Excess CAAR	t stat	Excess AAR	t stat	Excess CAAR	t stat
-20	-0.0191	-3.0302*	-0.0191	-3.0302*	0.0000	0.0000	0.0000	0.0000
-19	0.0021	0.3374	-0.0169	-1.9041	0.0191	0.6610	0.0191	0.4674
-18	-0.0037	-0.5857	-0.0206	-1.8928	0.0169	0.5874	0.0360	0.7208
-17	0.0044	0.6985	-0.0162	-1.2900	0.0206	0.7152	0.0566	0.9818
-16	0.0043	0.6806	-0.0119	-0.8495	0.0162	0.5628	0.0728	1.1298
-15	0.0057	0.9042	-0.0063	-0.4063	0.0119	0.4143	0.0848	1.2006
-14	-0.0001	-0.0121	-0.0063	-0.3807	0.0063	0.2171	0.0910	1.1936
-13	-0.0017	-0.2755	-0.0081	-0.4535	0.0063	0.2197	0.0974	1.1942
-12	-0.0021	-0.3308	-0.0101	-0.5379	0.0081	0.2798	0.1054	1.2192
-11	0.0048	0.7680	-0.0053	-0.2674	0.0101	0.3520	0.1156	1.2679

-10	0.0033	0.5204	-0.0020	-0.0981	0.0053	0.1845	0.1209	1.2645
-9	0.0073	1.1665	0.0053	0.2429	0.0020	0.0709	0.1230	1.2312
-8	0.0033	0.5286	0.0086	0.3799	-0.0053	-0.1835	0.1177	1.1320
-7	-0.0023	-0.3696	0.0063	0.2673	-0.0086	-0.2988	0.1090	1.0109
-6	0.0018	0.2911	0.0081	0.3334	-0.0063	-0.2182	0.1028	0.9203
-5	0.0047	0.7468	0.0128	0.5095	-0.0081	-0.2817	0.0946	0.8207
-4	0.0054	0.8588	0.0182	0.7026	-0.0128	-0.4446	0.0818	0.6883
-3	0.0020	0.3203	0.0202	0.7583	-0.0182	-0.6320	0.0636	0.5200
-2	0.0018	0.2783	0.0220	0.8019	-0.0202	-0.7018	0.0434	0.3451
-1	0.0097	1.5460	0.0317	1.1273	-0.0220	-0.7625	0.0214	0.1658
<b>0</b>	<b>0.0170</b>	<b>2.6953*</b>	<b>0.0487</b>	<b>1.6883</b>	<b>-0.0317</b>	<b>-1.0998</b>	<b>-0.0103</b>	<b>-0.0781</b>
1	0.0078	1.2458	0.0565	1.9151	-0.0487	-1.6878	-0.0590	-0.4362
2	0.0055	0.8738	0.0620	2.0552*	-0.0565	-1.9595	-0.1155	-0.8352
3	-0.0014	-0.2285	0.0606	1.9653*	-0.0620	-2.1501*	-0.1775	-1.2565
4	0.0003	0.0470	0.0608	1.9350	-0.0606	-2.1003*	-0.2380	-1.6512
5	0.0016	0.2572	0.0625	1.9479	-0.0608	-2.1105*	-0.2989	-2.0330*
6	-0.0105	-1.6774	0.0519	1.5886	-0.0625	-2.1666*	-0.3613	-2.4120*
7	0.0041	0.6561	0.0560	1.6840	-0.0519	-1.8007	-0.4132	-2.7088*
8	-0.0083	-1.3144	0.0478	1.4106	-0.0560	-1.9438	-0.4693	-3.0227*
9	0.0048	0.7683	0.0526	1.5272	-0.0478	-1.6571	-0.5170	-3.2744*
10	0.0015	0.2410	0.0541	1.5456	-0.0526	-1.8247	-0.5697	-3.5489*
11	-0.0035	-0.5515	0.0507	1.4238	-0.0541	-1.8773	-0.6238	-3.8249*
12	-0.0018	-0.2794	0.0489	1.3534	-0.0507	-1.7570	-0.6744	-4.0723*
13	0.0002	0.0385	0.0491	1.3400	-0.0489	-1.6960	-0.7233	-4.3029*
14	-0.0057	-0.9012	0.0435	1.1684	-0.0491	-1.7045	-0.7725	-4.5290*
15	-0.0047	-0.7402	0.0388	1.0287	-0.0435	-1.5079	-0.8159	-4.7170*
16	0.0157	2.4930*	0.0545	1.4245	-0.0388	-1.3464	-0.8547	-4.8742*
17	-0.0028	-0.4490	0.0517	1.3328	-0.0545	-1.8902	-0.9092	-5.1162*
18	0.0009	0.1419	0.0526	1.3383	-0.0517	-1.7923	-0.9609	-5.3372*
19	0.0032	0.5148	0.0558	1.4029	-0.0526	-1.8232	-1.0135	-5.5584*
20	0.0005	0.0759	0.0563	1.3975	-0.0558	-1.9355	-1.0693	-5.7924*

*Note. The samples consist of highest 10% and lowest 10% of directors' purchases and directors' sales ranked according to the trading volume. Accordingly, high or low volume directors' purchases samples included 220 directors' purchases events and high or low volume directors' sales samples included 94 directors' sales events. The RAR Model is used to measure abnormal returns. Excess AAR/CAAR are the difference between the AAR/CAAR of the high volume sample over the low volume sample. \* indicates statistical significance of test statistics at 0.05 level.*

#### Appendix 2 - Excess AAR and Excess CAAR for directors' Trading Percentage Sub Sample

Day	Purchases				Sales			
	Excess AAR	t stat	Excess CAAR	t stat	Excess AAR	t stat	Excess CAAR	t stat
-20	0.0010	0.1737	0.0010	0.1737	-0.0059	-0.3893	-0.0059	-0.3893
-19	-0.0023	-0.3774	-0.0012	-0.1441	-0.0020	-0.1328	-0.0079	-0.3692
-18	0.0087	1.4461	0.0075	0.7173	-0.0113	-0.7508	-0.0192	-0.7349

-17	-0.0073	-1.2184	0.0001	0.0120		-0.0049	-0.3237	-0.0240	-0.7983
-16	0.0016	0.2631	0.0017	0.1283		-0.0028	-0.1888	-0.0269	-0.7984
-15	0.0027	0.4435	0.0044	0.2982		0.0032	0.2106	-0.0237	-0.6429
-14	-0.0034	-0.5598	0.0010	0.0645		0.0128	0.8497	-0.0109	-0.2740
-13	0.0005	0.0862	0.0015	0.0908		0.0023	0.1560	-0.0086	-0.2012
-12	-0.0025	-0.4131	-0.0009	-0.0521		0.0015	0.0999	-0.0071	-0.1564
-11	0.0018	0.3014	0.0009	0.0459		-0.0133	-0.8822	-0.0203	-0.4273
-10	0.0073	1.2216	0.0082	0.4121		0.0005	0.0347	-0.0198	-0.3970
-9	-0.0041	-0.6806	0.0041	0.1981		-0.0153	-1.0154	-0.0351	-0.6732
-8	0.0014	0.2282	0.0055	0.2536		-0.0022	-0.1483	-0.0373	-0.6880
-7	-0.0038	-0.6331	0.0017	0.0752		-0.0013	-0.0884	-0.0387	-0.6866
-6	0.0045	0.7502	0.0062	0.2663		-0.0060	-0.3969	-0.0446	-0.7658
-5	-0.0021	-0.3465	0.0041	0.1713		-0.0199	-1.3253	-0.0646	-1.0728
-4	-0.0013	-0.2104	0.0029	0.1151		-0.0013	-0.0883	-0.0659	-1.0622
-3	-0.0003	-0.0493	0.0026	0.1002		-0.0162	-1.0776	-0.0821	-1.2862
-2	-0.0075	-1.2418	-0.0049	-0.1873		-0.0175	-1.1624	-0.0996	-1.5186
-1	-0.0040	-0.6638	-0.0089	-0.3310		-0.0170	-1.1314	-0.1166	-1.7331
<b>0</b>	<b>0.0054</b>	<b>0.9022</b>	<b>-0.0035</b>	<b>-0.1261</b>		<b>0.0021</b>	<b>0.1428</b>	<b>-0.1145</b>	<b>-1.6602</b>
1	-0.0213	-3.5384*	-0.0248	-0.8776		-0.0832	-5.5252*	-0.1976	-2.8000*
2	-0.0004	-0.0671	-0.0252	-0.8723		0.0002	0.0130	-0.1975	-2.7357*
3	0.0052	0.8581	-0.0200	-0.6788		-0.0010	-0.0668	-0.1985	-2.6918*
4	0.0052	0.8575	-0.0148	-0.4936		-0.0013	-0.0832	-0.1997	-2.6540*
5	0.0082	1.3680	-0.0066	-0.2157		0.0045	0.3020	-0.1952	-2.5433*
6	-0.0048	-0.7937	-0.0114	-0.3644		0.0001	0.0079	-0.1950	-2.4942*
7	0.0046	0.7715	-0.0067	-0.2121		0.0031	0.2047	-0.1920	-2.4106*
8	0.0066	1.0945	-0.0002	-0.0051		0.0181	1.2029	-0.1739	-2.1453*
9	0.0037	0.6119	0.0035	0.1067		0.0104	0.6913	-0.1635	-1.9830*
10	0.0093	1.5451	0.0128	0.3824		0.0125	0.8317	-0.1509	-1.8014
11	-0.0030	-0.5048	0.0098	0.2872		0.0018	0.1189	-0.1492	-1.7520
12	-0.0025	-0.4074	0.0073	0.2119		-0.0006	-0.0413	-0.1498	-1.7324
13	-0.0008	-0.1376	0.0065	0.1851		0.0002	0.0113	-0.1496	-1.7048
14	-0.0101	-1.6870	-0.0037	-0.1027		-0.0019	-0.1270	-0.1515	-1.7018
15	-0.0077	-1.2749	-0.0113	-0.3137		-0.0059	-0.3921	-0.1574	-1.7433
16	0.0096	1.5884	-0.0018	-0.0483		-0.0042	-0.2773	-0.1616	-1.7652
17	0.0006	0.0954	-0.0012	-0.0322		0.0001	0.0077	-0.1615	-1.7405
18	-0.0021	-0.3441	-0.0033	-0.0869		0.0005	0.0337	-0.1610	-1.7127
19	-0.0038	-0.6369	-0.0071	-0.1865		0.0014	0.0932	-0.1596	-1.6764
20	0.0041	0.6745	-0.0030	-0.0789		-0.0042	-0.2781	-0.1637	-1.6993

*Note. The sample consists of highest 10% and lowest 10% directors' purchases and directors' sales ranked according to the trading percentage. Accordingly, high/ low trading percentage directors' purchases sample included 220 directors' purchases events and high/ low trading percentage directors' sales samples included 94 directors' sales events. The RAR Model is used to measure normal returns. AAR/ CAAR are the difference between the AAR/ CAAR of the high trading percentage sample over the low trading percentage sample. \* indicates statistical significance of test statistics at 0.05 level.*