

Intra-Day Stock Returns and Close-End Price Manipulation in the Istanbul Stock Exchange

Güray Küçükkocaoğlu*

Abstract

In this paper, we examine the behavior of the intra-daily stock returns and close-end stock price manipulation in the Istanbul Stock Exchange (ISE). Understanding the price behavior in a given trading day could help investors when they are making their buy and sell decisions. Studies of intra-daily returns have found that stock prices systematically rise near the closing minute and the last trade is more often initiated by a buyer. It is likely that a trader in the ISE with a big net position in a given day will want to enhance his performance by manipulating the closing price, this trader will try to improve his position by placing the last buy order. The possibility to artificially influence stock prices in the ISE is an important issue to everybody who is involved in stock trading securities exchanges, investors, brokers, the largest share holders etc.

In order to test for the closing price manipulation by the traders in the ISE, we used a regression model, which looks for the effects of the size of the daily traders net position in eight stocks selected from the ISE National-30 index companies. If a trader acquires a large net position in one of these stocks during the trading day, it is possible that he tries to influence the closing price of the stock. In addition, this trader could even be the largest stockholder at the Settlement and Custody Bank of ISE then he will also be motivated to manipulate the closing price to increase his overall wealth.

JEL classification: G1; G14; G15; G24 ; C22

Keywords: Stock market returns; Closing Price; Manipulation; Istanbul Stock Exchange

1. Introduction

Extensive amount of research has shown that the stock market is more active at the beginning and the ending of the trading session. Trading volume, price volatility and number of buy and sell orders, are higher at the open and close for different stock exchanges. The intra-daily volatility exhibits a U-shaped pattern associated with the opening and closing of the trading sessions. This pattern has been identified in a number of studies by Wood, Mc Inish and Ord (1985), Harris (1986, 1989), Smirlock and Starks (1986), Jain and Joh (1988), Foster and Viswanathan (1993), Jang and Lee (1993) in the New York Stock Exchange, Andersen, Bollerslev and Cai (2000) in the Japanese Stock Market, Choe and Shin (1993) in the Korea Stock Exchange, Cheung (1995) in the Hong Kong Equity Market, Norden (1993) in the Swedish Stock Market, Lowengrub and Melvin (2002) in the German Stock Market, Yadav and Pope (1992) in the UK Market, Bildik (2001) in the Turkish Stock Market.

Former study conducted by Bildik (2001) examines the intra-daily seasonalities of the Istanbul Stock Exchange with the ISE-100 index data between January 2,1996 – January 15,1999, he finds that stock returns follow a U-shaped pattern associated with the opening and closing of the separate morning and afternoon trading sessions, opening and closing returns are large and positive. Volatility is higher at the opening and follows an L-shape during the morning and afternoon sessions. In order to test the stability of the patterns detected by Bildik (2001), we used eight stocks instead of an index to examine the intra-daily seasonalities of the stock patterns over the trading day.

* Başkent Üniversitesi İktisadi İdari Bilimler Fakültesi, İşletme Bölümü, Bağlıca Kampüsü, Ankara, Türkiye. Tel : +90 312 235 10 10/1728, Fax: +90 312 234 10 43 E-mail : gurayk@baskent.edu.tr

When stock prices systematically increase prior to the close, there is the possibility that these prices are artificially influenced by the activities of brokerage houses, stockbrokers, fund managers, speculators and daily traders with large amount money to change the closing prices.

If a fund manager takes a big net position for his client over the trading day, there is always a possibility that he will likely attempt to change the closing price in his clients favor. He will place a buy order at seconds to close to increase the closing price of a stock, thus his attempt to change the closing price is manipulation, and this kind of activity at the closing is expected to last for a short period until the opening of the next trading day.

The Capital Market Board of Turkey defines manipulation in two different types; Rule 47/A-2 prohibits *Trade-based manipulation* where a trader affects prices by significantly changing his order, like buying at low and selling at high. Rule 47/A-3 prohibits *Action-based manipulation* where the manipulator issues a false statement or an insider tip, when the traders in the market relies on his information, they could drive up or down the stock price, thus the manipulator can profit by selling at high or buying at low and make trading profits.

When Jarrow (1992) defines trade-based manipulation, he identifies the trader as a wealthy person who can affect prices by significantly changing the order flow to the market maker.

This definition could be very useful when this wealthy trader wants to take control of a stock, he would enhance and empower his position by manipulating the stock price by buying large amounts of shares. But to be a trade-based manipulator this person could not have to be wealthy at all times, according to Capital Market Board (1999) a trader with a purchasing power of buying a minimum one lot could set the closing price by buying shares just prior to close.

Either wealthy or not, traders would try to influence the closing prices, stock price manipulation at close would benefit stockholders since it artificially increases the prices at which they can sell their shares at a higher price at the opening of the next trading day. Hence, closing prices are the most important indicators of the stock market. They are used in different places as a benchmark of stocks, traders and market performance.

Stock price manipulation has received a lot of attention in the literature. Researchers and academicians widely studied the different characteristics and the actions of the manipulation practices. Allen and Gorton (1992), Allen and Gale (1992) present models in trade based manipulation in which uninformed and informed traders' success through trading strategies. Jarrow (1992) presents a model in which market manipulation trading strategies exists under reasonable hypotheses with the existence of large traders. Kyle (1984) and Jarrow (1994) and Kumar and Seppi (1992) study manipulation in derivative security markets, investigate the relationship between prices, trading strategies, and their possible effects to traders and markets. Benabou and Laroque (1992), Bagnoli and Lipman (1996) study action based manipulation through insider trading and takeover bids. Chatterjea and Joseph (1993) examine the actions undertaken by the corporations to prevent its shares from being manipulated by others. Fried (2000) discusses the economic consequences, the motive and the effect of high closing.

When Felixson and Pelli (1999) studied the manipulation of closing prices by the traders in an organized exchanged, they raised a question about a different type of manipulator, they define this person as a trader who acquires a large net position in a stock during the trading day and tries to improve his position by manipulation the closing prices. This person could be a broker or a fund manager; Broker is the representative of the brokerage house in the trading floor and directed by his brokerage house to buy and sell shares for his customer. If the broker makes wrong moves and buys when the price is high and sells when the price is low, he will likely try to manipulate the stock price to keep his client in the house. Fund managers are the poorest of all, they report their activities to a third party, and they are expected to be a profit generator all the time.

Using the insights developed in Felixson and Pelli (1999) we use their model to test whether the largest traders in the ISE manipulate the close-end prices of the selected stocks.

The paper is structured in six sections Section 2 describes the setting of the Istanbul Stock Exchange, the data set and the companies used in this study. Section 3 documents the intra-day patterns of the selected stocks from the ISE National 30 index companies, between 1st January 2000 – 29th March 2002. Section 4 discusses manipulation and why traders attempt to manipulate the close-end prices. Section 5 discusses the model and the results, to observe whether traders influence the closing prices. Section 6 concludes the paper with a brief summary of our results and discussion of our conclusions.

2. The Istanbul Stock Exchange, Data Set, Companies and Brokerage Houses

2.1. The Istanbul Stock Exchange

The ISE is a continuous market with no market professionals. The trading system is fully computerized which enables the ISE members to trade in stocks. The stock trading activities are carried out in two separate sessions, first session opens at 09.15 a.m., and ends at 12.00 a.m. and the second session opens at 13:45 p.m., and ends at 16.30 p.m (Table 1). Session hours were 10:00 a.m. to 12:00 a.m., and 14:00 p.m. to 16:00 p.m. and fully changed into new hours after August 13, 2001. After the change in session hours, the members of the stock market are given the ability to send their orders directly to the trading system of the ISE by using their own computer systems and get the responses immediately. This feature is being used together with the manual order entry through the workstations and the order transfers via floppy diskettes and aims to prevent time losses in the transfer of the customer orders collected via internet and/or other order collecting systems.

Morning orders received by the ISE members by electronic means prior to the first session are entered to the trading system via floppy diskettes through trading terminals and matched in a continuous auction system according to time and priority as in a normal session. The ISE accepts floppy diskette orders between 09:15 a.m. to 9:45 a.m. as part of the first session, floppy diskette orders are tested between 9:15 a.m. to 9:30 a.m. level and the tested orders are sent into the system for an execution in the continuous auction system between 9:30 a.m. to 9:45 a.m. After 9:45 a.m. all functions of keyboards in the floor can be used and Ex-API orders can be accepted for an execution until the end of the first session. Ex-API order executions gives ability to the members of the stock market to send their orders directly to the trading system of the ISE by using their own computer systems and get the responses immediately¹.

Afternoon orders received by the ISE members by electronic means prior to the second session are again entered to the trading system via floppy diskettes through trading terminals and floppy diskette orders are tested between 13:45 p.m. to 14:00 p.m. tested orders are sent into the system for an execution in the continuous auction system between 14:00 p.m. to 14:10 p.m. and matched in a continuous auction system according to time and priority as in a normal session. After 14:10 p.m. all functions of the workstations' keyboards in the floor can be used and Ex-API orders can be accepted for an execution until the end of the second session.

Order entrance procedure via floppy diskettes is subject to some trading rules and only available for "limit orders". Prices are determined on a "multiple price-continuous auction" method, utilizing a computerized system that automatically matches buy and sell orders on a price and time priority basis. The buyers and sellers enter the orders into the computer system through their workstations located at the ISE.

¹ Electronic Orders sent via Ex-API started at 4th January 2002.

Table 1. Trading Hours in the Istanbul Stock Exchange

SESSIONS		TIME	EXPLANATION	
1 st SESSION	Electronic Orders are sent via Floppy Diskette and Ex-API	Floppy Diskette Pre-test Level	09:15-09:30	Floppy Diskette orders are tested in this level
		Floppy Diskette and Ex-API Orders Level	09:30-09:45	Tested orders are sent into the system and orders are executed in the continuous auction system.
	Keyboard and EX-API orders are accepted for an execution.		09:45-12:00	In this level, all functions of keyboards in the floor can be used and Ex-API orders can be accepted for an execution.
BREAK		12:00-13:45		
2 nd SESSION	Electronic Orders are sent via Floppy Diskette and Ex-API	Floppy Diskette Pre-test Level	13:45-14:00	Floppy Diskette orders are tested in this level.
		Floppy Diskette and Ex-API Orders Level	14:00-14:10	Tested orders are sent into the system and orders are executed in the continuous auction system.
	Keyboard and Ex-API orders are accepted for an execution.		14:10-16:30	In this level, all functions of keyboards in the floor can be used and Ex-API orders can be accepted for an execution.

Source: ISE, Sermaye Piyasası ve Borsa Temel Bilgiler Kılavuzu, İMKB, 16. Baskı, İstanbul.

2.2. Data Set

The data set in this study is obtained from the Istanbul Stock Exchange, the data contains the daily transaction data of each company and consists of the time of the execution, the price, the number of shares traded, and the code/name for the brokerage houses whose active in buying and selling. The data is composed of eight stocks from the ISE National-30 index companies. We selected three stocks with low market capitalization (Stock 1, 2 and 3), three stocks with high market capitalization (Stock 4, 5 and 6), and two stocks with medium market capitalization (Stock 7 and 8) from thirty stocks in the ISE National-30 index. The time period is 1st January 2000 – 29th March 2002. To examine the stability of the results, we divide the data set into two sub-periods, the first sub-period is the trading sessions prior to 13th August 2001, where the trading sessions were 10:00 a.m. to 12:00 a.m. for the first session, and 14:00 p.m. to 16:00 p.m. for the second session (399 Days). The second sub-period is the trading sessions after 13th August 2001 where the trading sessions are 9:30 a.m. to 12:00 a.m. for the first session, and 14:00 p.m. to 16:30 p.m. for the second session (155 Days).

2.3. Companies and Brokerage Houses

Eight stocks have been selected for the current study from the ISE National-30 index companies listed in Istanbul Stock Exchange, but we keep the name of the companies and the name of the brokerage houses confidential. We used code names like Company 1, Company 2, Company 3..., for the companies, Stock 1, Stock 2, Stock 3..., for their stocks, and Broker 1, Broker 2, Broker 3..., for the brokerage houses actively trading in these stocks.

3. Intra-Day Patterns

3.1. Data Description

In this section, we examine the intra-day patterns of the selected stocks listed in the ISE. Before proceeding to the manipulation analysis, we need to observe the day-end returns of the selected companies. If these returns are large and positive (negative), we can hypothesize that, traders who buy (sell) large sum of shares over the trading day would try to influence the closing price.

All stock price returns are computed as the percentage change in the value of a company compared with the previous in 15-minute intervals.

$$R_{e,t} = (\text{price}_{t+15} - \text{price}_t) / \text{price}_t \quad (1)$$

All stock returns for the trading sessions prior to 13th August 2001 are computed in the following order: 10:15 a.m., 10:30 a.m., 10:45 a.m., 11:00 a.m., 11:15 a.m., 11:30 a.m., 11:45 a.m., 12:00 a.m., 14:15 p.m., 14:30 p.m., 14:45 p.m., 15:00 p.m., 15:15 p.m., 15:30 p.m., 15:45 p.m., 16:00 p.m.

The 15-minute interval data prior to August 13th, 2001 consists of 16 observations.

All stock returns for the trading sessions after 13th August 2001 are computed in the following order: 9:45 a.m., 10:00 a.m., 10:15 a.m., 10:30 a.m., 10:45 a.m., 11:00 a.m., 11:15 a.m., 11:30 a.m., 11:45 a.m., 12:00 a.m., 14:15 p.m., 14:30 p.m., 14:45 p.m., 15:00 p.m., 15:15 p.m., 15:30 p.m., 15:45 p.m., 16:00 p.m., 16:15 p.m., 16:30 p.m.

The 15-minute interval data after August 13th, 2001 consists of 20 observations.

Close-to-open returns are computed by comparing the prior day-end price of the company on price interval price_t with the first 15-minute interval of the current day's price on price interval price_{t+15} .

3.2. Empirical Evidence

This part of the paper examines whether the return and standard deviation patterns documented by Bildik (2001) exists in stocks rather than ISE-100 index. To provide comparable results, the methodology applied by Bildik (2001) is followed closely.

Following tables and figures set out the results of the analysis of return and standard deviation for ISE before and after the change in the trading hours and the method.

Table 2, shows the intra-day returns of the eight stocks 15-minute overall and individual patterns for the first period (4.1.2000 – 10.8.2001). Mean returns at the opening and the day-end returns at the closing are large and positive. Positive returns at the end of the day are positively correlated with the opening returns in the morning. Figure 1 exhibits the movements of the eight stocks 15-minute overall returns throughout the day². Consistent with Bildik's (2001) findings, typical U-shape or more precisely W-shape pattern in stock prices detected.

Table 3, shows the standard deviations of the eight stocks 15-minute overall and individual patterns for the first period (4.1.2000 – 10.8.2001). The magnitude of the standard deviations follows an L-shape pattern, higher at the beginning, peaked at lunch break, and lower at the closing (Figure 2). As expected, there is a remarkable similarity in the standard deviation patterns with Bildik's (2001) findings for the first period. According to Brock and Kleidon (1992) the morning peak in volatility and return may be due to an increase in transactions and the accumulated information from the last close is reflected to the opening prices of the trading day.

² Appendix A exhibits the movements of the eight stocks individual 15-minute returns throughout the day between 4.1.2000 – 10.8.2001.

Table 2. Intra-day Stock Returns (4.1.2000 – 10.8.2001)

	OVERALL RETURNS	Stock 1	Stock 2	Stock 3	Stock 4	Stock 5	Stock 6	Stock 7	Stock 8
10:15	0.002053	0.003607	-0.002634	0.000932	0.002928	0.005216	0.003024	0.002302	0.001053
10:30	-0.000096	0.000454	-0.000835	0.000885	0.000865	-0.000289	-0.000599	-0.000654	-0.000592
10:45	-0.000472	-0.000114	0.000166	-0.000863	-0.001056	-0.000649	-0.000401	-0.000379	-0.000478
11:00	-0.000630	-0.000151	-0.000765	-0.001213	-0.000335	-0.000384	-0.000760	-0.000426	-0.001009
11:15	-0.000634	-0.001389	-0.001449	-0.000736	-0.001537	-0.000503	-0.000301	0.000785	0.000054
11:30	0.000027	0.000289	0.000481	-0.000146	0.000232	0.000191	0.000240	-0.000882	-0.000184
11:45	-0.001221	-0.001562	-0.001921	-0.001584	-0.000938	-0.001506	-0.000878	-0.000374	-0.001004
12:00	0.000030	-0.002697	0.002010	0.000807	0.000776	-0.000817	-0.000091	0.000143	0.000112
14:15	-0.001898	-0.002923	-0.001482	-0.001992	-0.002321	0.001705	-0.004405	-0.002143	-0.001623
14:30	0.000310	0.000080	0.000039	0.000535	0.000023	0.000222	0.000795	0.000221	0.000563
14:45	-0.000409	-0.001251	0.000166	0.000398	-0.000812	-0.000934	-0.000392	-0.000272	-0.000173
15:00	-0.000120	0.000462	-0.000254	0.000017	-0.000705	0.000106	-0.000029	-0.000959	0.000404
15:15	0.000516	0.000640	0.001365	0.000783	0.001087	0.000504	-0.000158	0.000252	-0.000340
15:30	-0.000381	0.000213	-0.001195	-0.000600	-0.000637	-0.000787	-0.000287	0.000274	-0.000025
15:45	-0.000501	-0.000465	0.000240	0.000260	-0.000275	-0.000694	-0.000779	-0.001676	-0.000616
16:00	0.002724	0.001236	0.004909	0.003515	0.002318	-0.000844	0.002349	0.003620	0.004691

Figure 1. Intra-day Stock Returns (4.1.2000 – 10.8.2001)

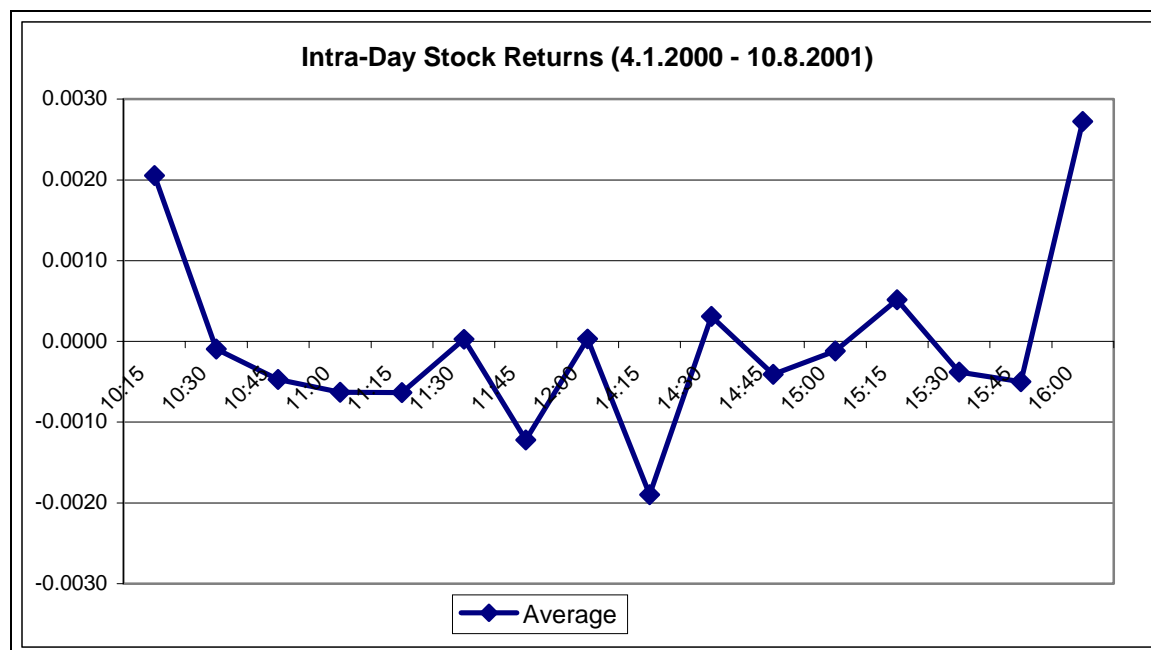


Table 3. Standard Deviations (4.1.2000 – 10.8.2001)

	OVERALL STD. DEV.	Stock 1	Stock 2	Stock 3	Stock 4	Stock 5	Stock 6	Stock 7	Stock 8
10:15	0.012001	0.010242	0.013430	0.013852	0.009294	0.013011	0.010695	0.012388	0.013100
10:30	0.006913	0.005458	0.007179	0.007435	0.007660	0.007119	0.006163	0.006995	0.007297
10:45	0.005871	0.006734	0.006303	0.005928	0.005787	0.006576	0.004085	0.006138	0.005419
11:00	0.005175	0.004306	0.006167	0.005614	0.005162	0.005246	0.005169	0.004407	0.005327
11:15	0.005240	0.004590	0.005380	0.005745	0.004959	0.006732	0.004984	0.004337	0.005195
11:30	0.005185	0.005575	0.004584	0.006054	0.004471	0.006790	0.004528	0.004818	0.004664
11:45	0.006518	0.004908	0.012132	0.006495	0.005607	0.006920	0.004528	0.005820	0.005737
12:00	0.009653	0.024499	0.019694	0.004593	0.005028	0.007016	0.004805	0.005416	0.006170
14:15	0.011659	0.007169	0.011702	0.011835	0.008665	0.009309	0.028745	0.007178	0.008666
14:30	0.006250	0.005314	0.006561	0.008009	0.007042	0.007082	0.004308	0.006256	0.005431
14:45	0.005704	0.007358	0.005632	0.005976	0.005975	0.004779	0.004995	0.005092	0.005823
15:00	0.005455	0.005125	0.005941	0.006441	0.004917	0.005968	0.004634	0.005018	0.005599
15:15	0.005073	0.004163	0.005244	0.005758	0.004676	0.006104	0.004961	0.004879	0.004796
15:30	0.005937	0.004877	0.006987	0.005475	0.006704	0.006916	0.005367	0.005893	0.005277
15:45	0.005808	0.005942	0.006458	0.006776	0.005465	0.005612	0.004522	0.005364	0.006327
16:00	0.006737	0.006452	0.007283	0.006807	0.005933	0.007543	0.004596	0.006956	0.008331

Figure 2. Standard Deviations (4.1.2000 – 10.8.2001)

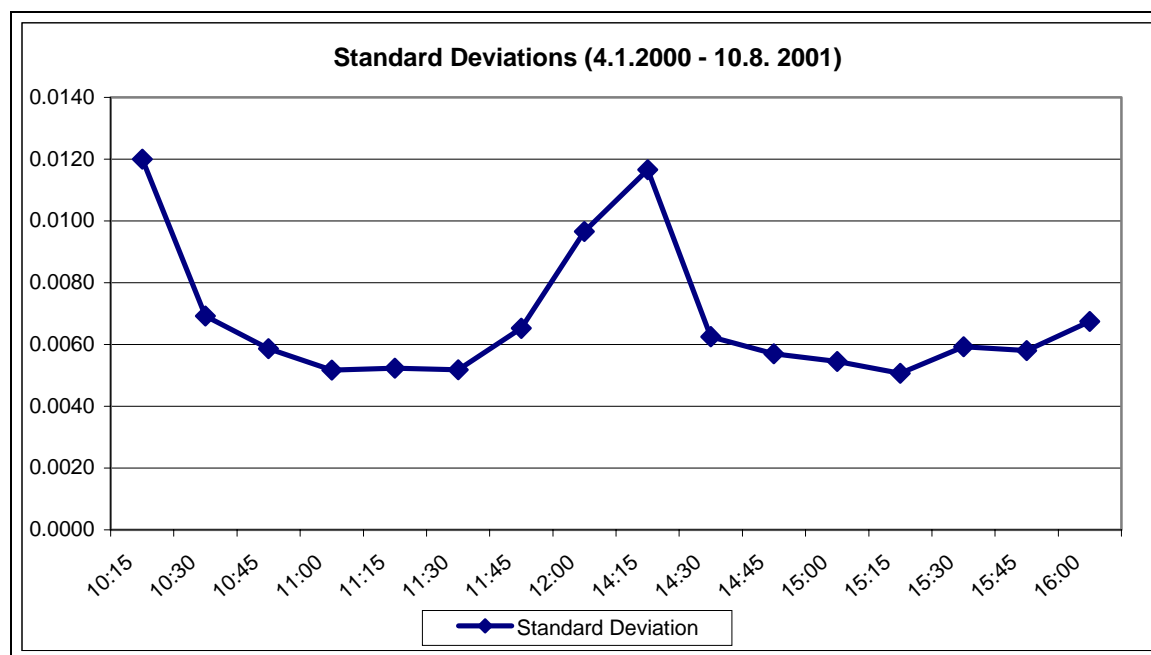


Table 4, shows the intra-day returns of the eight stocks 15-minute overall and individual patterns for the second period (13.8.2001 – 29.3.2002). Figure 3 exhibits the movements of the eight stocks 15-minute overall returns throughout the day³. The results reported for the opening return and standard deviation confirm that there is a significant decrease in both patterns following the change in the trading method and hours. However, day-end returns at the closing are still large and positive.

³ Appendix B exhibits the movements of the eight stocks individual 15-minute returns throughout the day between 13.8.2001 – 29.3.2002.

Table 5, shows the standard deviations of the eight stocks 15-minute overall and individual patterns for the second period (13.8.2001 – 29.3.2002). The magnitude of the standard deviations changed into a new flatter L-shaped pattern: slightly higher at the beginning, lower at break and flat again at the closing (Figure 4). It is interesting to see that, the use of floppy diskette order system at the beginning of the each trading sessions decreases the volatility in stocks. “Limit orders” with a “multiple price-continuous auction” method takes the power of setting the opening prices from the traders.

Table 4. Intra-day Stock Returns (13.8.2001 – 29.3.2002)

	OVERALL RETURNS	Stock 1	Stock 2	Stock 3	Stock 4	Stock 5	Stock 6	Stock 7	Stock 8
09:45	0.000768	0.000844	-0.001970	0.000807	0.001015	0.006728	-0.000155	0.000766	-0.001890
10:00	-0.000020	0.001310	0.000225	0.000894	-0.002101	0.000172	0.000078	-0.000831	0.000089
10:15	-0.001254	-0.001624	-0.001215	-0.001061	-0.001785	-0.000593	-0.001007	-0.001972	-0.000777
10:30	-0.000642	0.001178	-0.001730	-0.001662	0.000124	-0.001047	-0.001670	0.000079	-0.000411
10:45	-0.000006	0.000264	-0.001257	-0.000330	0.000194	-0.000133	0.001170	0.000053	-0.000011
11:00	-0.000137	0.000350	0.000872	0.001653	0.000297	-0.001020	-0.002195	-0.000393	-0.000660
11:15	-0.000554	-0.000881	-0.000501	-0.001583	-0.000424	0.000045	-0.000631	-0.000366	-0.000091
11:30	0.001019	0.000401	0.002183	0.000275	0.001741	0.001587	0.002232	-0.001004	0.000736
11:45	-0.000421	0.000202	-0.000253	0.001015	-0.002280	-0.000578	-0.000800	0.000190	-0.000866
12:00	0.001261	0.000402	0.002716	0.001870	-0.000106	0.000530	0.002329	0.001035	0.001309
14:15	-0.001619	-0.003242	-0.002467	-0.002497	0.000793	-0.001365	-0.000473	-0.003167	-0.000532
14:30	-0.000431	0.000192	-0.001538	-0.000527	-0.000613	-0.000240	-0.001277	0.000355	0.000199
14:45	-0.000796	-0.000931	-0.000924	0.000993	-0.000069	-0.001282	0.000270	-0.001580	-0.002842
15:00	0.000961	0.000187	0.000517	0.002160	-0.000237	0.000371	0.000579	0.002686	0.001423
15:15	-0.000088	0.000022	0.001053	0.000297	-0.000353	0.000302	-0.000584	-0.000743	-0.000694
15:30	0.000991	0.001295	0.001077	0.000808	0.001812	-0.000529	0.001786	0.000484	0.001193
15:45	0.000993	0.000537	0.001831	0.001193	0.000688	0.000748	0.000429	0.000904	0.001614
16:00	-0.000093	-0.000097	0.000730	-0.000416	-0.000675	0.000597	-0.000227	-0.000675	0.000023
16:15	-0.000641	0.000341	-0.000926	-0.001875	-0.000736	-0.000038	-0.000992	0.000442	-0.001347
16:30	0.003550	0.002992	0.005669	0.004640	0.003223	-0.002918	0.003730	0.004333	0.006734

Figure 3. Intra-day Stock Returns (13.8.2001 – 29.3.2002)

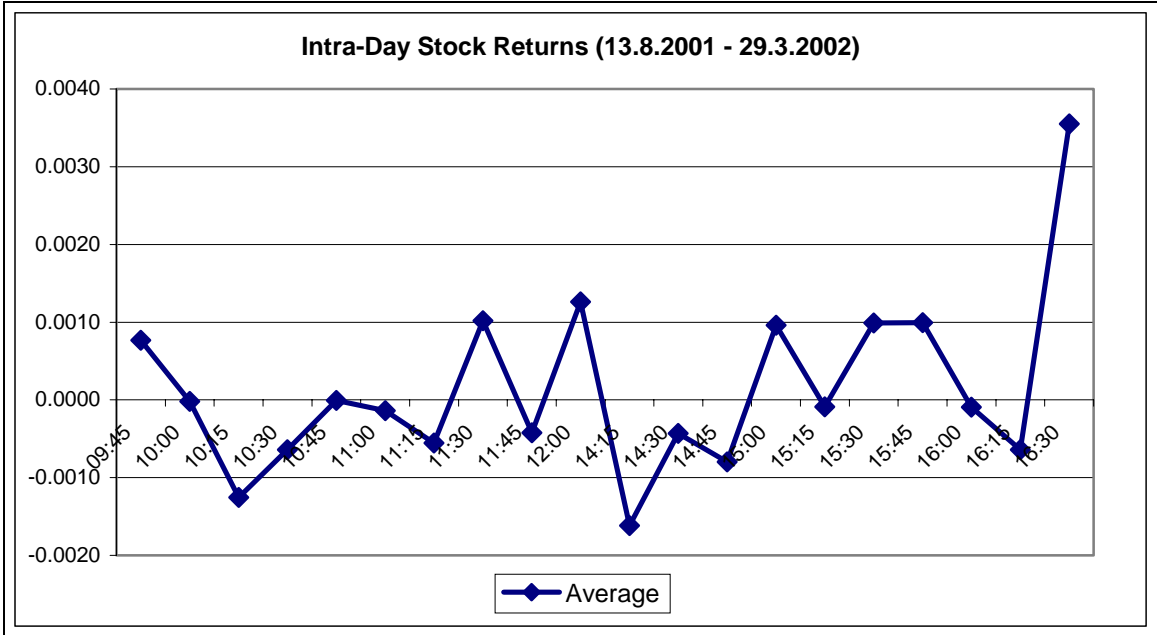
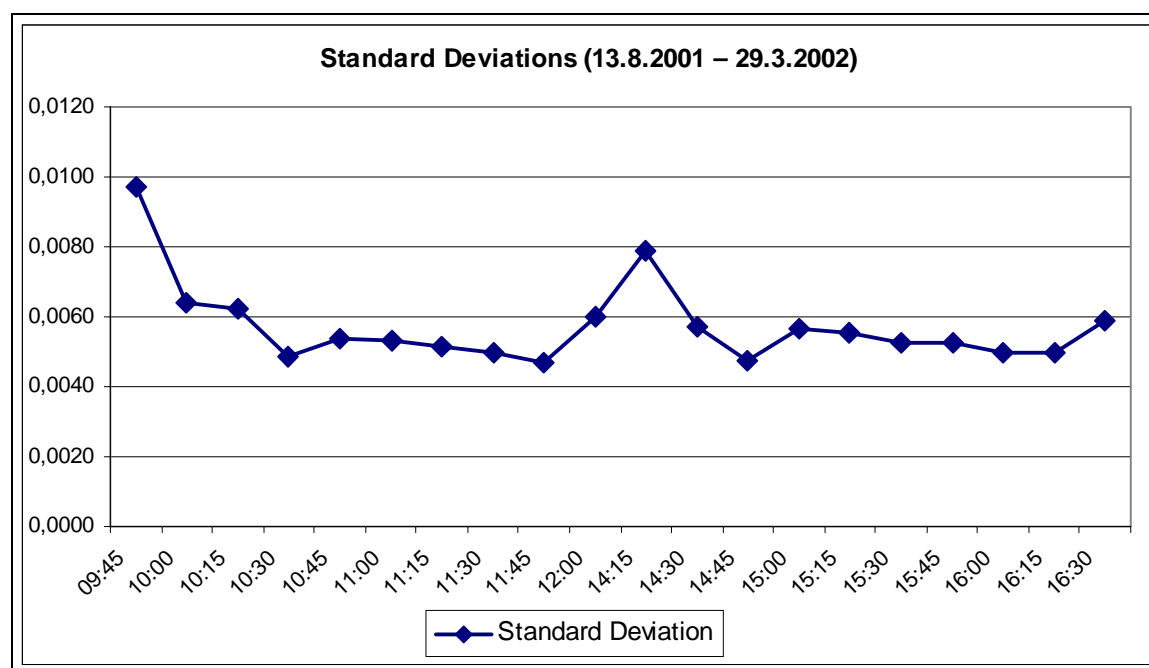


Table 5. Standard Deviations (13.8.2001 – 29.3.2002)

	OVERALL STD. DEV.	Stock 1	Stock 2	Stock 3	Stock 4	Stock 5	Stock 6	Stock 7	Stock 8
09:45	0.009694	0.009340	0.011075	0.009038	0.013054	0.010662	0.007293	0.008839	0.008249
10:00	0.006401	0.007305	0.005544	0.005592	0.012609	0.004759	0.004836	0.005587	0.004973
10:15	0.006212	0.005484	0.007526	0.007683	0.005503	0.005998	0.005466	0.005029	0.007005
10:30	0.004873	0.005193	0.003454	0.006022	0.004590	0.005329	0.004851	0.004711	0.004833
10:45	0.005393	0.004499	0.004612	0.005982	0.005761	0.004576	0.005074	0.005191	0.007452
11:00	0.005318	0.004245	0.005923	0.005407	0.006717	0.005298	0.005105	0.005518	0.004332
11:15	0.005153	0.005348	0.005553	0.004686	0.005364	0.005109	0.004732	0.004523	0.005909
11:30	0.004996	0.003720	0.006467	0.004742	0.005696	0.005558	0.004395	0.003842	0.005547
11:45	0.004703	0.004795	0.004611	0.003961	0.007803	0.005099	0.004957	0.003404	0.002996
12:00	0.005997	0.005501	0.005680	0.005292	0.008940	0.006806	0.004801	0.004740	0.006220
14:15	0.007863	0.005478	0.005656	0.006675	0.020299	0.006927	0.005983	0.006761	0.005127
14:30	0.005705	0.006097	0.006224	0.004667	0.005935	0.006079	0.005071	0.005758	0.005809
14:45	0.004766	0.003649	0.006025	0.005110	0.004827	0.004718	0.004852	0.003977	0.004965
15:00	0.005657	0.004839	0.006940	0.007432	0.005298	0.004792	0.004777	0.005460	0.005721
15:15	0.005533	0.004418	0.006747	0.006252	0.005971	0.005382	0.004787	0.005752	0.004958
15:30	0.005236	0.005269	0.006359	0.004063	0.005955	0.006104	0.004076	0.005177	0.004885
15:45	0.005249	0.004360	0.005213	0.005174	0.004536	0.005273	0.005101	0.006215	0.006119
16:00	0.004958	0.004470	0.005764	0.004863	0.005901	0.004893	0.004613	0.004761	0.004396
16:15	0.004996	0.003907	0.005537	0.006279	0.005290	0.004602	0.003941	0.005129	0.005282
16:30	0.005881	0.005257	0.006801	0.008105	0.006007	0.004451	0.005742	0.005156	0.005524

Figure 4. Standard Deviations (13.8.2001 – 29.3.2002)



The new trading system at ISE shows that the large and positive day-end returns are corrected by the multiple price-continuous auction method at the opening transaction of the next trading day. Positive returns at the end of the day are still but not highly correlated with the opening returns in the morning. The magnitude of the standard deviations changed into a new flatter L-shaped pattern.

Before proceeding to the manipulation analysis, it is useful to establish that there is, in conjunction with Bildik's (2001) findings, a U-shaped pattern of stock return and L-shaped pattern of volatility observed by the selected stocks between January 4th, 2000 – August 10th, 2001. We were expected to find the same pattern with respect to Bildik's (2001) study, since the trading hours of the Bildik's (2001) data were the same with our data prior to August 13th, 2001.

However, after the change in trading hours and system in August 13th, 2001, traders are now subject to sent their limit orders electronically via floppy diskettes into the continuous auction system at the beginning of the each trading session. The auction system automatically matches buy and sell orders on a price and time priority basis and decreases the power of traders influence on stock prices, the morning volatility peak in returns and standard deviation observed before August 13th, 2001 significantly decreased after the change in the trading system. Our final observation on intra-day patterns of stocks for both periods is the day-end closing returns are still large and positive at close. In the next section, we will explore one of the causes of systematic increase in closing prices. We will try to answer, whether these prices are artificially influenced by the activities of the brokerage houses or the traders with large positions over the trading day.

4. Manipulation

Stock price manipulation at day-end returns is studied by Felixson and Pelli (1999) in Helsinki Stock Exchange. To the best of our knowledge this is the only study on day-end return on stock price manipulation for stocks trading in an organized exchange. Felixson and Pelli (1999) build a regression model to test for closing price manipulation by the daily traders in the Finnish stock market. They examine whether closing prices are manipulated by these traders who buys (sells) a large sum of shares. Their results show that there is a weak evidence that these traders manipulate the closing prices. Using the insights developed in Felixson and Pelli (1999) we use their model to test whether the largest traders in the ISE manipulate the close-end prices.

The intuition behind the big buyer (seller) to manipulate the closing price is to increase his overall wealth by the end of the day. If the big buyer (seller) decides to improve his daily performance he will try to move up (down) the closing to a higher (lower) level. However, he would try to do so if the expected cost of buying more shares at close is minimal.

This can be shown with real data from ISE in Tables 6a and 6b, stock price for Company A opens at 2,400 TL when the trading starts at 09:30:00. At 09:34:31, Broker 1 makes the first trade of the day and buys 2 lots (1 Lot =1000 Shares) at 2,400 TL per share (Table 6a), than at 09:46:07, *Broker 10 (or a trader acting through Broker 10)*, the big buyer of the day, makes his first buy and pays 2,375 TL for a single share, a total of 3,882,000 shares with a total market value of 9.219 Billion TL (Table 6a).

Table 6a. Time and Trade Log for Company A (1st Session)

TIME	PRICE	LOT	BUYER	SELLER	PRICE*LOT	TOTAL VALUE
09:34:31	2400	2	BROKER 1	BROKER 2	0	0
09:35:35	2375	700	BROKER 1	BROKER 3	0	0
09:36:38	2400	53	BROKER 1	BROKER 2	0	0
09:37:44	2400	200	BROKER 4	BROKER 2	0	0
09:37:54	2375	42	BROKER 1	BROKER 5	0	0
09:43:58	2400	25	BROKER 1	BROKER 2	0	0
09:45:05	2375	1500	BROKER 1	BROKER 4	0	0
09:45:37	2400	25	BROKER 1	BROKER 2	0	0
09:45:53	2375	65	BROKER 8	BROKER 1	0	0
09:45:53	2375	66	BROKER 1	BROKER 1	0	0
09:46:06	2375	500	BROKER 8	BROKER 4	0	0
09:46:07	2375	3882	<i>BROKER 10</i>	BROKER 1	9,219,750	9,219,750,000

Table 6b. Time and Trade Log for Company A (2nd Session)

TIME	PRICE	LOT	BUYER	SELLER	PRICE*LOT	TOTAL VALUE
16:29:31	2500	300	<i>BROKER 10</i>	BROKER 29	750,000	750,000,000
16:29:34	2525	300	<i>BROKER 10</i>	BROKER 4	757,500	757,500,000
16:29:59	2525	5000	BROKER 6	BROKER 25		
16:29:59	2525	5000	BROKER 6	BROKER 25		
16:29:59	2525	658	BROKER 6	BROKER 25		
16:29:59	2500	4590	<i>BROKER 10</i>	BROKER 16	11,475,000	1,147,500,000
16:29:59	2500	1	<i>BROKER 10</i>	BROKER 74	2,500	250,000
16:29:59	2525	1	<i>BROKER 10</i>	BROKER 25	2,525	252,500

Broker 10's attempt to manipulate the closing price succeeded at close but this price could not hold for a long time. According to Fischel and Ross (1991) manipulation attempt by traders cannot be succeeded by making trades unless they use false statements and/or fictitious trades.

5. Model and Results

5.1. Model

The model we used in this study is the replication of the Felixson and Pelli's (1999) first model. When they are building their model;

1) They use two different sets of variables to measure the buyer and the seller side of manipulation.

$$\text{Return}_{i,\text{close}-t} = \text{Normal Return}_{i,\text{close}-t} \pm \text{Manipulation Effect}_{i,\text{close}-t} + e_{i,\text{close}-t} \quad (2)$$

The big buyer and the big seller of the trading day could be at the manipulator side in this equation, buyer will try to influence the closing price by adding extra return to the normal return, seller will try to influence the closing price by decreasing the normal return. They will more likely attempt to change the closing price in the last 15-minutes of the trading day. We assume that these traders have no insider information.

2) If the buyer's (seller's) attempt to manipulate the closing price succeeded by increasing (decreasing) it to a desired level, he will have no incentive to keep it at that level, the artificial price at the close will return to its true market value after the close, which will likely happen in the first 15-minutes of the next trading day.

$$\text{Return}_{i,\text{close}+t} = \text{Normal Return}_{i,\text{close}+t} \pm \text{Reversal Effect}_{i,\text{close}+t} + e_{i,\text{close}+t} \quad (3)$$

Using the theory presented above (Eqs. (2) and (3)). Model 1,

$$\text{Return}_{i,\text{close}-15} = \text{Intercept} + b_1 * D_{\text{Buy}_{i,d}} + b_2 * D_{\text{Sell}_{i,d}} + b_3 * D_{\text{Both}_{i,d}} + e_{i,d} \quad (4)$$

and

$$\text{Return}_{i,\text{close}+15} = \text{Intercept} + c_1 * D_{\text{Buy}_{i,d}} + c_2 * D_{\text{Sell}_{i,d}} + c_3 * D_{\text{Both}_{i,d}} + e_{i,d} \quad (5)$$

$$H_o : b_1 \text{ or } c_2 < 0, c_1 \text{ or } b_2 \geq 0$$

$$H_I : b_1, c_2 > 0 \text{ and } c_1, b_2 < 0$$

In this model, we assume that if the big buyer of the selected stock is active at close (in the last minute of the close) the dummy variable D_{Buy} will take the value of 1 only if the biggest buyer's attempt to buy more at close to set the closing price at a higher level and the big seller of the stock do not sell more shares to close the price at a lower level, otherwise it will be zero. The dummy variable D_{Sell} takes the value of 1 if the big seller is active in the last minute of close and the big buyer is not, otherwise it will be zero⁴. A third dummy variable D_{Both} takes the value of 1 if both the big buyer and the big seller make the last trade, they will most likely try to influence the closing price by bidding up and down the closing price. But our data reveals that, most of the time, the buyer side dominates the closing price because they are more active at close than the seller side⁵. According to the theory, the coefficient b_1 (b_2) should be positive (negative) to show that the return before the close is higher (lower) if the big buyer (seller) is active in a given day. If this is true than the coefficient c_1 (c_2) should be negative (positive) to show that the return after the close is lower (higher) if the big buyer (seller) was active during the previous trading day. A third dummy variable D_{Both} takes the value of 1 if both the big buyer and the big seller makes the last trade. It is also expected that b_3 should be positive and c_3 should be negative, again the biggest buyer is more active than the biggest seller at close. The intercept stands for the normal return before and after the close when there is no attempt to manipulate the closing price by the buyer and the seller. The intercept represents a real demand for the security if there is no manipulation attempt only the accumulation of the new information that was revealed while the market was closed could have an impact on the opening price of the trading day.

5.2. Results

This part of the study reports the results of the model for the selected periods. The theory presented in Section 4 suggests that if a buyer accumulated a large amount of shares during the trading day, he would more likely try to change the closing price by actively trading in the last minute of the close⁶.

5.2.1. Result before the close for the first period (4.1.2000 – 10.8.2001)

The intercept for most of the stocks, except for Stock 5, is positive (Table 7a). The intra-day returns studied in Section 3 shows that close-end prices tend to rise in the last 15 minutes of the trading day and the intercept of this model represents this movement in stock prices.

The sign of the coefficients for D_{buy} , is expected to be positive and D_{sell} , is expected to be negative and D_{both} is expected to be positive for the selected stocks. Positive signs of D_{buy} and D_{both} largely observed however expected negative signs of D_{sell} only observed in three stocks.

⁴ We assume that any trader acting through a broker could try to influence the closing price, but in this study we take the daily biggest buyer and the biggest seller of the selected stock and check to see whether they attempt to manipulate the closing price by actively trading in the last minute of the trading day.

⁵ We observed that around 70% of the selected stocks close-end prices are closed at ask prices.

⁶ In Appendix C we take the daily largest two buyers and the largest two sellers of the selected stock and check to see whether they attempt to manipulate the closing price by actively trading in the last minute of the trading day.

Table 7a. Results before the close (R_{c-15}) for the first period (4.1.2000 – 10.8.2001)

Stock	Intercept	D _{buy}	D _{sell}	D _{both}	R-square	F-value	N/df
Stock 1	0.000817 0.83	0.003140 1.68	-0.000689 -0.32	0.002153 0.99	0.009831	1.31	398
Stock 2	0.004898 3.47	0.000090 0.04	0.001372 0.54	-0.000299 -0.16	0.001171	0.15	398
Stock 3	0.002183 1.83	0.002977 1.49	0.003370 1.46	0.000101 0.05	0.009491	1.26	398
Stock 4	0.001769 1.81	0.000859 0.48	0.001422 0.67	0.001229 0.55	0.001731	0.23	398
Stock 5	-0.005665 -3.10	0.003627 1.49	0.007790 2.86	0.006206 2.86	0.027243	3.69	398
Stock 6	0.002335 2.58	0.001243 0.76	-0.002531 -1.56	0.001446 0.92	0.013920	1.86	398
Stock 7	0.003760 3.65	-0.000293 -0.16	0.000552 0.26	-0.000811 -0.42	0.000837	0.11	398
Stock 8	0.004369 3.23	0.000740 0.33	-0.001441 -0.64	0.001650 0.80	0.004492	0.59	398

†The t-statistics are reported under the coefficient estimates.
N/df is the number of observations and the degrees of freedom.

5.2.2. Result after the close for the first period (4.1.2000 – 10.8.2001)

The intercept of the stocks after the close is expected to be negative for the model presented in Equation 5, however large and positive returns at the first 15 minutes of the next trading day opening observed in Section 3 change these expected negative signs into positive signs (Table 7b). The sign of the coefficients for D_{buy} , is expected to be negative and D_{sell} , is expected to be positive and D_{both} is expected to be negative for the selected stocks. Negative signs of D_{buy} and D_{both} positive signs of D_{sell} largely observed in stocks.

Table 7b. Results after the close (R_{c+15}) for the first period (4.1.2000 – 10.8.2001)

Stock	Intercept	D _{buy}	D _{sell}	D _{both}	R-square	F-value	N/df
Stock 1	0.003485 2.21	-0.003060 -1.01	0.000537 0.16	-0.003046 -0.87	0.004356	0.58	398
Stock 2	-0.004167 -1.47	0.002747 0.62	0.006384 1.25	0.000261 0.07	0.004979	0.66	399
Stock 3	0.000499 0.23	-0.001681 -0.46	0.002527 0.60	-0.000052 -0.01	0.002088	0.28	398
Stock 4	0.001133 0.77	0.005147 1.92	0.002874 0.89	0.001006 0.30	0.009846	1.31	398
Stock 5	0.007302 2.12	-0.001029 -0.22	-0.008133 -1.58	-0.001839 -0.45	0.007534	1.00	398
Stock 6	0.000139 0.04	0.003786 0.67	0.002046 0.36	-0.000598 -0.11	0.001591	0.21	398
Stock 7	0.003076 1.59	-0.003034 -0.88	-0.001450 -0.36	-0.000291 -0.08	0.002130	0.28	398
Stock 8	0.002788 1.23	-0.003291 -0.88	-0.000325 -0.09	-0.004019 -1.17	0.004663	0.62	398

†The t-statistics are reported under the coefficient estimates.
N/df is the number of observations and the degrees of freedom.

Consistent with Felixson and Pelli (1999) the power of the model for the first period is null, low R-square and the low F-values observed in this period.

However, using the coefficients of the variables of some stocks presented in Tables 7a and 7b. we would like to comment on the possible signs of close-end manipulation. Expected positive signs of D_{buy} before the close and negative signs of D_{buy} after the close observed in Stocks 1, 3, 5 and 8. Expected negative signs of D_{sell} before the close and positive signs of D_{sell} after the close observed in Stocks 1 and 6. Expected positive signs of D_{both} before the close and negative signs of D_{both} after the close observed in Stocks 1, 3, 5, 6 and 8.

We assume that, using the signs of the coefficients of the variables, close-end prices of the selected stocks are manipulated in the ISE between 4.1.2000 – 10.8.2001 and mostly by the largest buyers.

5.2.3. Result before the close for the second period (13.8.2001 – 29.3.2002)

The intercept for most of the stocks, except for Stock 5, is positive (Table 8a). Positive signs of D_{buy} and D_{both} and negative signs of D_{sell} observed in nearly half of the stocks.

Table 8a. Results before the close (R_{c-15}) for the second period (13.8.2001 – 29.3.2002)

Stock	Intercept	D _{buy}	D _{sell}	D _{both}	R-square	F-value	N/df
Stock 1	0.001891 1.60	0.003435 1.63	-0.000872 -0.30	0.002138 0.91	0.022933	1.16	151
Stock 2	0.003647 1.09	0.004106 0.98	0.001916 0.36	0.001757 0.45	0.008205	0.35	129
Stock 3	0.003963 1.67	-0.001246 -0.33	0.001639 0.39	0.005561 1.40	0.025439	0.93	110
Stock 4	0.003847 2.57	0.000539 0.19	-0.002198 -0.72	-0.002934 -0.78	0.009208	0.40	133
Stock 5	-0.001107 -0.41	-0.003306 -0.97	-0.001032 -0.31	-0.002648 -0.87	0.010362	0.45	132
Stock 6	0.001963 1.50	0.002980 1.21	0.007352 2.55	0.002477 0.84	0.044223	2.31	153
Stock 7	0.003647 2.55	0.001863 0.78	0.004044 1.27	-0.000625 -0.23	0.014967	0.76	153
Stock 8	0.007564 3.68	-0.002767 -0.89	0.000373 0.12	-0.001498 -0.55	0.009448	0.41	131

†The t-statistics are reported under the coefficient estimates.

N/df is the number of observations and the degrees of freedom.

5.2.4. Result after the close for the second period (13.8.2001 – 29.3.2002)

The negative intercepts on seven stocks observed after the close (Table 8b), the possible explanation of this change is the new trading system adopted by ISE after 13.8.2001. Floppy diskette order system corrects the high closing prices of the previous trading day.

The sign of the coefficients for D_{buy} , is expected to be negative and D_{sell} is expected to be positive and D_{both} is expected to be negative for the selected stocks. Negative signs of D_{buy} and D_{both} and the positive signs of D_{sell} observed in nearly half of the stocks.

Table 8b. Results after the close (R_{c+15}) for the second period (13.8.2001 – 29.3.2002)

Stock	Intercept	D _{buy}	D _{sell}	D _{both}	R-square	F-value	N/df
Stock 1	-0.000528 -0.30	0.003531 1.14	0.000058 0.01	0.003897 1.13	0.014359	0.72	151
Stock 2	-0.001516 -0.32	-0.001194 -0.20	0.002952 0.40	-0.000736 -0.14	0.003261	0.14	129
Stock 3	-0.000184 -0.07	0.002717 0.64	-0.000028 -0.01	0.001386 0.32	0.004614	0.17	110
Stock 4	-0.003450 -1.32	0.003600 0.75	0.011200 2.10	0.014504 2.20	0.056153	2.58	133
Stock 5	-0.004659 -0.90	0.010061 1.52	0.011516 1.76	0.015540 2.64	0.052674	2.39	132
Stock 6	-0.000706 -0.41	-0.000382 -0.12	0.001784 0.47	0.003583 0.93	0.007433	0.37	153
Stock 7	0.003094 1.59	-0.006024 -1.84	-0.000049 -0.01	-0.004786 -1.27	0.028164	1.45	153
Stock 8	-0.003255 -1.02	0.003476 0.71	-0.000469 -0.10	0.003243 0.77	0.009135	0.39	131

†The t-statistics are reported under the coefficient estimates.

N/df is the number of observations and the degrees of freedom.

Again, consistent with Felixson and Pelli's (1999) findings the power of the model for the second period is null, low R-square and the low F-values observed in this period.

However, using the coefficients of the variables of some stocks presented in Tables 8a and 8b. we would like to comment on the possible signs of close-end manipulation. Expected positive signs of D_{buy} before the close and negative signs of D_{buy} after the close observed in Stocks 2, 6 and 7. Expected negative signs of D_{sell} before the close and positive signs of D_{sell} after the close observed in Stocks 1, 4 and 5. Expected positive signs of D_{both} before the close and negative signs of D_{both} after the close observed in Stock 2.

We assume that, using the signs of the coefficients of the variables, close-end prices of the selected stocks are manipulated in the ISE between 13.8.2001 – 29.3.2002, but in this period buyer side of price domination switches to seller side. One of the reasonable explanation of this change could be the Financial Crises of November, 2000 and February, 2001 in the Turkish Economy, where prices of these stocks plummeted and lose more than half of their values in a very short period of time.

6. Conclusion

In this paper, we examine the behavior of the intra-daily stock returns and close-end stock price manipulation in the Istanbul Stock Exchange (ISE). Several results are found in this study.

Day-end prices of the selected stocks increase at close in both periods. Mean returns at close started to reverse after the change in the trading system of ISE, floppy diskette orders corrects the large and positive close-end returns in the first 15-minutes of the next trading day. The morning volatility peak in returns and standard deviations observed before August 13th, 2001 significantly decreased after the change in the trading system. Our final observation on intra-day patterns of stocks for both periods is the day-end closing returns are still large and positive at close.

This is the first close-end price manipulation study in the ISE. We try to find out whether the daily largest traders in the ISE attempt to change the closing prices in the last minute of trade. In this study we used the daily transaction data of all stocks without removing high volume and block trades, and the possible effects of short selling activities at close. In future studies these facts should be kept in mind.

Even though the statistical results are weak and insignificant. Close-end price manipulation through big buyers and big sellers is possible in the ISE. High close-end returns, useful signs of the coefficients of the variables, high closing at ask prices increases the possibility of close-end stock price manipulation in the ISE. It is useful to keep in mind that close-end price manipulation by the largest buyers and sellers is not expected to happen everyday. Plus, manipulation attempt at close could be masked by the large volumes of buy and sell orders effected by the firm specific and macro-economic news. We also see some affirmative signs of close-end price manipulation by the largest buyers and the largest sellers in the selected stocks.

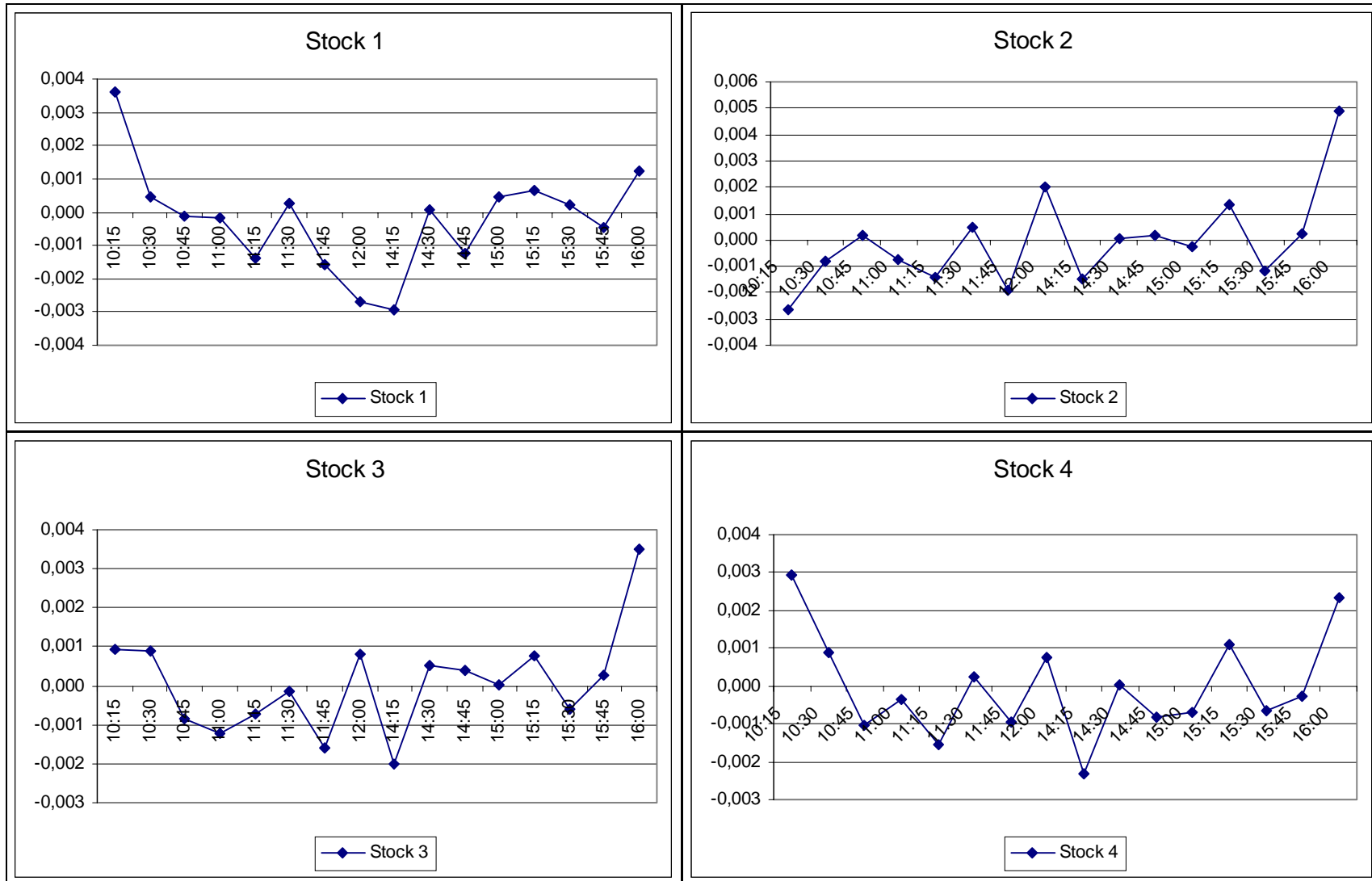
Finally, the study of how the largest stockholders, at the Settlement and Custody Bank of ISE, influence the close-end price needs to be conducted. This is the subject of a future paper.

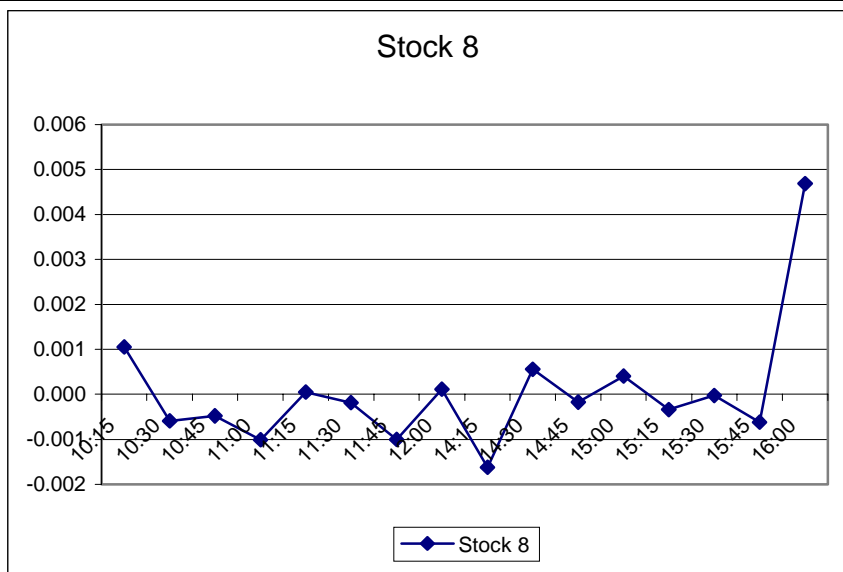
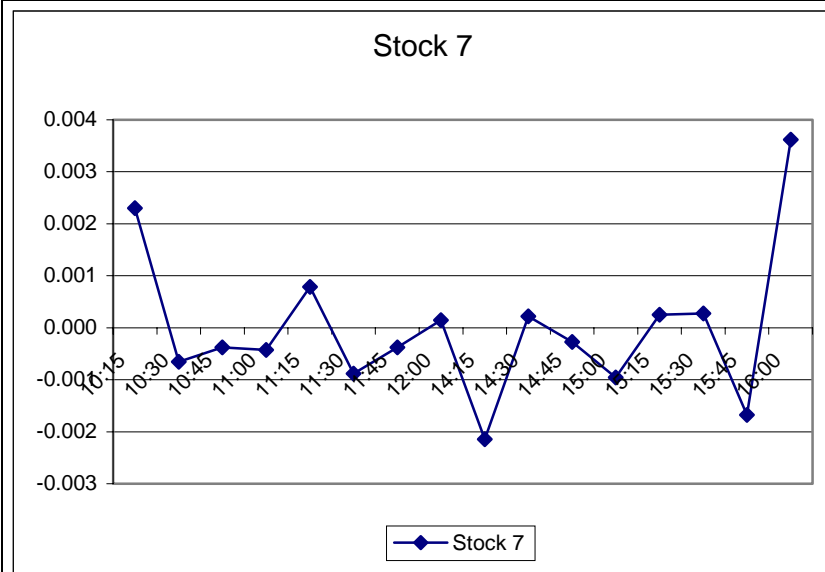
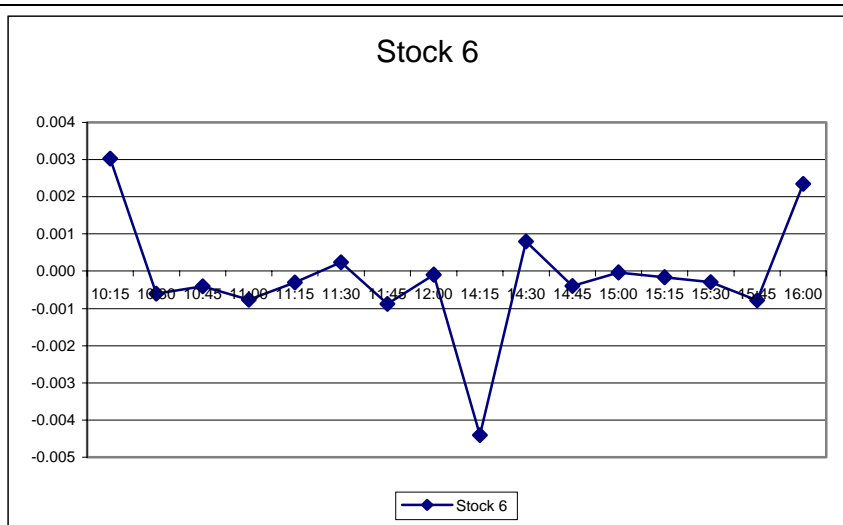
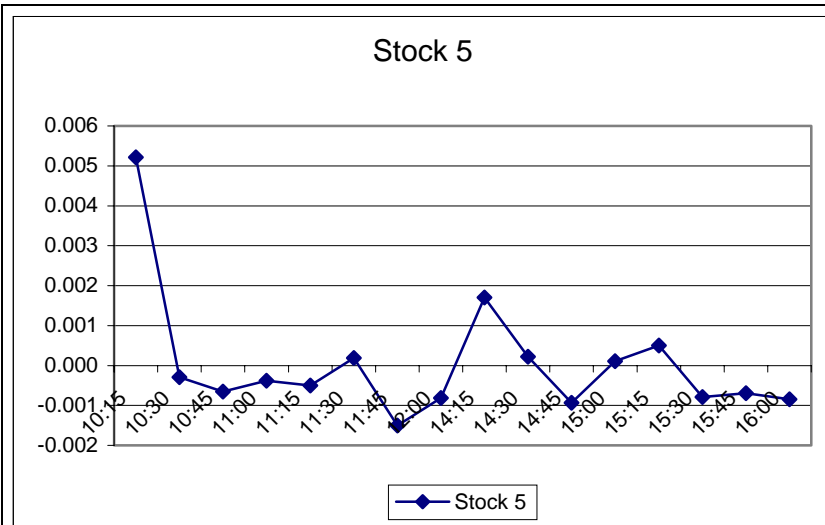
Acknowledgements

We gratefully acknowledge the comments on earlier drafts provided by, Arzdar Kiracı, Turan Erol, and participants in seminar at Başkent University, data support from ISE and database management support from A. Hamdi Varol. We retain responsibility for any errors.

Appendix A

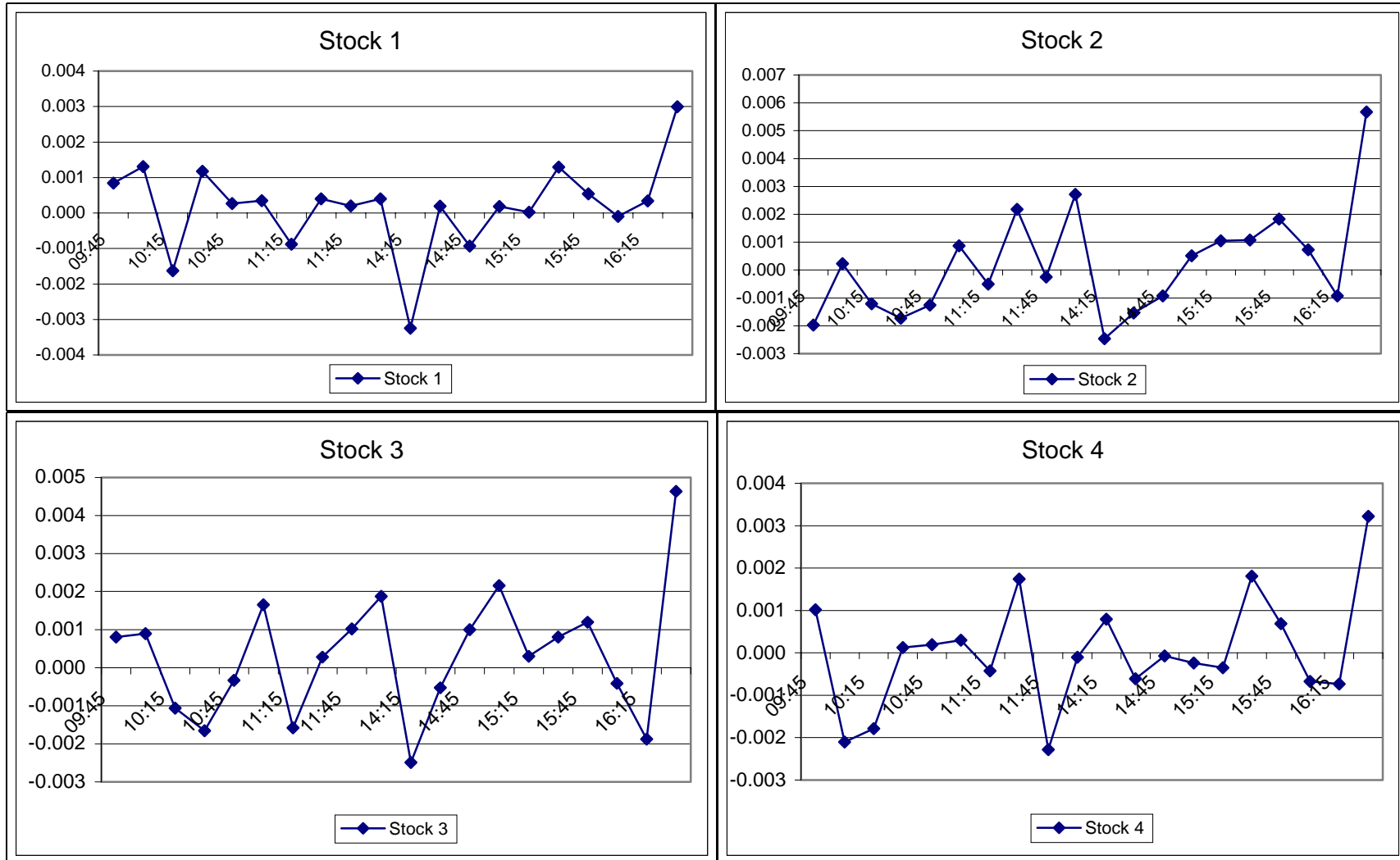
Appendix A exhibits the movements of the eight stocks individual 15-minute returns throughout the day (4.1.2000 – 10.8.2001)

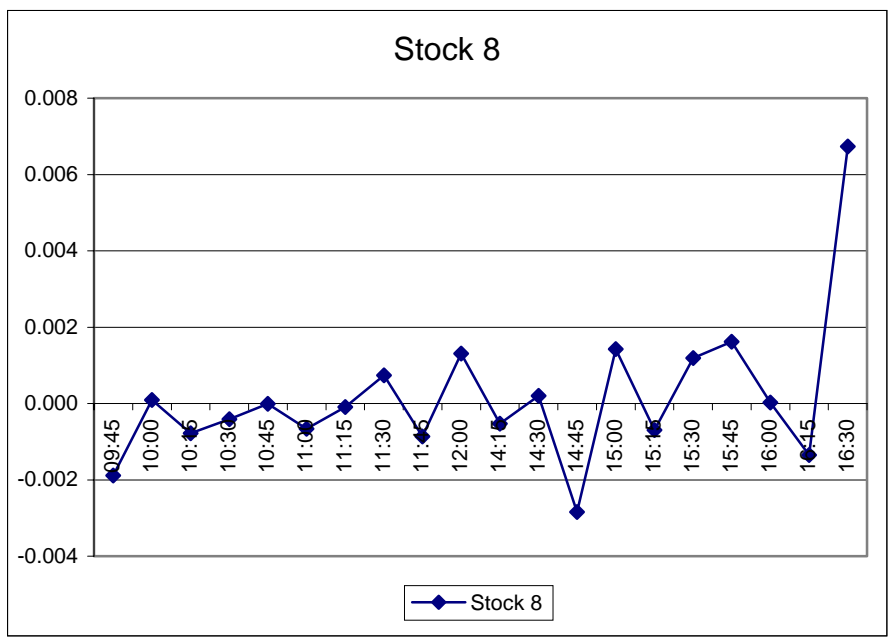
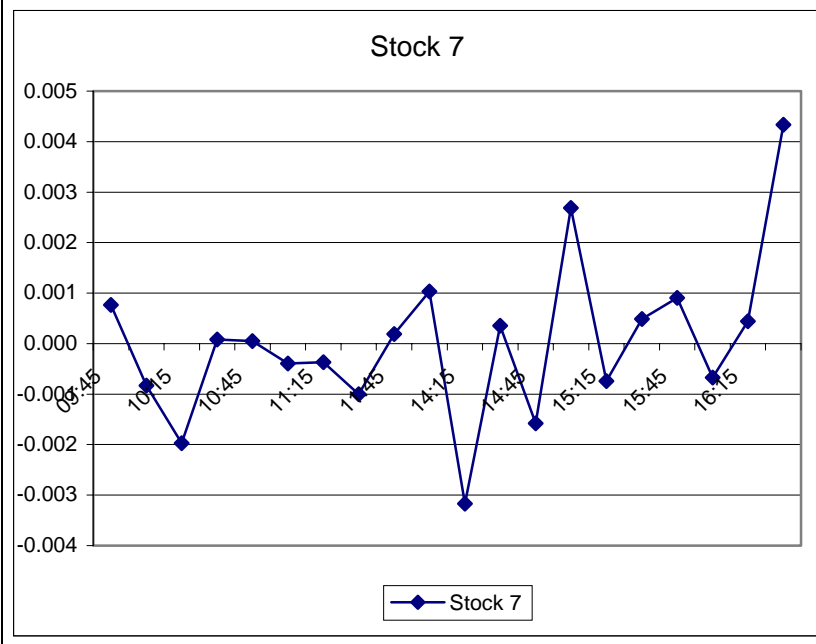
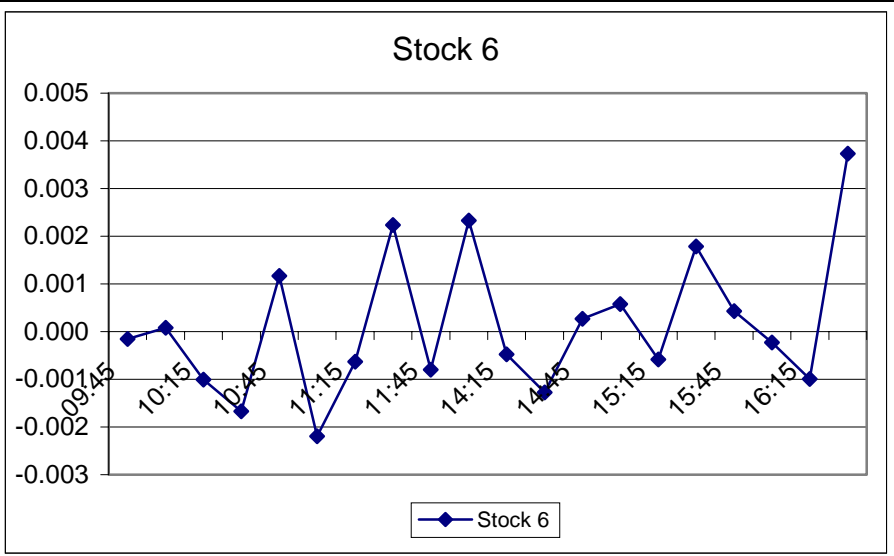
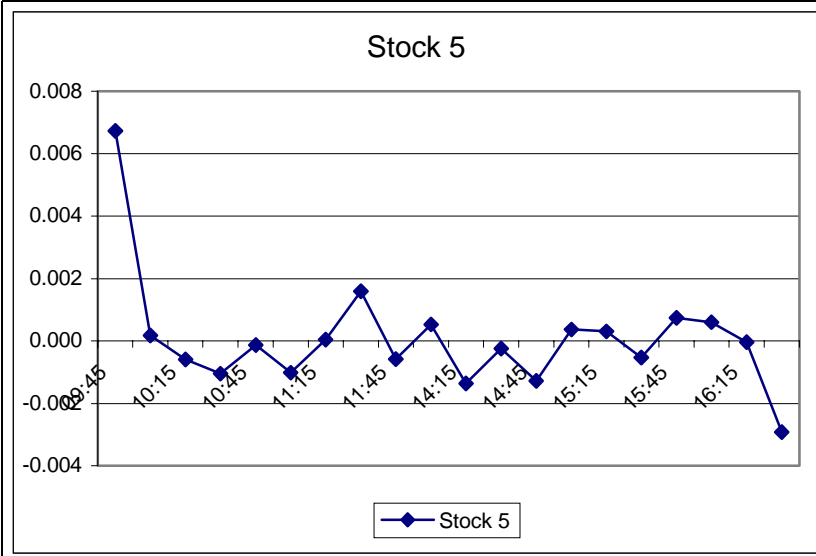




Appendix B

Appendix B exhibits the movements of the eight stocks individual 15-minute returns throughout the day (13.8.2001 – 29.3.2002)





Appendix C

Appendix C , shows the results of the daily largest two buyers and the largest two sellers possible manipulation attempt in the last minute of the trading day.

Results before the close (R_{c-15}) for the first period (4.1.2000 – 10.8.2001)

Stock	Intercept	Dbuy	Dsell	Dboth	R-square	F-value	N/df
Stock 1	-0.000153 -0.13	0.003653 1.94	0.001693 0.80	0.002712 1.46	0.010797	1.44	398
Stock 2	0.005916 2.73	-0.001381 -0.48	-0.000477 -0.16	-0.001095 -0.46	0.000789	0.10	398
Stock 3	0.001178 0.73	0.002035 0.89	0.003093 1.24	0.003463 1.68	0.007693	1.02	398
Stock 4	0.002698 2.22	-0.001014 -0.54	-0.000776 -0.36	-0.000118 -0.07	0.000955	0.13	398
Stock 5	-0.007208 -2.74	0.004320 1.25	0.006507 1.83	0.007386 2.64	0.019517	2.62	398
Stock 6	0.001845 1.62	0.000556 0.32	-0.001590 -0.88	0.001963 1.31	0.011670	1.55	398
Stock 7	0.003371 2.44	0.000700 0.36	0.002347 1.08	-0.001081 -0.58	0.007083	0.01	398
Stock 8	0.004308 2.21	0.001869 0.70	-0.002964 -1.09	0.001116 0.49	0.010503	1.40	398

†The t-statistics are reported under the coefficient estimates.
N/df is the number of observations and the degrees of freedom.

Results after the close (R_{c+15}) for the first period (4.1.2000 – 10.8.2001)

Stock	Intercept	Dbuy	Dsell	Dboth	R-square	F-value	N/df
Stock 1	0.004069 2.14	-0.005193 -1.71	0.001580 0.46	-0.002361 -0.79	0.011013	1.47	398
Stock 2	-0.006200 -1.43	0.008717 1.50	0.006038 1.00	0.002330 0.49	0.007981	1.06	398
Stock 3	0.003428 1.18	-0.004570 -1.10	-0.003984 -0.88	-0.003361 -0.90	0.003670	0.48	398
Stock 4	0.000585 0.32	0.002717 0.95	0.002991 0.91	0.004097 1.50	0.006182	0.82	398
Stock 5	0.008872 1.79	-0.004783 -0.74	-0.006942 -1.03	-0.003657 -0.69	0.002848	0.38	398
Stock 6	-0.004689 -1.20	0.008105 1.35	0.010884 1.76	0.006293 1.22	0.009020	1.20	398
Stock 7	0.004644 1.79	-0.001026 -0.28	-0.008456 -2.07	-0.002417 -0.69	0.012064	1.61	398
Stock 8	0.004231 1.29	-0.003451 -0.77	-0.004751 -1.04	-0.003700 -0.97	0.003187	0.42	398

†The t-statistics are reported under the coefficient estimates.
N/df is the number of observations and the degrees of freedom.

Results before the close (R_{c-15}) for the second period (13.8.2001 – 29.3.2002)

Stock	Intercept	Dbuy	Dsell	Dboth	R-square	F-value	N/df
Stock 1	0.002818 3.00	0.002429 0.80	-0.002095 -0.61	0.001607 0.40	0.008424	0.42	151
Stock 2	0.007022 4.08	-0.002048 -0.52	-0.004931 -1.21	-0.002514 -0.58	0.013070	0.56	129
Stock 3	0.003808 2.32	0.005762 1.27	0.000272 0.04	0.014544 2.08	0.049879	1.85	109
Stock 4	0.003142 2.57	-0.002568 -0.65	0.004397 0.96	0.002192 0.50	0.012916	0.56	132
Stock 5	-0.001302 -0.93	-0.004548 -1.73	-0.001344 -0.55	-0.005478 -1.91	0.040162	1.80	132
Stock 6	0.003543 3.31	0.000461 0.11	-0.001804 -0.56	0.009859 2.29	0.037211	1.93	153
Stock 7	0.004521 4.12	-0.001682 -0.48	0.003769 0.80	-0.000816 -0.22	0.006504	0.33	153
Stock 8	0.006165 4.79	0.003720 1.25	0.003124 1.05	-0.006955 -1.85	0.051598	2.32	

†The t-statistics are reported under the coefficient estimates.
N/df is the number of observations and the degrees of freedom.

Results after the close (R_{c+15}) for the second period (13.8.2001 – 29.3.2002)

Stock	Intercept	Dbuy	Dsell	Dboth	R-square	F-value	N/df
Stock 1	0.001538 1.12	-0.003097 -0.70	-0.003037 -0.61	-0.002527 -0.43	0.006091	0.30	151
Stock 2	-0.003442 -1.43	0.004315 0.79	0.000522 0.09	0.007621 1.27	0.015571	0.66	129
Stock 3	0.001521 0.83	-0.004569 -0.91	-0.003119 -0.44	0.000698 0.09	0.009163	0.33	109
Stock 4	0.001759 0.80	-0.007307 -1.03	-0.007540 -0.92	-0.001802 -0.23	0.013453	0.59	132
Stock 5	0.003625 1.32	0.008851 1.71	0.008882 1.83	-0.001781 -0.32	0.044892	2.02	132
Stock 6	0.000255 0.18	-0.007243 -1.37	0.002617 0.62	-0.003145 -0.56	0.017720	0.90	153
Stock 7	0.000409 0.27	0.007123 1.48	-0.004744 -0.74	-0.000503 -0.10	0.019330	0.99	153
Stock 8	-0.000978 -0.48	0.001360 0.29	-0.002780 -0.58	-0.004195 -0.70	0.007426	0.32	131

†The t-statistics are reported under the coefficient estimates.
N/df is the number of observations and the degrees of freedom.

References

- Allen, F., Gale, D., "Stock Price Manipulation." *Review of Financial Studies*, Vol. 5, (1992), pp. 503-529.
- Allen, F., Gorton, G., "Stock price manipulation, market microstructure and asymmetric information." *European Economic Review*, Vol.36, (1992), pp. 624-630.
- Andersen, T.G., Bollerslev, T., Cai, J., "Intraday and interday volatility in the Japanese stock market." *Journal of International Financial Markets*, Vol. 10, (2000), pp. 107-130.
- Bagnoli, M. And Lipman, B.L., "Stock Price Manipulation Through Takeover Bids." *RAND Journal Of Economics*, Vol. 27, (1996), pp. 124-147.
- Benabou, R. and Laroque, G. "Using Privileged Information to Manipulate Markets: Insiders, Gurus, and Credibility." *Quarterly Journal of Economics*, Vol. 107 (1992), pp. 921-958.
- Bildik, R. "Intra-day seasonalities on stock returns : evidence from the Turkish stock market." *Emerging Market Review*, Vol. 2, (2001), pp. 387-417.
- Brock, W.A., Kleidon, A.W., "Periodic market closure and trading volume." *Journal of Economic Dynamics and Control*, Vol.16, (1992), pp.451-489.
- Capital Market Board, Manipülasyon inceleme rehberi. Sermaye Piyasası, Ankara, Turkey, (1999).
- Chatterjea, A., Cherian, J. A., "Market manipulation and corporate finance: A new perspective." *Financial Management*, Vol. 22, (1993), pp. 200-209.
- Cheung, Y., "Intraday returns and the day-end effect: evidence from the Hong Kong Equity Market." *Journal of Business Finance and Accounting*. Vol. 22, (1995), pp. 1023-1034.
- Choe, H., Shin, H., "An analysis of interday and intraday return volatility _ evidence from the Korean Stock Exchange." *Pacific-Basin Finance Journal*. (1993), pp. 175-188.
- Felixson, K. Pelli, A., "Day-end returns – stock price manipulation." *Journal of Multinational Financial Management*, Vol. 9, (1999), pp. 95-127.
- Fischel, D.R., Ross, D.J., "Should the law prohibit "manipulation" in financial markets." *Harvard Law Review*, Vol. 105, (1991), pp.503-553.
- Fried, J. "High Closing", Working paper, University of Western Ontario, Canada, (2000).
- Foster, F.D., Viswanathan, S., "Variations in trading volume, return volatility, and trading costs: evidence on recent price formation models." *J. of Finance*, Vol. 48, (1993), pp.187-211.
- Harris, L., "A transactions data study of weekly and intradaily patterns in stock returns." *Journal of Financial Economics*, Vol. 16, (1986), pp. 99-117.
- Harris, L., "A Day-end transaction price anomaly." *Journal of Financial and Quantitative Analysis*, Vol.24, (1989), pp. 29-45.
- ISE, Sermaye Piyasası ve Borsa Temel Bilgiler Kılavuzu, 16. Baskı, İMKB, İstanbul, Turkey, (2001).
- Jain, P.C., Joh, G.H., "The dependence between hourly prices and trading volume." *Journal of Financial and Quantitative Analysis*, Vol.23, (1988), pp. 269-283.
- Jang, H., Lee, J. "Intraday behavior of the bid-ask spread and related trading variables." Working Paper, University of Oklahoma, U.S.A. (1993).
- Jarrow, R.A. "Market Manipulation, Bubbles, Corners, and Short Squeezes." *Journal of Financial and Quantitative Analysis*, Vol. 27 (1992), pp. 311-336.
- Jarrow, R.A., "Derivative security markets, market manipulation, and option pricing." *Journal of Financial and Quantitative Analysis*, Vol. 29, (1994), pp. 241-261.
- Kumar, P and Seppi, D.J. "Futures Manipulation with 'Cash Settlement,'" *Journal of Finance*, Vol. 47, (1992), pp. 1485-1502.
- Kyle, A.S. "A Theory of Futures Market Manipulations." In R.W. Anderson, ed., *The Industrial Organization of Futures Markets*. Lexington, Mass.: Lexington Books, 1984.

- Lowengrub, P., Melvin, M., "Before and after international cross-listing: an intraday examination of volume and volatility." *Journal of International Financial Markets*, Vol.12, (2002), pp.139-155.
- Norden, L., "An investigation of intradaily regularities in Swedish stock market returns." Working Paper, University of Lund, Sweden, (1993).
- Smirlock, M., Starks, L., "Day of the week and intraday effects in stock returns." *Journal of Financial Economics*, Vol.17, (1986), pp197-210.
- Wood, R.A., McInish, T.H., Ord, J.K., "An investigation of transaction data for NYSE stocks." *Journal of Finance*, Vol. 40, (1985), pp.723-741.
- Yadav, P.K., Pope, P.F., "Intraweek and intraday seasonalities in stock market risk premia: cash and futures." *Journal of Banking and Finance*, Vol.16, (1992), pp.233-270.